Chemical Weapons in Russia: History, Ecology, Politics

[Khimicheskoye Oruzhiye V Rossii: Istoriya, Ekologiya, Politika]

by Doctor of Chemical Sciences Lev Aleksandrovich Fedorov Moscow
Center of Ecological Policy of Russia
1994 [27 July 1994]

PREFACE

The Center of Ecological Policy of Russia is submitting the first straightforward analysis of the chemical weapons problem in Russia as a nation-wide political and ecological problem. This analysis is quite different from the usual official view of the problem that is concentrated only on the need for organizing safe destruction of the officially declared 40,000 toxic chemicals (TC).

Indeed, we must organize the most expeditious safe destruction of these TC. But as this analysis shows, for assurance of ecological safety of Russia it is no less important to ascertain the burial sites of many times that number of TC produced during the years of Soviet power.

According to Item 7 of the Law on State Secrecy, ecological information cannot be classified. Chemical weapons have been removed from armament, there is no provision for using them in Russian military doctrine, and production is unconditionally prohibited. However, data about both weapons that have already been produced, and the sites and circumstances of their destruction in the past are still classified. This practice is not only illegal, but immoral as well.

Chemical weapons were developed, tested and produced in the USSR. It avails nothing for Russia to assume this terrible burden of the past.

Like other analytical efforts by the Center of Ecological Policy of Russia, this work is addressed to two main audiences. The first audience is those responsible for making decisions in the legislative, executive and judicial branches of government.

During the years of Soviet power, surely more money was spent on developing, producing and equipping chemical weapons than on all public education, and many times more than on advancement of culture. The last ambitious infusions of funding were made in 1989 (!) by the infamous Decree of the CPSU Central Committee and USSR Council of Ministers on Developing Binary Chemical Weapons. A decision has to be made about how to proceed. Do we continue with top secret development of ever newer, more advanced and monstrous kinds of chemical weapons, increasing the threat of their accidental or intentional use? How do we use to public advantage the enormous scientific and engineering potential accumulated by the USSR during the years of the chemical arms race?

The second audience is the "Greens," ecological organizations and mass movements. We need to address this audience to keep pressure on agencies in power that are giving far too little attention to problems of ecological safety of people and society. The work is aimed at a third collective audience: the many thousands of Russian citizens involved (only in the past?) in the development, testing and production of chemical weapons. Perhaps after reading this they will think about whether it is worth going on with their involvement in a business that, putting it mildly, has no prspects in the future world. A few words about the author of the survey. Doctor of Chemical Sciences Lev Aleksandrovich Fedorov is an eminent scientist of the V. I. Vernadskiy Institute of Geochemistry and Analytical Chemistry of the Russian Academy of Sciences, and member of the New York Academy of Sciences. He has never himeslf been personally involved with either

development or production of chemical weapons, and since graduating from Moscow State University has worked throughout the years at the Academy of Sciences.

L. A. Fedorov analyzes questions having to do with chemical weapons from two points of view: as a professional chemist, and as a concerned citizen. He does this quite successfully, as he has been dealing with problems of ecology for the past ten years, especially with those areas involving man-made contamination of the environment with such organic ecopoisons as TC, dioxins and liquid rocket fuels. In 1992, L. A. Fedorov organized the Anti-Dioxin Association, and in December of 1993 he published a book "Dioxins as an Ecological Hazard: Looking Back, and Looking Ahead" (Moscow, Nauka, 267 pp). In mid-October 1993, L. A. Fedorov was elected president of the new public ecological organization "Union for Chemical Safety" at its first meeting.

As this survey is the first of its kind, it has not been possible, of course, to examine in as much depth as was wanted all problems associated with chemical weapons in Russia. Some of them are only mentioned, and more information about others is given in the appendices.

Clearly, conclusions given by the author, sometimes rather sharp ones, are a consequence of prolonged secrecy, and therefore seem justified. Of course, the positions set forth in the survey reflect expert opinion.

[signed] A. B. Yablokov, associate member of Russian Academy of Sciences, 9 March 94

INTRODUCTION

Chemical weapons are twentieth century weapons [1-8], though some chemicals subsequently used as toxic agents had already been discovered in the nineteenth century. The first international agreements relating to limitation of chemical weapons also go back to the last century [8]. Chemical weapons have always had features of weapons of mass destruction. The civilian population could not be excluded from their range of coverage, and for that reason they could never be treated as a means of attacking only troops of a probable enemy. It had never been officially acknowledged that the Soviet Army had chemical weapons. This fact was carefully hidden [5, 6, 9], although there was wide knowledge about chemical weapons themselves [1-8]; but their "service" in the Red (Soviet) Army ceased to be a secret at least from the time of World War II [10, 11].

No mention was made about Soviet chemical weapons in the propaganda pamphlet "Chemical Forces of the Soviet Army" signed to press in April 1987 [12]. Their existence was admitted only by M. S. Gorbachev that same month when he had to declare that industrial production was stopped: "I can tell you that the Soviet Union has stopped making chemical weapons. As you know, other Warsaw Pact nations never made them, and did not have them on their territories. The USSR has no chemical weapons outside its own borders, and with regard to stockpiles, I wish to inform you that we have started to build special enterprises for destroying them" [13].

It was not until 1990-1991 that the first official data about the number and qualitative characteristics of the Soviet Union's arsenal of chemical weapons were reported [14-16], after the residents of Chapayevsk objected to operation of a "special enterprise for ... destruction" of chemical weapons near their home [17-19]. However, even in 1990, information about the "possible" toxic properties of yperite and lewisite was being published exclusively with reference to foreign sources ("according to foreign data, yperite is a TC") [20].

Since the official information [14-16, 21, 22] and propaganda [9, 23-26] about the Soviet Union's chemical weapons pertained only to stockpiles that were still intact at the time of the official declaration about stopping production [13], it did not completely reflect reality. At any rate, it gave no idea about the historic aspect of the problem of chemical armament, and all the more could do nothing to help solve the problems of chemical disarmament.

Data of this kind about preparations of the Soviet Union for all-out chemical warfare could never give an idea about the medical and ecological consequences of these preparations, i.e. essentially about how to come out of this unstarted war with minimum losses.

With regard to the quality of the information provided [14-16, 21- 26], a lot of it was ambiguous, outright contradictory [27-29] and did not jibe with Western intelligence [10, 11, 30]. Finally, the clumsy actions of authorities, giving a glaringly political tone to natural questions about the reality of the start of chemical disarmament in Russia [27-29], created the impression that something was being intentionally hidden from the public about which they had a right to be informed. This became especially true after the international Convention on the Prohibition of the Development, Production, Stockpiling, and Use of Chemical Weapons and on Their Destruction was signed in Paris on 13 January 1993.

The official approach to implementing the Convention on chemical disarmament has been to destroy chemical weapons, solving the military and political problem of eliminating an entire class of weapons of mass destruction [34]. However, eliminating stockpiles of chemical weapons will not solve the problem of getting out of the prolonged chemical confrontation. This applies first of all to overcoming the consequences stemming from chemical armament for people and nature. The foregoing motives have been the basis for this writing.

I. RUSSIA'S ROAD TO CHEMICAL WEAPONS

Chemical weapons are essentially as old as machine guns in the army of Russia. Inherited from the czarist army, they continued to serve their hitch in Soviet Russia after 1918. Beginning in the twenties, work on developing, producing, stockpiling and using chemical weapons was the occupation of an entire sector, a system for organizing the army, industry and medicine, that had evolved into a stable and quite closed military-chemical complex (MCC) [36]. For all these years right up to the present, the MCC has operated in an environment of secrecy.

The initial organization of military-chemical affairs in the Soviet Union is linked with the name of the eminent twentieth century chemist and former Academician V. N. Ipatyev (1867-1952) [37]. Usually, his name is rarely mentioned, and not at all in connection with solution of problems of defense of the nation. It is only recently that V. N. Ipatyev has been restored to the academic title of which he was stripped in the thirties because he left the country following the arrest of Ye. I. Shpitalskiy, a corrresponding member of the USSR Academy of Sciences, who was for all practical purposes involved in working out the first production of toxic chemicals (TC): yperite and phosgene [37].

I.1. Military-Chemical Complex (MCC)

In the Red (Soviet) Army, military-chemical affairs were initially headed by the Military-Chemical Administration (VOKhIMU) of the RKKA [Workers' and Peasants' Red Army]. As it evolved, it underwent a series of transformations. In recent years, the organization has been called the Administration of the Chief of Chemical Forces (UNKhV) of the Soviet Army [12]. This is now the Radiation, Chemical and Biological Protection (RCB) Forces that have their own system of research, academic and testing organizations.

Throughout the post-war years and up to the present, the UNKhV has had a so-called scientific-technical committee (STC). In reality, this is an institute that was and is involved in military-chemical planning, including planning of "likely enemy" targets meriting the attention of "chemical gnomes" [58]. We do not know what the institute is now called, and will limit ourselves to the official codename--military unit No. 64518.

In industry, work on developing chemical weapons was initially done by the VOKhIM Trust. In the late thirties, this was transformed to the Sixth Administration of Narkhomtyazhprom (NKTP) [People's Commissariat of Heavy Industry] that headed up all work on special chemistry, including on development of chemical weapons. After removal of the chemical industry from the NKTP and creation of Narkomkhimprom (NKKhP) [People's Commissariat of the Chemical Industry] in 1939, the Sixth Administration was renamed the First Main Administration of the NKKhP (MKhP) [Ministry of the Chemical Industry]. It went through the war and the early post-war years in this organizational form, in charge of work on developing chemical weapons in its plants, and

coordinating production of TC and charging them into munitions at the same plants of the MKhP that were not incorporated into the system of this main administration. The first main administration continued to direct this work during the years of economic councils as well, when the MKhP was reorganized into the State Committee of the Council of Ministers of the USSR on Chemistry (GKhK), and later into the GKhK affiliated with the USSR State Planning Commission. In 1963, the Soyuzorgsintez All-Union Association was instituted, that included far from all former chemical weapons plants, and that directed production of chemical weapons in the Soviet Union right up to the late eighties, and weapons development until 1 January 1993 [52].

Throughout the years, chemical weapons have been offensively oriented, for which there is a basis in military science. Academician A. N. Bakh at the Sixteenth Congress of the VPK(b) [All-Union Communist Party (Bolsheviks)] 1930 proclaimed that victory in future warfare would be decided "not by metal, but by chemicals, not by bayonets and shells, but by poison gases" [38]. Development of technologies for producing TC and corresponding chemical munitions is tied up with the activity of a network of special chemistry organizations. We are referring to various secret production, design and testing institutes of the chemical industry and the army. They have all worked under top secret conditions with mandatory participation of the NKVD [36, 39].

Key personnel for the TC industry have been trained by several institutes: a special department of D. I. Mendeleyev Institute of Chemical Technology in Moscow (MKhTI) [11], as well as corresponding departments of the Military Academy of Chemical Protection (VAKhZ) of the Soviet Army. Graduates of the latter have been such renowned Soviet personalities as P. N. Demichev and N. S. Patolichev [27].

Sanitation and health support at TC production facilities in the pre-war years, during the war and in the early post-war years was the province of the Institute of Labor Hygiene and Occupational Illnesses of the USSR Academy of Medical Sciences (Moscow) and the Institute of Labor Hygiene and Occupational Illnesses of the RSFSR (Nizhniy Novogorod).

Production of new generations of chemical weapons was handled by the already specialized institutes of the USSR Ministry of Public Health: at first by the Institute of Biophysics (Moscow), and later by the Institute of Labor Hygiene and Occupational Pathology (St. Petersburg) and the Institute of Labor Hygiene and Occupational Pathology (Volgograd). They were all part of a closed special system of classified medicine: the Third Main Administration affiliated with the USSR Ministry of Public Health (today the Federal Administration of Medical-Biological and Emergency Problems of the RF Ministry of Health Care). Also incorporated into this system was the "Medstatistika" Scientific Research Institute. The real purpose of this specially created institute is to accumulate all available toxicological information, including about chemical weapons, high-toxicity dioxins, and the like [36].

I.2. Chemical Arsenal of the Soviet Union

Chemical weapons are subdivided into three generations. Each has been marked by an era in military-chemical affairs (technology of use), and hence in industry (technology of production).

The military differences of the three generations of chemical weapons boil down essentially to a sequential change in their combat effectiveness. This refers not just to increased toxicity and other combative characteristics of the TC themselves. Also important has been the evolution of means of delivery (chemical munitions).

The only element that has nothing to do with the evolution of chemical weapons, and therefore unites all three generations, is that they cannot be used in combat without harm to the civilian population.

In the pre-war years, chemical weapons were given a serious role in the Soviet Army along with tanks and aircraft. During World War II, no side wanted to risk resorting to chemical weapons, and they were relegated to the background in military operations.

Nevertheless, chemical weapons of the Soviet Union received enormous additional development in the post-war period.

First Generation Chemical Weapons

The TC that provide the basis for chemical weapons of this generation were developed in Germany, the United States and several other nations in connection with combat operations of World War I and immediately following it [6]. Within the scope of combat classification, they include three major groups:

- persistent TC (PTC) of skin-blistering and general toxic action: yperites--sulfuric (agent HD) and nitric (HN)--and lewisite (L),
- nonpersistent TC (NTC): prussic acid (AC), phosgene (CG) and diphosgene (DP),
- irritating TC (irritants): adamsite (DM), diphenyldichloroarsine (DA), diphenylcyanoarsine (DC), chloroacetophenone (CN), CS gas, and chloropicrin (PS).

PTC and NTC were considered as chemical weapons in the Soviet Union from 1918 up until the turn of the sixties, when chemical rearmament was started. They were produced beginning in 1924 when the first experimental batch of yperite was made in Moscow at what is today GSNIIOKhT [State Union Scientific Research Institute of Organic Chemistry and Technology] [43].

PERSISTENT TC

Yperite. PTC of skin-blistering and general toxic action. Oily brown liquid. Lethal dose for action through the skin is 80 mg/kg of body mass. Has latent period of action (death occurs within 24 hours). There are no antidotes. Has mutagenic effect. Very poorly hydrolyzed.

Lewisite. Organoarsenic PTC of skin-blistering action. Liquid. Concentration of 0.12 mg/liter causes death upon action through respiratory organs. Lethal dose when lewisite is applied to the skin in liquid droplets is 35 mg/kg. Has no latent period of action. There is an antidote. Readily hydrolyzed by water with forma-

In addition to irritants, first generation TC include psychochemical compounds (incapacitants): agents designed for temporarily disabling an enemy [6]. Among these are LSD, 3-quinuclidinic ester of benzilic acid (agent BZ) and others. These, like chloroacetophenone ("tear gas") and CS gas, were not retired from "active duty" until the late eighties, when the well known events in Tbilisi occurred.

Second Generation Chemical Weapons

These include organophosphorus TC (OTC) of paralytic nerve action: tabun (GA), sarin (GB), soman (GD) and V-gases [6]. The first three OTC were developed in Germany at the turn of the forties (though an agent that is the complete analog of tabun can be found, for example, in a pre-war Soviet monograph [2]).

ORGANOPHOSPHORUS TC OF PARALYTIC NERVE ACTION

V-gas. Oily high-boiling liquid. Readily soluble in water. Freezes at very low temperatures. Penetrates into the organism through the skin and respiratory tract. Latent period of action from a few minutes to 4-6 hours. Dozens of times more toxic than soman. Slowly hydrolyzed by water.

Sarin. Colorless liquid. Mixes readily with water. Lethal concentration about 0.2 mg/liter with exposure of a minute. In liquid droplet form causes complete poisoning through the skin. Slowly hydrolyzed by water.

Soman. Colorless liquid. Lethal concentration about 0.02 mg/liter with exposure of 1 minute. Causes general poison in action on the skin in vapor state. Very slowly hydrolyzed by water.

Tabun. Lethal concentration 0.3 mg/liter with exposure of 1 minute. Exposure of the skin to 50-70 mg/kg of liquid droplet tabun results in lethal poisoning. Slowly hydrolyzed by water. Products of hydrolysis are poisonous.

The group of TC designated by international classification as V-gases was developed in the United States, Sweden and other nations in the fifties. Second generation chemical weapons became a component of combat planning of armies of the world beginning in the fifties, and in binary form starting in the sixties [8].

These same years saw the advent of psychochemical compounds (incapacitants), TC that do not destroy or irritate, but merely temporarily disable the enemy [5, 6].

In the Soviet Union, developments of the most toxic OTC based on Western data [36, 44] began in earnest in 1943. They were not stopped even when the advent of nuclear-missile weapons eliminated the strategic need for chemical weapons [39]. Every project on production of OTC culminated in prizes awarded to the directors of the MCC including for research on developing chemical munitions and improving the effectiveness of their action [36]:

- sarin--Stalin Prize, First Class, 1946 (M. I. Kabachnik),
- sarin and soman--Lenin Prize, 1960 (V. D. Belyayev, B. P. Kuchkov, V. V. Pozdnev, N. N. Yukhtin et al.),
- chemical munitions--State Prize, 1970 (I. M. Gabov et al.),
- soman--Lenin Prize, 1972 (S. V. Golubkov, V. M. Zimin, I. V. Martynov et al.),
- V-gas--Lenin Prize, 1974 (K. A. Guskov, M. I. Kabachnik, V. M. Romanov, A. V. Fokin et al.).

In the Soviet Union, three kinds of OTC were included in armament, produced on industrial scale, and are still being stored in army stockpiles: sarin, soman, and Soviet V-gas [14,43]. The United States has only sarin and VX-gas [6, 8]. At one time, the Soviet Army also had stockpiles of tabun captured in Germany in 1945.

The present Russian stockpiles of OTC and munitions charged with them are entirely linked to the activity of two plants: the old S. M. Kirov Chemical Plant in Stalingrad (Volgograd), and a newly constructed plant in Chuvashia at Novocheboksarsk ("Khimprom" Production Association imeni the Leninist Komsomol) [27, 36, 43].

Third Generation Chemical Weapons

The advent of third generation chemical weapons in the Soviet Union was a direct consequence not only of the Cold War, but also of attempts of the MCC to "keep itself alive." These weapons embody dual advances in special chemistry: not only new types of TC [45], but also more effective means of combat use (binary weapons [46] and multiple warheads [47]).

The development of new OTC that became the basis for third generation chemical weapons dates from 1973-1976 [48, 49]. This was followed by technological research, production of experimental lots and many years of combat tests of various munitions [29, 48- 50] that were completed in 1991-1992 [29]. As a whole, the "Foliant" program [51] yielded five promising OTC of a new type [48]. One of these (A-232, "novichok-5" [36]) turned out to be convenient for combat use in binary form (Soviet V-gas has also been made for use in binary form [43, 46, 48]). The concluding cycle of research within the scope of the "Foliant" target program [51] was conducted in fulfillment of Decree of the CPSU Central Committee and the USSR Council of Ministers No 131-24 dated 25 March 1983, and a special Decree of the CPSU Central Committee and the USSR Council of Ministers No 844-186 on research to develop binary weapons was promulgated on 6 October 1989 when perestroyka was at its height [52].

The services of the MCC leaders in developing third generation chemical weapons were rewarded with prizes and other honors [36]:

- "solution of special problems"--State Prize, 1978 (A. Ye. Gusakov, I. B. Yevstafyev, V. A. Romanchuk, L. S. Shevnitsyn et al.),
- "Foliant" program--State Prize, 1981 (N. N. Kovalev, V. K. Pikalov, O. I. Stuzhuk, A. G. Shkuro et al.),
- "solution of special problems"--State Prize, 1982 (A. M. Ivanov, Yu. I. Musiychuk, G. A. Patrushev, V. V. Pozdnev et al.),

- binary weapons--Lenin Prize, 1991 (A. D. Kuntsevich, V. A. Petrunin et al.),
- binary weapons--State Prize, 1991 (R. K. Balchenko, I. B. Yevstafyev, N. N. Kovalev, G. S. Leonov et al.).

Data are not available about the combat characteristics of third generation chemical weapons. It is only known that the new chemical weapons are superior to American VX, and that they practically defy medical treatment [53]. Among their other features are relative simplicity of manufacture and accessibility of raw material [54].

Nontraditional Chemical Weapons

The Soviet Union made experimental lots of some kinds of incapacitants in preparation for combat use [39, 55]. Nor could the Soviet Army resist the temptation to prepare for warfare using nontraditional means of attack: herbicidal weapons, sabotage (including dioxins) and the like [27, 39, 42].

I.3. Development of Chemical Weapons

Any new types of TC and new types of chemical munitions have become a topic of concern of industry after the army (chemical forces, as well as the air force and artillery) had adopted them, though not all TC put into ordnance have been successfully produced by industry.

The head institute of the chemical industry in developing chemical weapons (TC themselves and corresponding ordnance) was the Moscow-based State Union Scientific Research Institute of Organic Chemistry and Technology with Experimental Plant (GSNIIOKhT, now GNIIOKhT [34]) of the Ministry of Chemical Industry.

The development of chemical weapons was also the business of military organizations: VAKhZ SA in Moscow, and also for some time the Red Army Chemical Scientific Research Institute [NIKhI RKKA] (now TsNIVTI), which had not yet been resettled from the capital to Shikhany. For years, especially during the post-war period, GSNIIOKhT was in the most intimate contact with military organizations. Within the scope of the MCC, it was a kind of union within a union.

At various times, organizations of many other ministries and agencies--the USSR Academy of Sciences, the USSR Ministry of Public Health, the USSR Ministry of Agriculture and many others--took part in supporting the development of chemical weapons.

GSNIIOKhT and institutes and other organizations of the MCC in general maintained especially close contacts with academic science of the Soviet Union. In 1992, Western authors made this assessment of the wartime and post-war level of these contacts: "It can be assumed with certainty that academic scholars of the USSR have been enlisted in the development of new agents that are made by enterprises producing TC of paralytic nerve action... Although there is no doubt that the efforts of many scientists have been joined in this work, it would seem that six of them have been responsible for Soviet advances: V. M. Plets, A. Ye. Arbuzov, S. I. Volfkovich, M. I. Kabachnik, V. A. Kargin and I. L. Knunyants. The first four have done research relating to tabun" [11].

A similar assessment resounded in the official Russian press in 1993: "Representatives of the science schools of academicians Zelinskiy, Knunyants, Fokin and Kabachnik have been working at the institute" [meaning GSNIIOKhT -- L.F.] [40]. We might add a personage not included in this assessment, a member of the Russian Academy of Sciences and lieutenant-general of chemical forces, A. D. Kuntsevich, quoting his own self-appraisal: "I have managed to form and head up a large scientific and practical school that has achieved considerable results in the field of fundamental and applied problems relating to the reactivity of organophosphorus agents" [41].

GSNIIOKhT was set up in the twenties on the basis of the prerevolutionary Olginskiy Plant located on Entuziastov Highway, and the special laboratory of V. Ya. Karpov Institute of Physical Chemistry (FKhI MKhP). During its early years, the organization was oriented mainly toward production, when volumes of the chemical weapons made there were appreciable against the general background (Olginskiy Plant, Plant No 1, Plant No 51). It was part of the corresponding

trusts (Aniltrest, VOKhIM Trust, VKhTOP). Prior to the war in connection with evolution of scientific subdivisions, the organization was renamed: Scientific Research Institute with Experimental Plant (GSNII-42), and following the war--GSNII-403 and GSNIIOKhT [36]. GSNIIOKhT had an affiliate in Dzerzhinsk, which detached itself as time passed to become an independent institute with a different problem area: Gorkiy Scientific Research Institute of Organochlorine Products and Acrylates (NIKhP). Two new affiliates of GSNIIOKhT were created in the fifties and sixties: the Volsk Affiliate (now the State Institute of Organic Synthesis Technology--GITOS) and the Volgograd Affiliate (now the Scientific Research Center of the Chemical Industry).

The Novocheboksarsk Affiliate of GSNIIOKhT was also set up in the late seventies, lasted to the mid eighties, and was then retired. The design of chemical weapons production plants was handled by Moscow Design Institute GSPI-3 (State Union Design Institute of the Chlorine Industry--GIPROKhLOR) and by its Dzerzhinsk and Volgograd (now GIPROSINTEZ) affiliates.

Operations of several institutes of industry and agriculture are associated with development of herbicidal weapons [27, 36, 42]. Moscow All-Union Scientific Research Institute of Chemical Means of Plant Protection (VNIIKhSZR), its affiliate herbicidal institute VNITIG (Ufa), and also the experimental plant of VNIIKhSZR in Shchelkovo developed formulas for killing plants of a "likely enemy." Also participating in this work was the Institute of Phytopathology of the USSR Ministry of Agriculture that is now part of the RASKhN system (formerly VASKhNIL [V. I. Lenin All-Union Academy of Agricultural Sciences]. Chemical munitions were first developed at GSNIIOKhT. A specialized organization began operation in the forties in Moscow (its most recent name is "Basalt" Scientific Production Association).

In determining the nomenclature and technology of first and second generation TC, GSNIIOKhT originally used foreign experience of various origins, mainly that obtained by intelligence operations. It has developed with allowance for the technological capabilities of specific production facilities, chiefly with orientation toward making them less costly, and consequently toward the dehumanization typical of socialist nations.

Developments of new TC of the third generation and technologies for producing them were concentrated in GSNIIOKhT and its Volsk affiliate [48, 49]. Two victims of these developments are known: former GSNIIOKhT employees A. N. Zheleznyakov and L. A. Lipasov [97].

I.4. Chemical Weapons Testing

Since the twenties, the Soviet Army has had several subdivisions and organizations that specialize in developing and testing chemical weapons [10, 11].

NIKhI RKKA (subsequently TsNIVTI) is the first military institute of the SA where TC and chemical weapons were developed. Since relocation to Shikhany in the early sixties under the name 33 TsNIII KhV SA, it has been basically a test facility.

VAKhZ SA has also been engaged in developing and testing chemical weapons.

Chemical weapons sent to the Soviet Army in experimental lots were tested at many sites [10, 11]. Based on intelligence data from the time of World War II [11], a list is given of sites of the Soviet Union where chemical weapons were tested in pre-war years: the Caspian Sea in the vicinity of Astrakhan (lewisite), Lake Baykal, Florishchi near Nizhniy Novgorod (VAKhZ test base), Gelendzhik, Odessa and Sevastopol (marine tests on the Black Sea), Luga (Leningrad Oblast), Kuntsevo and Kuzminki (Moscow), and so on.

The practice of field and marine testing of chemical weapons continued in the post-war years as well, when civilized nations began conducting tests of this kind as far as possible in enclosed hangars because of extreme danger to the population and natural environment [56].

Specialized organizations (research and testing military-chemical institutes, VAKhZ SA, military-chemical academies of Kostroma, Saratov and Tambov) had their own proving grounds.

The diversity of territories where chemical weapons were tested was due, among other things, to the necessity of studying their combat characteristics under different climatic conditions [10, 11]. In addition, this diversity is associated with different kinds of troops and types of armed forces using chemical weapons for their own purposes.

Consideration of testing of TC and highly toxic agents in general and the consequences of these tests should be given a serious place in discussion of the problem. Although all nations are reluctant to publish data on this topic, there is hardly anyone who would doubt that tests of TC with the participation of people, and even tests directly on people were the usual thing for the Soviet Army and industry, not to mention the practice of the NKVD [57, 58].

In the pre-war years, involuntary contaminations of participants in chemical weapons tests were especially frequent [59]. At that time, the practice of direct tests of TC on people was widespread, and included thousands of people, among them tests of such PTC as yperite and lewisite [60]. In particular, about 6000 tests were done at NIKhI RKKA in 1930-1935 on the action of various TC on the skin of people. From time to time, the practice was stopped, and then taken up again. Newly developed TC were also tested on people in a chemical "sharashka" [footnote: The "sharashka" is a specific form of development of Soviet applied science: a scientific institution utilizing forced labor of incarcerated scientists.] located in the pre-war years at what is now GSNIIOKhT [58].

Many naval exercises were conducted with the use of TC. For example, during exercises on the Baltic in August of 1934 with participation of the destroyer "Karl Marx," it was contaminated with yperite from an airplane. Several noncommissioned sailors were exposed to the direct action of TC; they had protective clothing with slits made on various parts of the body [58].

In post-war years, several field training exercises have been carried out with large-scale use of TC. For example an OTC (apparently sarin) was tested during field training exercises in 1971 conducted near Lake Balkhash [61].

The practice of testing TC directly on people persisted into the post-war years. The toxic properties of V-gas were studied on people in the sixties. In the early eighties, tests of the latest TC were carried out not only on experimental animals, but on dozens of people as well [58, 62-64]. Tests of TC on people at the 33rd TsNIII SA in Shikhany were supervised by then director of this TsNIII General A. D. Kuntsevich [58].

Moscow

On the territory of Moscow alone, chemical weapons were apparently tested at three sites, including at what are today Kuzminki [11, 59, 65] and Kuntsevo [11].

The proving ground at Kuzminki was situated on the extensive property of the Golitsyn estate, and was operated from the early twenties to the early sixties. It belonged to TsNIVTI UNKhV SA until this institute was moved to Shikhany, and the territory surrounding the proving ground was given over to housing construction. In the pre-war years, "open" tests of first generation PTC and NTC (yperite, lewisite and phosgene) were conducted on the proving ground. After the war, tests were continued, now using OTC: sarin, soman and V-gases. Kuzminki was used for storing TC and wastes left after TC testing. The danger of the aftermath of these tests for citizens of Moscow is readily evident from a report sent in 1937 to the people's commissar of defense, K. Ye. Voroshilov, by the deputy chief of VOKhIMU RKKA: ("...Extracted from pits charged with PTC: 20 metric tons of laboratory waste, 4 truckloads of metal and other scrap, 3 metric tons of TC arsenicals, and 4.5 metric tons of PTC-charged chemical absorber. All this was carted to the field division on the proving ground at Kuzminki and destroyed...") [59].

Shikhany Central Military-Chemical Proving Grounds

The proving ground with greatest capacity, the Central Military-Chemical Proving Ground (TsVKhP), is located on the banks of the Volga at Shikhany, where the 33rd TsNIII UNKhV SA (formerly TsNIVTI) has been operating since the early sixties. Military and intelligence agencies throughout the world had full knowledge of the existence of the proving ground [30]; however, it was kept secret from Soviet people until 1987 [12] when it was opened to the press and diplomatic

representatives of many nations [25, 26]. The beginning of activity of TsVKhP dates from the twenties, when a tank proving ground was set up on Count Orlov's estate in 1924. This began to be operated as a chemical proving ground in 1926 [66, 67]. Until 1933, work on preparation for a chemical attack was done at TsVKhP under the direction of German officers who were having trouble continuing work on chemical arms at home due to prohibitions of the Treaty of Versailles. The tests were subsequently continued independently.

Nukus

Second in capacity and importance was the military-chemical proving ground located on the Ustyurt Plateau in Karakalpakia (Uzbekistan). Chemical weapons tests were conducted here analogous to those in Shikhany, but under different climatic conditions. The importance of the proving ground increased dramatically after TsVKhP was opened in Shikhany and Uzbek scientists of that time were "restricted in visitation of the territory" of the Ustyurt Plateau, "part of the zone was prohibited" [22]. The proving ground was first opened up in 1992 after the collapse of the Soviet Union when the chief of chemical forces, General S. V. Petrov, and his first deputy, General Yu. N. Koryakin, were there at the same time. The reason for the visit was "testing of means of antichemical protection," during which "dummy bombs were set off, filled with insignificant charges of sarin, soman and VX-gases" [22]. The meaning of these words will be sufficiently clear if you consider the content of the technical assignment: "Development, fabrication and delivery of casings for special explosive devices (prototypes) for field tests of a system of agent A-232 components (code `Novichok-5')." This was one of the assignments which marked the completion of the testing of the Soviet Union's binary chemical weapons [52]. On the threshold of field testing of the prototype in military unit No 26382 "in the temperature range from minus 30 to plus 50 degrees," the assignment prescribes a method of unambiguous protection from indiscreet eyes ("work on the project will be carried out under the title `Development of Smoke Bomb Prototypes'). This work was done in conformance with Decree of the CPSU Central Committee and USSR Council of Ministers No 844-186 dated 6 October 1989.

I.5. Geography and Dimensions of Production of Chemical Weapons

In the pre-war years, the production of yperite was being prepared at plants in Chapayevsk, Stalingrad (Volgograd), Dzerzhinsk, Berezniki and Stalinogorsk (Novomoskovsk). These plants, with the exception of that at Novomoskovsk, took part in producing yperites during World War II, and in charging munitions with them. By the end of the war, chemical munitions were being charged with yperite using imported raw material as well at a plant in Kirovo-Chepetsk (then plant No 752 [36]. Until 1989, the Chapayevsk and Stalingrad plants officially did not exist, as it were [68], although for historical reasons it was their activity that was especially well known in the West [11].

Attempts to plan and begin construction of yperite production facilities during the pre-war years are also known for many other plants: in Kemerovo, Yaroslavl, Moscow (plant No 93, now GosNIIkhloproyekt) and so on. However, for various reasons not all plans came to fruition.

Lewisite production was planned from the late thirties; however, because of raw material and technological problems it was not begun until the start of the war in Chapayevsk and Dzerzhinsk, and was continued until the war ended [36]. Facilities for producing lewisite that had been prepared before the war at Novomoskovsk Chemical Combine were not put into operation. Nor was lewisite produced at Berezniki. During the pre-war years, prussic acid production had been prepared at I. V. Stalin Chemical Combine in Voskresensk (now the Nitrogen Fertilizer Plant). Actually, because of military reverses during the war years, this combine essentially produced no prussic acid until 1941.

Experimental lots of TC of all three generations were produced mainly at three sites: at GSNIIOKhT (Moscow), at its Volsk affiliate, and also at S. M. Kirov "Khimprom" Production Association in Volgograd.

Large-scale industrial production of TC was organized in the Soviet Union mainly in the Volga basin (Fig. 1), although numerous attempts to expand the geography are known [11]. Chemical weapons were produced exclusively on the shores of deep rivers that in the past had been clean, using the waters of the Volga, Oka and Kama for production needs, as well as for dumping [69-71].

Fig. 1. The Soviet Union's
chemical weapons production plants

Moscow

Arrangements for producing yperite and phosgene at the Moscow GSNIIOKhT were made by Ye. I. Shpitalskiy (1879-1931). In 1929 he was arrested and sentenced on standard anti-Soviet charges; however, the death sentence was commuted to ten years of incarceration. The scientist continued to direct operations on development of chemical weapons right up to his death, but now as a prisoner [36, 37]. The use of prison labor was practiced at this institute right up to the "thaw" [36, 72]. Industrial production of the simplest yperite (in the technological sense), Levenstein yperite, was started in Moscow at the Olginskiy Plant (at that time the "Aniltrest" Experimental Plant) in 1924, when the first experimental lot was produced in the amount of 18 poods (425.5 lb) [43]. By March of 1926, the plant had produced 857.3 poods (about 14 metric tons) of yperite. At the same time, the plant began charging yperite into artillery shells in a specially constructed ammunition filling shop. The capacity of yperite production at this plant when it had become Experimental Plant GSNII-42 was 2,250 metric tons per year in the pre-war years, and the production of experimental lots of yperite continued right up to the war itself [39]. At this same plant in 1937, technology on an experimental scale had been developed for producing V. S. Zaykov's winter (ethylene-propylene) yperite.

Experimental lots of many other TC such as lewisite, chloroacetophenone, adamsite and phosgene were also produced there. In the post-war years, the GSNIIOKhT experimental plant produced batches of many TC and their precursors, including irritants and incapacitants [27, 39].

TC production was planned and carried out in Moscow and in some other plants. Phosgene and diphosgene were made in the pre-war years and during the war at M. V. Frunze Chemical Plant in Dorogomilovsk [11, 36]. Production of diphenylchloroarsine and diphenylcyanoarsine was planned at I. V. Stalin Chemical Plant in Derbenev. In 1936, 135 metric tons of diphenylchloroarsine were produced. Yperite production was planned at plant No 93 (now GosNIIkhlorproyekt) [11]. Moscow did not escape ecologically dangerous events, including accidents.

For example, at the beginning of the war, tons of yperite were simply dumped into a hole on the territory of GSNIIOKhT [46] (this is denied in [40, 72], though without support by "lost" documents). A case is described of sinking "bottles" of phosgene to the bottom of two rivers--the Moscow and the Setun--in autumn of 1941, that were not pulled out for two years in virtue of production necessity [68].

Among events of recent years, we can mention a fire that occurred in February of 1980. During this fire, several hundred grams of V-gas with which work was being done at the institute at that time "disappeared" [39, 46]. Neither the citizens of Moscow nor the firemen who bravely fought the "loss" with water knew anything about the danger that had been loosed over the city. Control services called in for analysis were not provided with the proper equipment [46].

Volsk

The experimental plant of the Volsk affiliate of GSNIIOKhT produced experimental lots of various TC and their precursors, including irritants and incapacitants [27, 39]. In organizing the affiliate, it was planned that its waste water would be taken to TsVKhP in Shikhany. Until 1988, liquid wastes associated with production of experimental lots of TC were simply dumped out onto the proving grounds [73].

Chapayevsk

The first large-scale production of yperite was organized in Ivashenkovo (later Trotsk, and today Chapayevsk, Samara Oblast). This was done by adaptation of the prerevolutionary (1908) Ushkov Plant, in the new era called plant No 2 of VKhTOP, combine No 15, for many years plant No 102 (after detachment from combine No 15), and today Chapayevsk Chemical Fertilizer Plant [43].

Initially, production of yperite was organized with the participation of the German Weimar

Republic within the framework of the specially created German-Soviet joint stock company "Bersol," and at Reichswehr expense. In 1923-1926 the Germany Stolzenberg Company was supposed to deliver, set up and start equipment for producing yperite. However, the company failed, and all plans fell through. From 1927, plants were constructed independently under the direction of Ye. I. Shpitalskiy [74, 75]. In 1931, the future plant No 102 reached a capacity of 5000 metric tons of Levenstein yperite per year, and soon was retooled for a capacity of 6000 metric tons. In 1934, 591.5 metric tons of yperite were produced. Subsequent attempts to increase the capacity of this extremely archaic production facility failed. In the pre-war years, the plant was started up from time to time to produce batches of yperite for the needs of the RKKA, and some updating was also done.

Large-scale production of yperite and lewisite at plant No 102 was carried out only during wartime. Yperite was produced in 1941-1943 only in the "men's" shop No 4, and then was stopped because it was impossible to prevent injuries to people. Lewisite production involving activity of shops No 7 (production of lewisite proper with capacity of 4000 metric tons per year) and No 28 (production of lewisite precursor: arsenic trichloride) continued throughout the war. Munitions were charged with yperite, lewisite and mixtures of the two in the "women's" shops No 52-55, including with the use of imported raw material [36, 69, 76].

Phosgene production was also organized at the plant in Chapayevsk (shop No 6 with capacity of 2600 metric tons per year) and continued throughout the war in the years from 1941 to 1945. Facilities for diphosgene production were also maintained. Production equipment worked very poorly at the plant, gas tightness was not ensured [62]. Air from shops that produced yperite and lewisite was exhausted directly to the city atmosphere without purification, and there was practically no purification even of absorption gases. Waste water purification stations were frequently shut down despite ongoing production of the TC themselves, and wastes were dumped directly into the Chapayevka [river], which no longer exists, and from there reached the Volga. Spoilage went to a "letter" dump [i.e., designated only by a letter or number to preserve security] on the plant territory, now long forgotten [69].

As a result in Chapayevsk, the first city of large-scale TC production, thousands of people were victims of yperite production during World War II [39, 62, 76, 77]. During the first six months of 1942, there were 280 incapacitating accidents and 177 cases of occupational illnesses [69]. Dozens of workers died on the job, and hundreds died after becoming occupational invalids (yperite is a TC with delayed lethal action [4]). Most of the workers at these production facilities died during the early post-ware years, when the State had begun to forget them. This is evidenced by the municipal cemetery of Chapayevsk--the "city of death" [77]. The reason was the extreme "simplicity" of technologies used during the war, which were developed in the twenties and thirties, and had not changed since then. In those days, yperite was poured into munitions by an open method under low pressure, and topped up with tankards, cans and teakettles [62]. A working day during the war was 11 hours (in gas mask and protective clothing), and spoilage was removed by specified "wrongdoers" during off-hours [69]. "22 June 1941...I got the yperite duty. We went to work in protective clothing, rubber boots and gloves, and gas masks. Working in a contaminated atmosphere for hours is an art. Despite all precautions, I had my first accident within a month, in July. I was in hospital for a month, and then back to the yperite. The repair was done right there in the shop. The coil was pulled out by a cable tied to a tractor... that kind of `technology' really raised the gas contamination. The maximum permissible concentrations of yperite vapor were exceeded in the rooms 200-400- 500 times... If your buddy had an accident and couldn't take his shift, you had to work two shifts. In 1944, the production of TC dropped off considerably" [76].

By the end of the war, in spite of large-scale production of TC, no exclusion zone was established around plant No 102, and residential areas, as before, continued to encroach directly on the enterprise. The measure of the danger is apparent from the fact that during the war and for many years afterward, the chlorine content in atmospheric air of residential areas of the city 300-1500 m from the plant generally were 10-20 times the maximum permissible concentration for atmospheric air of centers of population. As to arsenic, a recent analysis of the soil near former shop No 7, where lewisite was made during the war, showed disastrously high levels, 7000-8500 times the maximum permissible concentration [78].

Berezniki

During the First Five-Year Plan, two chemical combines were set up for producing yperite and other TC. A combine at Berezniki (Perm Oblast) was built on the shore of the Kama on the base of the former prerevolutionary Solveyev Plant, and the convict-builders knew it as VIShKhIMZ and Berezniki Chemical Combine [36, 69, 79]. During the war, a soda plant under the name of No 761 was detached from the combine, and Levenstein yperite was produced in shop No 10 (planned capacity was 9000 metric tons per year). A total of about 10,000 metric tons of yperite was produced during the war. In the post-war years, yperite was not produced, and the plant subsequently became today's "Soda" Production Association [36, 69].

The discharge from the yperite facility was never purified: purification units were not built in the First Stalinist Five-Year Plan [79], and were never planned in subsequent years. As a result, during the war the yperite concentration in plant effluents averaged 156 mg/liter, and frequently went as high as 320 mg/liter, approaching the solubility of yperite in water [69].

Stalinogorsk (Novomoskovsk)

A combine was constructed at a new site in Bobrinki (later Stalinogorsk, and today Novomoskovsk, Tula Oblast) [79]. Long before the war, it was prepared for production of yperite and other military-chemical goods (yperite capacity was 9000 metric tons per year). However, yperite production was limited only to pre-war lots. With the start of the war and unavoidable evacuation and re-evacuation, today's Nitrogen Fertilizer Plant never returned to full-scale yperite production.

Stalingrad (Volgograd)

Up to the mid thirties, large-scale production of TC, mainly yperite, was organized on the banks of the Volga at the S. M. Kirov Chemical Plant in Stalingrad (the plant began operation in 1929, from 1931 was called VKhTOP Plant No 3, for years was Plant No 91, and is today S. M. Kirov "Khimprom" Production Association in Volgograd). Yperite production was 336.5 metric tons in 1933, and 1530 metric tons in 1934. The yperite capacity of shop No 2 was 9000 metric tons per year. In the pre-war years, individual lots of Levenstein yperite were produced, while simultaneously reconstructing for conversion to V. S. Zaykov yperite.

When the war started, the plant began continuous production of Levenstein yperite, continuing until autumn of 1942. The total yperite production during the war years was 6000 metric tons, as a result of which most of the workers in "letter" shops No 2, where yperite was produced, and No 11, where it was poured into munitions, suffered injury [69]. After that, despite repeated attempts, yperite production was not started again at this plant [36, 69].

Phosgene was produced at shop No 1. Before the war, experimental lots of this TC were repeatedly produced (165 metric tons in 1934, and 321 metric tons in 1940). After 1941, the phosgene production unit was shut down. Experimental production of sarin, soman and V-gas was set up in the plant in the forties and fifties (today's shops No 22 and 34). Full-scale production of sarin was organized in 1959, and of soman in 1967.

OTC production facilities were unsafe for people and the environment. An event of dangerous scales occurred in Volgograd in 1965 [39, 80]. Due to high flooding, contents of the equalizer storage unit for waste and slurry (the so-called "white sea"), where purified, poorly purified and completely unpurified discharge of shops No 22 and 34 had accumulated for years, broke through into the Volga. At the time, the plant was engaged not only in industrial production of munitions with sarin, but also in experimental production of V-gas. According to recollections of eye-witnesses, the surface of the river was white with a flood of dead fish as far as Astrakhan. There were similar occurrences with the "white sea" much later as well. The veil of secrecy distorted assessments of the sources of pollution. For example, a book by Western authors "Ecocide in the USSR" [81] describes an episode of "ecological awakening" of the population living to the south of Volgograd.

"...a group of women working at an oil refinery ... and their friends from southern districts called attention to the fact that an alarmingly large number of babies were coming into the world with birth defects, as well as mentally retarded people. By late 1987, they had come to the conclusion that the fault was in chemical contamination of the environment in the highly industrialized area of

Krasnoarmeysk where they lived and worked" [81].

Named as sources of danger were an aluminum plant, the "Red October" Steel Plant, and "chemical complexes" in general (with their effluents of hydrogen chloride). There were a lot of oil refineries and aluminum plants in the former Soviet Union, and the "Red October" Plant was on the north side of Volgograd. However, the aggregate of troubles that had befallen the citizens of the Krasnoarmeysk district was unique. That a role was played here by S. M. Kirov "Khimprom" situated a few kilometers upstream from Krasnoarmeysk (called Sarepta until 1920, and incorporated into the city limits of Volgograd in 1931) in the given case is obvious. This was the enterprise that in accordance with plans, within the framework of technologies countenanced by the authorities and checked by no one, dumped its purified, partly purified and unpurified wastes of OTC production (as well as less toxic phosphorus pesticides, mercaptophos, chlorophos and others) directly into the Volga or first into an equalizing storage facility ("white sea") from which they were later dumped into the Volga. Health services were unable to stop the dumping of highly toxic wastes that went directly into the drinking water supply of the Krasnoarmeysk district (even if efforts had been made in earnest to do so). Ecological activists "shook down" the whole system of authority in the vicinity of Volgograd [81]; however, the true cause of the ecological disaster unfolding to the south of Volgograd was not revealed. Recently the "white sea" was filled with dirt [80] without ecological assessment of the situation. However, this step merely puts off the danger without resolving it (there is no clay barrier under the "white sea"), and poisonous materials will be concentrated in unpredictable amounts in the groundwater.

Dzerzhinsk

In 1939, a Levenstein yperite production facility was organized in shop No 3 of "Zavodstroy" in Dzerzhinsk (it was plant No 96, and is today "Kaprolaktam" Production Association) [36, 69, 79]. Production of Levenstein yperite was continued in 1941-1942 as well (2933 and 480 metric tons respectively), when the plant was converted to V. S. Zaykov yperite [43] (803 and 14,905 metric tons respectively). Up until the end of the war, the production was 18,630 metric tons in 1943, 10,335 metric tons in 1944, and 2730 metric tons in 1945. Production of yperite at "Kaprolaktam" Production Association continued for many years after the war was over, and, after the end of the 1950's, on a continual basis [39, 82]. The same plant made lewisite (shops No 14 and 15), of which 15,900 metric tons were produced [11,36, 69].

Prussic acid was produced and charged into chemical munitions at two Dzerzhinsk plants: "Rulon" (plant No 148, which went into production in 1939, and is today "Orgsteklo" Production Association), and M. I. Kalinin Chemical Plant in Chernorechenskiy (ChKhZ, which today is "Korund" Production Association) [36].

Phosgene production in Dzerzhinsk was set up at ChKhZ, and was carried out throughout the war.

The status of accident prevention at "Kaprolaktam" Production Association can be judged from the following: in 1942 in special shops alone there were 1585 cases of occupational illness, and in the other shops (which were also hazardous)--112. There were two reasons for the turnover of personnel near the front lines. In addition to the obvious technological reason, there was also an organizational reason: the special shops suffered from an acute shortage of protective clothing [69].

Purification of air contaminated by yperite was ineffective at "Kaprolaktam" Production Association, and there was considerable entrainment of alkali into the atmosphere along with incompletely decontaminated yperite. Contamination of air with yperite during the war spread over a radius of 507 km from the plant. Originally there was no exclusion zone, and none had been established by the early sixties. The plant was essentially encircled by residential settlements: to the north was the settlement of Krasnyy Khimik at a distance of 1090 m, to the south the settlement of Lyakhanovka 1800 m away, and to the west the settlements of Pionerskiy and Avariynyy (1060 and 1010 m respectively).

Pollution of the atmosphere of residential settlements of "Orgsteklo" Production Association was due to emissions of prussic acid. These emissions were not effectively purified. It was not until 1967 that the Dzerzhinsk municipal sanitation- epidemiological station undertook a study of pollution of atmospheric air. The greatest pollution of atmospheric air with such toxic agents as

phosgene and prussic acid was observed 500-1000 m from the plants, and contamination with more specific ingredients was observed at a distance of 2500-3000 m.

Discharge of waste waters of chemical enterprises of Dzerzhinsk in the years of intensive production of TC provided for passage from industrial sites into the Oka River through a system of seven lakes along the Volosyanikha River that were used as a settling system. Recycling of industrial wastes by storage was a problem because the ground in Dzerzhinsk is sandy. Not only that, the land of this city is typically cavernous.

Kineshma (Zavolzhsk)

Production of adamsite and diphenylchloroarsine was set up in the pre-war years in the trans-Volga section of Kineshma (Ivanovo Oblast) at shop No 3 of M. V. Frunze Aniline Ink Plant (defense plant No 756 during the war) [36]. Wastewater was routed to the Volga. Today this is the Zavolzhsk Chemical Combine, and for many years now it has been relieved of mobilization readiness for adamsite production. However, in the past the adamsite capacity of the plant was 10,000-12,000 metric tons per year. Actually, until the end of the war this plant produced nothing but adamsite.

Novocheboksarsk

Industrial production of the most toxic agent, V-gas, began in 1972 at the Khimprom Cheboksary Production Association imeni the Leninist Komsomol, which was built specifically for that purpose. For this purpose, the city of Novocheboksarsk was built, a satellite of Cheboksary, the capital of Chuvashia, many of the construction workers being convicts. Munitions were charged in shop No 83 of the so-called Production Facility III right up to 1987 [36, 83]. Wastes were carted to an unequipped disposal site, effluents were dumped into the Tsivil River and from there entered the Volga.

V-gas production workers did not wear pressure suits, but rather L-1 rubber suits that did not completely protect the skin from OTC vapor. Thousands of people who took part in this production feel that they were victims. In this regard, they are outraged by the attitude toward them on the part of agencies of public health and social security [84-87]. The acute toxicity of V-gas had been well known prior to starting planning and construction of the plant; even tentative results of a study of long-term toxicity of small doses of the TC were known. Such data demanded the most advanced technology; yet in fact, everything was done just as before: gas tightness of equipment was not ensured, nor was there any change in attitude toward the people taking part in production. At the time of planning shop No 83, no standards existed for TC content in the air of the work area, nor were there facilities for measurement to support monitoring. However, based on experience in operation of the experimental V-gas production facility in Volgograd, it was already known that women should not be involved in this production. Everything was done the wrong way round. It is no wonder that participants, especially those who took part in V-gas production at Novocheboksarsk, feel that they have willy-nilly been made subjects of massive long-term testing of the latest and least studied nerve- paralytic OTC, the complete results of which are as yet unknown, and no intermediate results have been published [86].

"Cerebrosthenia, polyneuropathy, cardiac failure, hepatitis. I could go on with the list of my illnesses. I have no right to keep silent about where I got such a `bouquet' of medical problems. This is the third production facility. It's too bad that reporters don't point out everything and tell about everything. They've also hidden the exact figure reflecting the number suffering occupational illnesses in shop No 83. There are lots of unfortunate women like me. We put on `fishing' suits and gas masks, but none of us imagined that we would be invalids. The `agent' got onto our skin anyway, but not through the gas mask, not through the respiratory tract. The L-l suit failed when the worker bent over. A slight gap was formed between the fabric and the person's body. And the agent had a cumulative effect, i.e. it had the ability to accumulate in the organism for years. Time worked against us. I don't sign my name for fear of retribution" [86].

Novocheboksarsk can serve as an example of the effect of chemical weapons production on those who had nothing to do with this business, who were not favored with privileges and compensatory payments. Chronic illness of children in this city is already 40 percent (much higher than for

Chuvashia as a whole), and the level of abnormal childbirth has reached 88-90 percent, no other serious ecotoxicants being known for the city [60, 85].

Among documented accidents and disasters associated with V-gas production, a special place goes to the fire that occurred on 28 April 1974 [27, 39]. It is indicative that, a month before the fire was reported [39], the publication which reported it had stated that specialists at this plant "had not had a single accident" [88]. According to official data that were not made public until 18 years after the fire, the cause was a short in the power line due to failure to complete some construction work [89-91]. The fire resulted in loss of seal of aircraft bombs filled with "product," and temporary loss of control over the latter. The main thing is the totally incredible fact that unfinished work did not show up until two years after the start of series production of chemical munitions filled with highly toxic V-gas that was extremely hazardous for personnel and residents of the city. Accidents occurred with release of V-gas even after that, for example in 1978.

Transportation of V-gas munitions was extremely hazardous. For 15 years the railroad used for the purpose was the Cheboksary-Kanash branch line that was in "unsatisfactory" condition [92].

I.6. Where Chemical Weapons Were and Are Stored

Pre-war bases for storage of the Soviet Union's chemical weapons were not well known to German intelligence [11]. Information that showed up in the course of World War II enables us to make a judgment to some extent about stockpiles and bases under central and [military] district jurisdiction. In addition, a map has become available showing the placement of bases and stockpiles under army jurisdiction, although their deployment is much less stable [10, 11].

Fig. 2. Bases and stockpiles of
the Soviet Union's chemical weapons in the pre-war years and
during the war [10, 11]

At present, we know of a list [11] of only some of the chemical weapons stockpiles and storage bases (Fig. 2). But even this is a pretty impressive list (the asterisk * denotes stockpiles under the direct jurisdiction of the Defense Ministry): Alitus (Lithuania), Bologoye (Tver Oblast), Vladivostok, Voronezh, Gomel, Gorokhovets (* Vladimir Oblast), Dzerzhinsk (* Nizhniy Novgorod Oblast), Yelets (Lipetsk Oblast), Zadonsk (Lipetsk Oblast), Zolotonosha (Ukraine), Irkutsk (*), Kambarka (* Udmurtia), Kirov, Krasnoarmeysk (Volgograd Oblast), Krasnoyarsk (*), Kremenchug, Krivoy Rog, Komsomolsk, Leningrad, Lipetsk, Moscow, Ochakov (Ukraine), Saratov (*), Syzran (* Samara Oblast), Tatishcevo (Saratov Oblast), Ussuriysk (Maritime Kray), Usolye (* Perm Oblast), Fastov (Ukraine), Chapayevsk (* Samara Oblast), Cherkassy, Chita, Shikhany (* Saratov Oblast), Yurga (Kemerovo Oblast). There are several points with vague geographic referents: Anushkin, Inzhenernaya, Kirovsk, Krasnaya Guba, Milovakhovka, Nikolsk, Sofiako and others.

The reason for siting stockpiles at points near chemical weapons production plants (Chapayevsk, Dzerzhinsk, Gorokhovets, Krasnoarmeysk, Usolye) is obvious. The location of others is the result of planning and vagaries of the war. Another thing to remember is that because of changes in strategic structures, chemical weapons, being exceptionally offensive weapons of the Soviet Army, were sometimes "demoted" for storage not only to armies, but to divisions as well. The war and urgent shifts of position altered the map of siting of chemical weapons storage bases by quite a bit. At that time there were lots of arsenals of TC and chemical weapons; and today they are filled up and no longer operating, but have left their mark up to the present.

Fig. 3. USSR chemical weapons
storage bases as of 1985 [30]

Chemical weapons storage facilities that evolved up to the mid eighties due to ups and downs of the Cold War and the Soviet-Chinese confrontation are sketchily shown on a map given in [30] without indication of specific geographic referents (Fig. 3). The map shows a total of nine, and they were comparatively uniformly distributed over the entire territory of the USSR. This information is based on U.S. intelligence. At the present time, according to army data, there are seven specialized arsenals in Russia where chemical weapons are stored in considerable amounts. In addition, consideration should be taken of two stockpiles where there have to be chemical munitions, albeit

in less serious amounts (TsVKhP in Shikhany, and the chemical site in Chapayevsk).

Two of the declared bases belong to the chemical forces: in Kambarka (Udmurtia) and in the settlement of Gornyy (Saratov Oblast). Two bases belong to GRAU: in Shchuchye (Kurgan Oblast) and in the settlement of Kizner (Udmurtia). The other three chemical weapons storage bases belong to the VVS: in the settlement of Leonidovka (Penza Oblast), in the settlement of Maradykovskiy (Kirov Oblast), and in Pochep (Bryansk Oblast). Declared [93] chemical weapons storage facilities were set up in 1941-1950 at conventional munitions storage bases. However, not until now has serious work been done on updating them, providing automatic signaling, firefighting equipment, and so on [94].

Fig. 4. Deployment of present-day chemical weapons arsenals of Russia (1--Pochep, 2--Leonidovka, 3-- Gornyy, 4--Kizner, 5--Kambarka, 6--Maradykovskiy, 7--Shchuchye) [95, 114b]

The limited number of chemical weapons arsenals declared in [93] came about in 1986-1989, when chemical weapons were redeployed and concentrated at a limited number of points (Fig. 4). It is assumed that there are no longer any chemical weapons at other bases, though in fact it is a question of the possible presence of amounts that do not exceed the weight limitations of the Convention on Chemical Disarmament. Nor can it be ruled out that the very necessity of redeployment was due to the forthcoming signing of this Convention and the future destruction of chemical weapons.

On 23 September 1989, upon completion of this redeployment, the U.S.-Soviet Wyoming Memorandum was signed, according to which the parties exchanged information about military-chemical facilities [41, 93]. Data about the deployment of storage bases are not classified [43, 79, 95], although the army tries to keep them hidden under the contrived pretext of maintaining public tranquility [21].

Shikhany Central Military-Chemical Proving Grounds

A certain number of conventional chemical weapons are stored at one of the TsVKhP stockpiles. Apparently, this is the storage site of the 3400 metric tons of irritants (chloroacetophenone and CS gas) mentioned in [96]. Also stored here are 3200 metric tons of adamsite, buried in accordance with the directive of the USSR Council of Ministers dated 14 April 1960, No 82rs [96]. TsVKhP is still destroying chemical weapons by the method of open explosion: winter of 1992-1993 [83] and summer of 1993 [97].

Chapayevsk

The chemical site located roughly 12 km from Chapayevsk has been in operation from the early war years (in the past, it was NKO Military Base No 433), and belongs to RCB forces. It was first stocked with PTC evacuated from the village of Seleshino near Rukopol (Poltava Oblast, Ukraine). Then the chemical site began to receive for storage chemical weapons that had been produced since the war started from the plant in Chapayevsk, and possibly from other plants. A considerable percentage of yperite stored in tanks was shipped out for destruction in the early post-war years [98]. In the early sixties, yperite was still being stored there in tanks (at least 1200 metric tons), and lewisite in aircraft bombs [99]. The yperite was later destroyed on site, and the lewisite was sent out to be sunk. At the present time, the base apparently has no appreciable quantities of chemical weapons in storage.

Gornyy

The TC storage base in the settlement of Gornyy (Krasnopartizanskiy Rayon, Saratov Oblast) was founded in 1943 as NKO Warehouse No 276, and belongs to the chemical forces [100]. Stocks of PTC (lewisite and yperite-lewisite mixtures) were formed by stocks evacuated from Chapayevsk [101]. Following the war, captured chemical weapons were stored at the base as well [101]. In the late fifties, yperite and lewisite were destroyed at the base in accordance with governmental decisions [96]. Some of the chemical munitions were sent off to be sunk in the Sea of Okhotsk [101]. The base covers an area of 498 hectares. Groundwater lies at a depth of 5-10 m. Distance to

the Volga is 75 km. At the present time, skin-blistering TC are stored at the base (yperite, lewisite and a mixture of the two) in tanks of up to 50 cubic meter capacity. There are 8200 people living within 10 km from the base. Water supply is from a well with total flow of 30 cubic meters per hour. The sewage system is cesspool type, there are no treatment facilities [96, 102].

Kambarka

The storage facility at Kambarka was founded in October of 1941. It belongs to the RCB forces [103]. Major storage units were constructed in the early fifties [116]. In the late fifties yperite and lewisite were destroyed here in conformance with governmental decisions [96, 104]. The base covers an area of 721 hectares. Major supplies of army lewisite are stored here in tanks with volume of as much as 50 cubic meters (a total of 6400 metric tons). The storage facility is not equipped with an automatic alarm system for detection of TC vapor in the air. It is situated about three km from Kambarka with a population of 17,100. There are 19,600 people living within 10 km from the base, and 1.7 million within a 100-km radius. The depth of groundwater beneath the base is roughly one-five m. The territory of the base is located at the juncture of three republics: Udmurtia, Bashkiria and Tataria [96, 102]. Nearly all who took part in operations of open burning of yperite in the early sixties have died of cancer [104].

Kizner

Stored in the chemical artillery munitions arsenal at the settlement of Kizner is rocket and non-rocket artillery ammunition charged with OTC [43, 102]. Also stockpiled at this facility is lewisite ammunition (roughly 730 metric tons). The arsenal is not equipped with an automatic alarm system for detection of OTC and PTC vapor in the air [105]. There was an accident at Kizner in early 1993 on a railroad run not far from a large stockpile of both chemical and other weapons [95].

Shchuchye

The chemical artillery munitions arsenal at Shchuchye stores missile warheads, rocket and non-rocket ammunition charged with OTC [43, 79, 95, 102]. There is also a small amount (five metric tons) of phosgene in munitions. Conventional arms are stored on the same territory. The arsenal is not equipped with an automatic alarm system for detection of OTC vapor in the air [105, 106].

Pochep

Stored at the air base for chemical munitions storage at Pochep are aircraft bombs, universal munitions dispenser pods and spray rigs charged with OTC [43, 79, 95]. The base is minimally equipped with an automatic alarm system for detection of OTC vapor in air.

Leonidovka

The air base at the settlement of Leonidovka stores aircraft bombs, universal munitions dispenser pods and spray rigs charged with OTC [43, 79, 95]. The base is minimally equipped with an automatic alarm system for detection of OTC vapor in air. A fire that occurred in 1984 with conventional ammunition was put out before it had reached the chemical munitions [107].

Maradykovskiy

The air base at the settlement of Maradykovskiy stores aircraft bombs, universal munitions dispenser pods and spray rigs charged with OTC [43, 79, 95]. Also stockpiled here are munitions with a mixture of yperite and lewisite. The base is comparatively well equipped with an automatic alarm system for detection of OTC vapor in air. Once OTC munitions were destroyed at the base by sinking into a swamp. They were shot from machine guns before sinking [107].

I.7. Use of Chemical Weapons

Data about the use of and attempts to use chemical weapons in the former Soviet Union cover the period of 1918-1991. All were directed at handling internal political problems. Among other things, several attempts at using chemical weapons are known from civil war years: in suppressing

uprisings by the residents of Yaroslavl 1918, and by the Don Cossacks in 1919 [79]. There is a documented account of the use of chemical weapons by the future marshal M. N. Tukhachevskiy in suppression of the peasants' uprising in Tambov Province in June of 1921. Gas cylinders and chemical artillery ammunition were used [79, 108].

Standard army chemical weapons (at least "riot control" CS gas and chloroacetophenone, that is, "tear gas") were used by Soviet Army units in suppressing disturbances on 9 April 1989 in Tbilisi [109].

As established by a commission of the Congress of People's Deputies of the USSR under the supervision of A. A. Sobchak, "damage to the health of those taking part in the events of 9 April showed up... in the form of traumata, poisonings by TC, or their combinations... The pattern of poisoning... differs noticeably from the usual pattern for cases of use of toxic chemicals of this kind." The specialists enlisted by A. A. Sobchak's special commission arrived at the conclusion that "the immediate cause of death of all victims, except for a single case of skull fracture and brain trauma, is choking (asphyxiation)... The combination of breathing chemical agents and constriction of the body reinforced their detrimental effect and served... as the cause of death of victims" [109].

Incidentally, the MCC is known to have attempted to cover up these facts. For example, on the day that the Second Congress of People's Deputies of the USSR convened (December 1989), a leaflet was circulated among the deputies: "Demand the truth about Tbilisi! According to data of United Nations experts comrades N. A. Loshadkin and A. D. Gorbovskiy, and also a number of committees (Soviet and international), there were no wounds inflicted by stabbing, hacking or bludgeoning on a single body of those who died in Tbilisi on 9 April 1989 ... The experts categorically reject the the possibility of death by the use of chemical agents! ... People were killed not by the hands of soldiers, but rather were crushed by the resisting mob" [109]. The independent "UN experts" were two representatives of the MCC: N. A. Loshadkin, senior instructor of VAKhZ [112a] and Colonel A. D. Gorbovskiy, at that time a worker in the UNKhV SA, and today an official of the RF President's Committee on Conventional Problems of Chemical and Biological Weapons.

In [110] mention was made of plans for possible use of incapacitants in the August events of 1991 against the defenders of the White House (incidentally, the report was refuted [16]).

As to the handling of military problems outside of the Soviet Union, two episodes can be mentioned that relate to Afghanistan. In 1929, the famous leader of the Red Cossacks, V. M. Primakov, when he was being sent to Afghanistan under the name of Counsellor Ragib-Bey, asked Moscow about the feasibility of sending a batch of yperite munitions [79]. In the eighties, during the war in Afghanistan, the Soviet Union (e.g. see information of General I. B. Yevstafyev [21]) and countries of the West [111] actively accused each other with using chemical weapons. It is true that no serious proofs against the Soviet Union were offered [112]. However, munitions with OTC were known to be actively stockpiled during the war years at Ushtobe Station (Kazakhstan), which served as a way station for accumulating munitions before sending them on to the theater of military operations.

I.8. How Many and What Kinds of Toxic Chemicals There Were in the USSR

Industrial production of TC in the Soviet Union was continued until 1987 [13].

According to foreign intelligence [11], various plants were purported to be producing yperite and lewisite in the Soviet Union. The data agree in part with actual pre-war plans of the Stalinist regime on drastic expansion of PTC production facilities (e.g. on enlarging the facilities for producing yperite and lewisite in Kemerovo).

As a whole, German intelligence apparently overstated the chemical weapons potential in the Soviet Union. In particular, according to their data the capacity of yperite production facilities had reached 180,000 metric tons per year in 1943. In reality, the Soviet Union entered the war with yperite capacity of roughly 90,000-100,000 metric tons per year, and lewisite capacity of 12,000 metric tons; however, not one of the PTC production shops was able to reach full capacity, even during the most hectic days of the war.

Evidently there are no complete data about volumes of first generation TC production in the Soviet Union. It is only known that during the years prior to the beginning of 1936, the army had managed to stockpile about 3500 metric tons of yperite. It can be assumed that the army got approximately 3000-5000 metric tons of yperite from industry in 1936-1939. Thus, for base data that are clearly understated, the most appropriate figures are those relating to the peak industrial TC production, i.e. the volumes of production of major TC in pre-war and war years [36].

As a whole in 1940-1945, approximately 110,000-115,000 metric tons of first generation TC were produced, including:

```
77,400 metric tons of yperite (with allowance for
pre-war production, the total volume of yperite stockpiled in
1945 can be estimated at 84,000-86,000 metric tons),
20,600 metric tons of lewisite,
6100 metric tons of adamsite,
8300 metric tons of phosgene.
```

It is known that the volume of spoilage was always appreciable in industrial production of TC in the USSR. Spoilage is not included in the aforementioned data; it was considerable, but was not sent on to the army, and was destroyed directly on plant territory [69].

In 1990-1992, on the threshold of signing the Convention on Chemical Disarmament [35], the Soviet Army presented for inspection and destruction 40,000 metric tons of the current stockpile of TC: about 8000 metric tons of PTC and 32,000 metric tons of OTC [14- 16].

The following numbers of first generation chemical weapons (in storage tanks and munitions) were declared as included in the presented stockpiles:

```
yperite--690 metric tons (only in tanks; storage
site--base at Gornyy settlement, Saratov Oblast),
lewisite--6625 metric tons in tanks (storage sites--6400 metric
tons at Kambarka in Udmurtia, and 225 metric tons at Gornyy
settlement, Saratov Oblast) and 10 percent of the total amount
of lewisite, i.e. roughly 730 metric tons, in munitions (storage
site--Kizner settlement in Udmurtia),
mixtures of yperite and
lewisite--210 metric tons in tanks (storage site--Gornyy
settlement) and roughly 4.3 metric tons in munitions (storage
site--Maradykovskiy settlement, Kirov Oblast),
phosgene--5 metric tons in munitions (storage site--Shchuchye, Kurgan
Oblast).
```

Thus, the total is 8260 metric tons, even though the declared [102] stockpiles of first generation TC (without phosgene) amount to 7700 metric tons. About 32,300 metric tons of OTC presented by the army (all in munitions) is distributed by types of TC as follows [36, 43]:

```
sarin--11,700 metric tons,
soman--4800 metric tons,
V-gas--15,200 metric tons.
```

In 1993 (after discussion in the press [27, 83]), new data [96] were added to the 42,020 tons about TC which in accordance with the Convention on Chemical Disarmament [31] are irritating TC (irritants) rather than combat agents, and therefore in discussion are taken out of parentheses by army representatives [21]:

```
3200 metric tons of adamsite (buried on the territory
of the military-chemical base at Shikhany),
3400 metric tons of other irritants (chloroacetophenone, CS gas)
in steel and polyethylene drums (storage site not published).
```

The total numbers of captured TC held in the Soviet Union and Germany in 1945 are not known. We know only the types (yperite, adamsite, chloroacetophenone) and the amounts of TC sunk by the Soviet Union in the Baltic Sea in 1947 [112a]. Complete data about the fate of captured chemical weapons brought into the Soviet Union, e.g. tabun and other OTC, are lacking. Nor are

there any exact data about the types and amounts of incapacitants stored in Russia.

In discussing types of TC for which full-scale industrial production was organized in the Soviet Union, we have to work with several lists. One of these is the lapidary list of current TC stockpiles officially declared by the last two chiefs of chemical forces of the Soviet (Russian) Army S. V. Petrov [14] and V. K. Pikalov [16], even though not concurring [27]. General V. K. Pikalov made mention [26] also of previously produced TC (phosgene and cyanogen chloride), without noting their fate, as they are not to be found in current stockpiles (mention is made only of 5 metric tons of phosgene [102]).

Other lists stem from data of [11], and also from data about TC that are actually produced and/or deployed in armament of the Soviet Army. As a result, we arrive at a TC list that is apparently most likely:

```
Levenstein yperite,
V. S. Zaykov yperite,
lewisite,
yperite-lewisite mixture,
phosgene,
diphosgene,
prussic acid
cyanogen chloride
adamsite,
diphenylchloroarsine,
diphenylcyanoarsine,
chloroacetophenone,
tabun,
sarin,
soman,
V-gas,
CS gas,
novichok-5.
```

In 1987, representatives of the diplomatic corps and press were shown 19 specimens of chemical munitions alleged to be deployed at the time in armament of the SA [25, 26]. In addition to combat grenades of the Soviet Army with "riot control" CS gas, these included 18 other kinds of chemical munitions that can be subdivided into several groups.

```
A. 6 types of munitions charged with first generation TC:

122-mm artillery shells with lewisite (3.3 kg of concentrated lewisite),
152-mm artillery shells with lewisite (5.4 kg),
100-kg aircraft bomb charged with yperite-lewisite mixture (28 kg charge),
100-kg aircraft bomb charged with yperite-lewisite mixture (39 kg charge),
500-kg aircraft spray rig charged with yperite-lewisite mixture (164 kg of TC),
1500-kg aircraft spray rig charged with yperite-lewisite mixture (630 kg of TC).

B. 8 types of munitions charged with OTC--sarin and soman:

122-mm non-rocket artillery shells (1.3 kg of sarin),
130-mm non-rocket artillery shells (1.6 kg of sarin),
152-mm non-rocket artillery shells (2.8 kg of sarin),
122-mm rocket artillery shells (3.1 kg of sarin),
140-mm rocket artillery shells (2.2 kg of sarin),
240-mm rocket artillery shells (8.0 kg of sarin),
250-kg aircraft bombs (49 kg of sarin),
350-kg aircraft spray rigs (with 45 kg of concentrated soman).

C. 4 types of munitions charged with "VX" OTC:

130-mm non-rocket artillery shells (1.4 kg charge),
122-mm non-rocket artillery shells (2.9 kg),
540-mm nose sections of tactical missiles (216 kg of V-gas),
884-mm nose sections of tactical missiles (555 kg of concentrated V-gas).
```

Considering that munitions with yperite, lewisite and their mixtures are essentially not being presented for elimination, only 12 of the 19 munitions demonstrated in 1987 pertain to the problem

of destruction of chemical weapons: those charged with OTC. Clearly, this number does not reflect the actual state of affairs, and in fact, besides the chemical munitions specified, there were many others deployed in service in the Soviet Army at the time. And they are deployed right now unless they have been secretly eliminated. In particular, it is known from U.S. experience that there is now in existence such an effective chemical weapon as airborne chemical cluster bombs [8]. Just a short time ago, the press [47] pointed out that the army of Russia has munitions of this kind (for the moment there is no information as to the possibility that they are charged with chemicals).

As to the time limits of possible storage of chemical munitions charged with OTC, in the opinion of the chief of RCB forces, General S. V. Petrov, our chemical weapons "may be kept for a long, long time yet with an absolute guarantee of safety" [15]. From the standpoint of his deputy General I. B. Yevstafyev, most of the stockpiles of chemical weapons of Russia can be stored for more than 50 years with complete guarantee of safety [21, 113].

However, these cannot be taken as official statements. The guaranteed shelf life of conventional chemical weapons generally does not exceed 20 years, and for more complicated munitions, cluster bombs, the safe storage time is even shorter [114].

II. ECOLOGY OF CHEMICAL ARMAMENT

Mankind has already done a lot toward self-destruction, and preparation for chemical warfare is just another episode on this path. However, this episode has been quite grave, and may already be irreversible in its consequences. At any rate the aftermath of chemical armament and preparation for chemical warfare merits at least as detailed and impassioned an analysis as issues of destruction of chemical weapons that usually work their way into the discussion of problems of getting out of the chemical weapons confrontation.

The policies and interests of the army and society in the process of chemical disarmament are incompatible. The army ordinarily makes no distinction between the combat and ecological characteristics of TC, and accordingly simplifies the process of ending the chemical weapons confrontation. At the same time, the ecological characteristics of TC are of importance for ecology and medicine, even in cases where their combat characteristics are no longer of any moment. Chemical weapons sent to the Soviet Army in experimental and industrial lots were tested at many sites [10, 11] even though this is extremely hazardous for the populace and the environment, and in civilized nations is done as far as possible in sealed enclosures [56].

Soviet data regarding the transformation of TC in the environment and the degree of toxicity of given products of this transformation so far have not been declassified, if they exist at all [115, 116]. At any rate, the information given in [116] is totally inadequate. Therefore, we have to make use of foreign data [117].

Nor have Soviet data been disclosed regarding long-term effects of TC on people and ecosystems, especially in trace amounts.

Facts have already been presented above relating to the impact of TC on the health of people and the environment as applied to specific circumstances. Now let us try to make a few integrated assessments in various coordinate systems.

II.1. How Long Toxic Chemicals Retain Toxic Properties

From the standpoint of long-term action on the environment, we can limit ourselves mainly to two groups of first-generation TC: first are the persistent chemical agents yperite and lewisite, and second, irritating TC, because such irritants as adamsite, diphenylchloroarsine and diphenylcyanoarsine are arsenicals, and there is no doubt about their grave ecological effect.

The non-persistent toxic agents phosgene, diphosgene and prussic acid got their name in connection with combat classification, and at first glance might have been excluded from retrospective

analysis. However, they must also be considered for at least two reasons. First of all, people may still be alive who at one time were victims of producing and testing of these weapons. Besides that, these TC inevitably come up when discussing the fate of chemical munitions that were sunk by our army.

In recent years, within the framework of the general logic of talks on chemical disarmament, the military people of the USSR and the United States have agreed not to include irritating TC (irritants) among combat weapons. As a result, adamsite has "dropped out" of discussion. However, this agreement has nothing to do with our examination, as it does not abolish the past combat service of this TC, nor does it reverse the already existing medical and ecological consequences of preparation for chemical warfare. Moreover, arsenic trichloride, a highly toxic substance and precursor of adamsite, diphenylchloroarsine and diphenylcyanoarsine, is a controlled substance under the terms of the Convention on Chemical Disarmament [35], unlike these toxic agents themselves.

In some circles, especially within the army, the opinion prevails that after TC have been in the environment for a long time, they spontaneously dissociate, and thus may become safe (e.g. see [22]). In reality, there are not sufficient grounds for hopes of this kind.

On the one hand, for example, the combat characteristics of OTC are retained in the environment comparatively briefly [117]:

```
sarin for two days,
soman for 6 months,
VX for up to 16 weeks.
```

But in actual fact, i.e. with allowance for the ecological danger of these TC, the situation for the civilian population and the environment is a lot more complicated. In particular, according to British experience, it is known that when the production of sarin (which is simplest in regard to self-degradation in nature) was ended in 1956, the territory and equipment at the enterprise were thoroughly decontaminated. Notwithstanding, people got sick when the facility was opened as a test 20 years later [118].

Soman and V-gases, being more persistent and less volatile, conceal even greater surprises. Persistent toxic agents are still more dangerous. Yperite may retain its ecological properties (when combat properties are gone) for several decades. For example, a batch of yperite stored in the United States at Edgewood Arsenal in 1941 without degassing was found to be little changed when this storage facility was opened in 1971 [119].

The mixture of agents formed as a result of hydrolysis of yperite stored in Canada for 18 years was biologically hazardous (of course, it did not contain yperite proper, but products of transformation, some of which are toxic) [120]. Yperite sunk in Japan during the early years after World War II in shallow water near the coast caused documented illnesses of people in 1962 and 1970 [121].

The properties of lewisite are analogous to yperite; however, lewisite is an arsenical, so that not just some, but all of the products of its transformation in the environment are dangerous. In this respect, lewisite has kindred among the arsenical irritants produced in the Soviet Union: adamsite, diphenylchloroarsine and diphenylcyanoarsine. All these agents are ecologically hazardous for any storage times. The compulsory destruction involved in eliminating TC also creates a host of problems.

If yperite and lewisite are destroyed, some of the resultant products may be ecotoxicants. Direct burning of yperite produces no less than 15 (11 for lewisite) substances, some of the combustion products being carcinogens [122]. This must be taken into consideration when evaluating the consequences of PTC elimination carried out at various times on military-chemical bases at Gornyy, Kambarka and Chapayevsk. Exhaustive chlorination of yperite and lewisite may yield not only oxidation products, some of which are toxic [4]. This process may be accompanied by formation of highly toxic dioxins. Chlorination was used for many years in the Soviet Union as a method of treating waste water from yperite and lewisite production facilities (although even this imperfect treatment was not nearly always done). However, the process was comparatively effective only in the sense of destroying yperite, but not lewisite. Thus, with correct ecological

assessments of the sites of past experimental and industrial production of lewisite (Chapayevsk, Dzerzhinsk, Moscow, Berezniki, Novomoskovsk), such a "monument" might be not just something that cannot be ignored, but something extremely dangerous. However, the ascertainment of consequences of this kind has essentially started only in Chapayevsk [78].

Incidentally, it is the chlorination of lewisite that was proposed as a basis for one of the technologies of lewisite treatment as late as the autumn of 1992, and without regard to past experience [116, 123].

II.2 How Many Sites in Russia Are Hazardous Due to Chemical Weapons

The total number of Russian territories that to some extent have been ecologically impacted by the detrimental effect of chemical weapons is not known. The Defense Ministry and Roskomkhimnefteprom [RF State Committee for the Chemical and Petrochemical Industry], without allowing for the radical change of situation following signing of the Convention on Chemical Disarmament, are in no hurry to publish appropriate data. Until now, neither the army nor industry has adapted an ecologically oriented retrospective view of the consequences of chemical armament. However, expert estimates can be made.

Tests and various degrees of application of chemical weapons have been made at no fewer than 35-40 sites in the Soviet Union. If we limit ourselves to Russia alone, data of [10, 11] give a rather large set of regions: Astrakhan, Leningrad, Nizhniy Novgorod and Tomsk Oblasts, Moscow [city] and Moscow Oblast, Krasnodar Kray and so on.

Chemical weapons could be buried and sunk on at least 30-35 sites in the USSR. Several Russian territories where chemical weapons were burned and buried in the past have not been informed so far about ecological danger (in addition to Udmurtia and Samara and Saratov Oblasts, other territories at the whim of the Defense Ministry are still in the dark about their trouble). The situation is especially complicated for territories toward which sites of past disposal of chemical weapons at sea gravitate. Besides Leningrad and Kaliningrad Oblasts, for which disposals in the Baltic Sea are pertinent, other regions have not so far been determined. At the same time, disposal of chemical weapons in the White and Barents Seas is pertinent for Karelia and Arkhangelsk and Murmansk Oblasts. The people of Kamchatka, Magadan, and Sakhalin Oblasts, and of Khabarovsk Kray ought to know about disposal in the Sea of Okhotsk, and those of Maritime Kray should know about disposal in the Sea of Japan. If the army's approach prevails with regard to destroying chemical weapons at the current storage sites, these regions will be included: Udmurtia once more, and also Bryansk, Kirov, Kurgan, Penza, and Saratov Oblasts.

The greatest number of sites may have been associated with permanent, and even worse, with temporary storage of chemical weapons in various historical periods. As a whole over the Soviet Union, there may have been 200-250 of them, an especially large number of points being associated with PTC in the pre-war years, when almost no thought was being given to the consequences. In Russia alone, according to data of [10, 11], chemical weapons were being stored in the following regions: Chita, Irkutsk, Kemerovo, Kirov, Leningrad, Lipetsk, Moscow, Nizhniy Novgorod, Perm, Samara, Saratov, Tver, Vladimir, Voronezh, and Volgograd Oblasts, Udmurtia, Moscow [city], Krasnoyarsk and Maritime Krays, and in many other areas. In many regions, there were several specific sites of permanent and temporary storage, especially in the Volga region.

Sites of industrial production of chemical weapons in the distant and not so distant past are more or less subject to determination. Large-scale production was in practice at ten sites of several regions (Chuvashia, Moscow [city] and Moscow Oblast, and Ivanovo, Nizhniy Novgorod, Perm, Samara, Tula, and Volgograd Oblasts). Allowance for experimental projects increases the number to 15. A recent report from Slavyansk (Ukraine) about finding a "burial site of lethally dangerous chemical weapons" on the territory of today's "Khimprom" Production Association is just one example of this kind [124]. Thus, in Russia alone there have been at least 38-40 regions involved in chemical weapons in the past and present, and this estimate is clearly understated. In other words, from the standpoint of cleaning up the aftermath of the chemical weapons confrontation, we are looking at a nation-wide problem, because there is a question of the hazard of long-term chemical weapons

contamination of roughly 300 specific sites on half the territory of Russia [60].

In the Unites States, the number of such sites is already documented: there are 215 of them [125].

And the future is not unclouded either. In transporting, repackaging, destruction and other operations in the handling of TC and chemical munitions, there is a high probability that processes will get out of control and TC will spontaneously be released into the environment.

In particular, it is acknowledged [116] that "when an emergency arises that is accompanied by spilling of considerable amounts of TC, the cloud of contaminated air may spread to dozens of kilometers, causing illness of people living in the vicinity of the facility." The probability of accidents was even greater in former years, when safety issues were not so of such specific concern as they are today.

Among the most ecologically hazardous accidents are airplane crashes at sites of chemical production facilities [18], and for that reason the skies are closed to civilian and military aviation above such cities of "large-scale chemical industry" as Volgograd and Dzerzhinsk.

Transportation accidents are just as dangerous. On the territory of the Soviet Union in past years, the number of major accidents was 100-150 per year on an average trip length of 957 km [96].

II.3. How Many People Suffered From Chemical Weapons in Russia

Assessment of the consequences of chemical arms for the health of the populace is approached from several directions and levels.

Especially large masses of people have been victims in cities where first-generation TC were in experimental and full-scale production and were being charged into munitions in the period from the twenties to the fifties. This applies primarily to cities like Chapayevsk, Stalingrad (Volgograd), Dzerzhinsk, Berezniki, Kineshma (Zavolzhsk), Moscow, Novomoskovsk, Kirovo-Chepetsk, and others.

The residents of Volgograd (see above), Novocheboksarsk, Dzerzhinsk, Volsk, and especially the first two, suffered injury as a result of OTC production.

The aftereffects of chemical weapons production on the health of affected populations may be two-fold.

First of all, TC had their strongest effect on persons directly involved in experimental and industrial production. This is particularly typical of nations with archaic chemical production facilities, which always included the Soviet Union. Secondly, untreated and partly treated wastes and emissions associated with chemical weapons production also had and continue to have a long-term impact on the state of the habitat of both the perpetrators themselves and others who do not suspect the causes.

An important issue comes up with regard to standards of the maximum content of TC in objects of the environment. During times when the production of yperite and lewisite was just being organized, for example at the plant in Chapyevsk, there simply were no such standards, at least in the air of the working zone. Nor were there any satisfactory methods of measuring the yperite and lewisite concentration in various media, even if such standards had existed. The situation in Dzerzhinsk, Stalingrad and Berezniki differed only in detail.

There are some data about the aftereffects of destroying chemical weapons. For example, many soldiers were put out of action during large-scale burial of yperite in the late forties [98]. As a result of this and similar accidents, the territories where they occurred were a disaster area. In particular, the regional leaders in oncological illnesses were Kambarka in Udmurtia [129] and Gornyy settlement in Saratov Oblast [101].

Complete data about the consequences of destruction of large amounts of TC (which was being

done not only at the aforementioned three sites) have not been published. Some cases have been described of people ill from undetermined causes. In particular, dermatitic skin conditions observed among citizens of Volsk-Shikhany in the summer and autumn of 1993 could have been due to wastes of SOVTOL-10 organochlorine transformer oil in the cement shops of the "Red October" Plant in Volsk. It has also been suggested that the cause might have been the PCT that were being destroyed at the time at TsVKhP by the method of open explosion of chemical munitions. As an official cover-up, the directorate of TsVKhP attributed the skin disorders to the hogweed, which does not even grow in the region; however, there has been no final answer as yet.

Results were recently published in the United States of a detailed investigation of the effect of yperite and lewisite on the health of veterans of many nations that in the past participated one way or another in operations with these chemical weapons: 1097 U.S. citizens who produced yperite at Edgewood Arsenal in the pre-war years, 495 Japanese citizens who had worked at an yperite production plant in 1929-1945, 511 British citizens who had worked in yperite production in 1939-1945, and so on [131]. There is no generalization of analogous data relating to the Soviet Union.

It is difficult for the moment to make integrated assessments of the number of victims. However, we can clearly assume, considering the plethora of sites that were affected by operations with chemical weapons, that the detrimental effects of producing, testing and storing TC could have impacted on the fate of many people. As a rough figure, we are talking about 5 million people who were and are subjected to the action of trace amounts of TC and the toxic products of their transformation. Foremost in this number, we must include several generations of people living in the cities and territories where chemical weapons were produced, a total of two-three million. The second major group of victims is made up of those who lived and are living near the numerous chemical weapons stockpiles and storage bases, from 1 to 1.5 million. A third group comprises participants in battlefield operations, exercises with the use of chemical weapons, operations in their destruction, and also the citizens of nearby territories, from 1 to 1.5 million.

It cannot be ruled out that there may be genetic aftereffects of TC for a considerable number of these people.

GETTING OUT OF THE CHEMICAL WEAPONS CONFRONTATION

The initialing on 3 September 1992 [123] and conclusion on 13 January 1993 [33] of the Convention on Chemical Disarmament [35] was enthusiastically received by the world community [9, 33, 34]. This required actions by the Russian side that should have demonstrated her good will.

However, resolution of issues of the military part of the Convention, i.e. the actual destruction of current stockpiles of chemical weapons, will be a prolonged process. It is quite possible that because of ineptitude of her leaders, Russia will be unable to guarantee destruction of her chemical weapons by the year 2005, as stipulated by the Convention, and will ask for more time [34].

However, this will merely solve the international (military and political) aspect of getting rid of chemical warfare. Domestic aspects associated mainly with the medical and ecological consequences of preparing for chemical warfare, are not usually brought up in discussions. Nor is much attention given to the economics and psychology of ending the military-chemical confrontation.

The necessity of chemical disarmament with minimum losses has required a psychological readjustment, acceptance of a new approach to things that once seemed obvious. This psychological readjustment has been a lot more complicated than was originally imagined.

III.1. Legal Entities in the Chemical Weapons Confrontation

Numerous ministries and agencies were involved in the prolonged Soviet-U.S. chemical weapons confrontation. Work orders came from the USSR Ministry of Defense. The RF Ministry of Defense is now the sole owner of chemical weapons stockpiles, and keeper of an especially large body of

information about past and present chemical weapons (their storage, testing, and destruction), including in the near abroad. This same ministry is the "landlord" of numerous tracts of Russian property previously used for chemical warfare preparations, and now in need of reclamation before being inevitably put back into national economic use. In practice, the investigation and cleanup of lands before their return might be organized by the newly instituted Administration of Ecology and Special Means of Protection of the RF Ministry of Defense; however, it has not yet felt covered by the authority of RF Law in the part pertaining to prohibiting concealment of any ecological information.

Work was carried out by the chemical agency: the USSR Ministry of the Chemical Industry. In our day, its rights and duties have been taken over by the RF State Committee for the Chemical and Petrochemical Industry (Roskomkhimnefteprom). The plants of this ministry are the owners of industrial sites contaminated by chemical weapons production in the past, including in bordering nations, and left uncleaned to this day. It is they who are responsible for contamination of city blocks adjacent to their plants. The ministry itself is the legal entity that is actively objecting to declassification of all documents associated with past production of chemical weapons, even the documents of 1939-1963 that should be disclosed in accordance with several laws now in effect. And unless the information is made public, lands cannot be reclaimed, nor can the social debt to workers and the general population be repaid.

The medical treatment and general preservation of health of chemical weapons production workers was, until the sixties, the province of the USSR Ministry of Public Health, today the RF Ministry of Health and the Medical Industry (Minzdravmedprom Rossii). It subsumed the sanitation-epidemiological administration responsible for specifically organizing safeguards of worker health prior to the organization of any production of TC and in the course of production. This is now the RF State Committee for Sanitary-Epidemiological Oversight (Goskomsanepidnadzor Rossii). It is this agency that is now responsible for ecological surveillance of the environment around enterprises that produced chemical weapons in the past. Unfortunately, it is not devoting much effort to this responsibility just now, especially the retrospective part that pertains to investigating and assessing the ecological damage of past years.

In fact, all work associated with human health and environmental protection in the production of chemical weapons, beginning in the sixties, was concentrated in the Third Main Administration of the USSR Ministry of Public Health. This is now the Federal Administration of Medical-Biological and Emergency Problems affiliated with Minzdravmedprom Rossii. Here until the present time has been concentrated all medical and ecological information that had been accumulated in connection with production of second- and third-generation chemical weapons, and that ecological organizations have failed to obtain so far.

Minzdravmedprom agencies are not the only ones who bear the responsibility for the welfare of people and nature that is associated with preparations for chemical warfare. Co-responsible with them are two other agencies: the RF Ministry of Environmental Protection and Natural Resources (Minprirody Rossii), and also the Russian Federal Service on Hydrometeorology and Environmental Control (Rosgidromet). The position of Minprirody is especially significant. It is this agency that was supposed to take care of the expert examination of facilities for destruction of chemical weapons in Chapayevsk and Chuvashia; however, citizens were not informed about the results of expert examinations [28]. In 1990, this same agency was supposed to organize expert examination of the first (still classified) "Program on Destruction of Chemical Weapons"; however, the staff of "experts" included almost exclusively representatives of the MCC or persons with close ties to it [27]. As to the draft of the program for destruction of chemical weapons of 1992 [102], it was endorsed by Minprirody before submission to the RF Supreme Council (the text bears the signatures of deputy minister of ecology N. G. Rybalskiy and department chief V. Ya Vasin) without preliminary expert examination.

It is assumed that safety during operations on destruction of chemical weapons will be supervised by the Russian Federal Mining and Industrial Oversight (Gosgortekhnadzor Rossii) [102], which could scarcely have any experience in this kind of work. But if there should be unforeseen accidents, the RF Ministry for Civil Defense, Emergencies and Natural Disasters (MChS) would step in. In recent years, the press has really started breaking out with little reports about accidents with chlorine [82, 152, 160] (the first chemical weapon of the twentieth century [1,4], not now

considered such [6]), and about MChS operations in this connection.

Of course, the protection of social rights of civilians who have been victims of the development, production, testing and storage of chemical weapons should be handled by the RF Ministry of Social Welfare (Minsotszashchity Rossii).

The interagency nature of the problem of ending the chemical and biological confrontation has necessitated adoption of commensurate measures. One of these has been declared by RF Presidential Decree No 523 dated 25 May 1992, which was instituted by the RF President's Committee on Conventional Problems of Chemical and Biological Weapons. The main task of the Committee is defined as coordinating the activity of governmental administrative agencies on working out and implementing the governmental policy of Russia in the area of ensuring fulfillment of international obligations with respect to two kinds of weapons of mass destruction: chemical and biological [116].

Among the numerous tasks that pertain to destruction of chemical weapons and that are more precisely international in nature, only one internal task has been entered in the Committee's Provisional Charter: the Committee "analyzes information on discovered old chemical weapons storage sites, determines the degree and scales of danger of these sites, and works out steps for eliminating possible sources of danger." Thus, only old chemical weapons storage sites are considered, the only information about them being in the hands of the army. Other sites of potential danger, some of which could be defined as non-military structures, remain outside the purview of any governmental agency of Russia. In particular, the Committee's work does not extend to seeking out and determining the danger of sites of past facilities for producing, testing, storage and destruction (other than by burial) of chemical weapons.

Thus, except for direct destruction of chemical weapons, the difficult problem of overcoming the dangerous aftermath of preparing for chemical warfare has not been assigned to a single governmental agency of Russia. From the standpoint of ensuring ecological safety, this may have a disastrous outcome for the country.

III.2. Lack of Trust Between U.S. and Soviet Sides

The world community will be able to end the chemical weapons confrontation with minimum losses only in an atmosphere of trust. At the same time, official practice of diplomatic and military representatives of the Soviet Union (and Russia) is not always responsible.

The most glaring example is the situation with regard to nomenclature of chemical weapons. On 3-4 October 1987, the Soviet Union displayed to official representatives of different nations and the press at military-chemical proving grounds in Shikhany samples of chemical munitions deployed in armament of the Soviet Army [26]. To the question "are we being shown all munitions deployed in the armament of chemical forces?" General A. D. Kuntsevich answered in the affirmative [25]. Somewhat later, data about the nomenclature of TC and chemical munitions of the Soviet Union were officially set forth by document CD/789 dated 16 December 1987, signed by Yu. K. Nazarkin, Soviet ambassador to the Geneva Conference on Chemical Disarmament [132]. A total of 19 samples of chemical munitions had been shown [25, 26], purportedly the only ones deployed in the chemical armament of the SA, not only for chemical forces, but for the air force and artillery as well. In addition to combat grenades with "riot control" CS gas, these included 18 other kinds of chemical munitions falling into several groups. For example munitions charged with OTC "of the VX type" included only four kinds; however, all of them pertained to non-rocket and rocket artillery, and also to missile forces.

In fact, at that time there were other chemical weapons deployed in combat service in the army. For example, an accident that occurred in 1974 at "Khimprom" Production Association in Novocheboksarsk revealed the existence of aircraft bombs that were charged with V-gas and were being series-produced. It was these munitions that burned and burst in a fire [89], and had not been included in the official list [132]; and incidentally several types of aircraft bombs with Soviet V-gas were being produced on the charging lines at Novocheboksarsk: parachute, fragmentation, cluster, and others [106]. On the whole, according to recollections of workers, it was not four types of chemical munitions being charged with V-gas at Novocheboksarsk, but rather at least 14 types, and

those munitions were being series-produced in large lots on assembly lines [127].

The situation is similar with regard to publicizing the total stockpiles of chemical weapons. In 1989 the Soviet Union acknowledged that it had about 50,000 metric tons of TC [24]. A year later, when chemical weapons had been redeployed to military-chemical bases singled out for review by foreign representatives, the number of officially declared TC was reduced to 40,000 metric tons [14, 15]. No explanation was given for the numerical discrepancy. However, even after the signing of the Convention on Chemical Disarmament, an official representative of the RF Ministry of Defense is saying that "more than 40,000 metric tons of toxic agents alone are concentrated" on the territory of Russia [133].

At the same time, in both the legal and ecological sense, the "lost" chemical weapons (the "loss" includes not just the 10,000 metric tons, but a still greater amount [32, 46, 45]) must be found. Even if munitions with the missing 10,000 metric tons of TC have been buried or sunk, the public should be informed about it. Recall that the Convention on Chemical Disarmament [35] continues to consider as chemical weapons even those munitions that have been buried since 1 January 1977 and sunk since 1 January 1985. And in the ecological sense, any chemical weapons, including those buried and sunk at any time, are hazardous. The psychological unpreparedness of the Soviet side for relations as partners has become especially clear in connection with the binary weapons problem.

In 1954-1960, binary chemical weapons began to be developed by the U.S. Army. Since then, it has been in this direction that chemical armament policy has evolved in the United States [8]. However, since 1969 the United States has not been series-producing any chemical weapons, either conventional or binary. Nevertheless, accusations that the United States is producing components [135], and indeed binary chemical weapons themselves, have continued until most recently [15, 136]. As to the Soviet Union, in 1982 General A. D. Kuntsevich, then deputy chief of chemical forces of the Soviet Army, informed the journal SPIEGEL that the Soviet Union would not be responding to escalation of chemical weapons by escalation in the same area [137]. Ten years later, General I. B. Yevstafyev, was quite definite in answering a question about the presence of binary chemical weapons in the Soviet Union: "We have no stockpiles, but any nation that has a chemical industry may have the potential" [21]. This statement implied that the Soviet Union felt that it had the right to create its own production potential of chemical attack by binary weapons.

The public now has at its disposal the following data about efforts expended in realizing this "right."

- about the fact of direct development of Soviet binary weapons [50], and in two versions [48],
- about a site for possible production of these weapons--at least an experimental lot [29],
- about the method of production, enabling it to be hidden from international inspection [83],
- about a site for storing combat reserves of binary weapons [48],
- about a developer who was killed [97, 138], and finally,
- about prizes awarded for developing binary weapons in 1991 (to A. D. Kuntsevich--Lenin Prize, to I. B. Yevstafyev--State Prize) [29, 36].

Further evidence that this "right" has been realized in full was the fact that E. A. Shevardnadze, minister of foreign affairs of the Soviet Union, speaking at the UN, stated that the USSR was prepared to assume mutual obligations with the United States in the cessation of production of chemical weapons, including their binary types.

No less difficult for the Soviet side has been the problem of keeping parties informed in talks about the most advanced TC--V-gas and the so-called "new TC." In an official document [132], a TC produced in recent years in the Soviet Union has been called agent VX within the scope of the international classification of V-gases. In fact, the Soviet V-gas produced at Novocheboksarsk had a different structure than the U.S. VX-gas [43, 48], and no official refutations have been given for the observed and admitted difference. The international community could have easily understood this, for example, from the report of Soviet delegate Yu. V. Skripkin at the international conference on chemical disarmament held in 1991, where analytical aspects of detecting the precursor of Soviet V-gas were discussed [139]. This delegate called himself a representative of the USSR Ministry of Foreign Affairs, although he was and is now working for GSNIIOKhT [112a] (it is he

that is meant, for example in [45]).

Nevertheless, a Russian Presidential edict forbids exporting an intermediate of U.S. VX-gas out of the country, but not that of Soviet V-gas [140]. Thus, the intermediate of Soviet V-gas may be freely exported [141], at any rate there are no Russian laws against it.

Nor is it forbidden to export third-generation TC and their main precursors out of Russia [48]. Their existence was reported in [29, 45], and development of a new TC has already been officially acknowledged [44, 52, 53].

In this regard, we cannot fail to call attention to efforts of army leaders to continue research in the area of "peaceful chemistry, leading-edge studies in chemistry and technology, investigation and in-depth examination of increasingly newer classes of biologically active substances, their effect on a target and the human organism" [113]. This in itself is reasonable. Our only concern is that this quote comes not from a scientist in a peaceful field of knowledge, but from a general of chemical forces.

The lack of trust between parties also shows up in the question of maintaining production potential for making chemical weapons, which has not been needed since signing the Convention on Chemical Disarmament. In connection with the completion of preparations for the Convention, this potential was destroyed at Dzerzhinsk [82], Volgograd [80] and Chapayevsk [142]. However, the production potential for making munitions with the latest V-gas has been maintained in Novocheboksarsk [142]. This situation cannot be based on considerations of maintaining the "balance of forces," since there is no such potential in the United States, which has not been making chemical weapons since 1969, and cannot have any modern production potential [113]. The most probable reason for the resistance of the MCC of Russia is to maintain for as long as possible the military-chemical superiority of Russia over parties to talks about chemical disarmament [138].

Pertinent to the issue of potential for producing chemical weapons is the problem of "maintaining commercial secrecy in the course of inspections" [9]. This is a problem with two views, depending on whether one's secrets are to be kept from a likely enemy, or "information leaks" to such countries as Iraq are to be prevented. However, for many years it served as a serious pretext for putting off signing the Convention on Chemical Disarmament.

At the same time, this problem seems rather contrived. On the one hand, it cannot be ruled out that stopping production of present-day OTC (and its inevitable "defense conversion" satellites--phosphorus and chlorine pesticides--which are of doubtful commercial value in our times) will completely eliminate the "commercial secrecy" problem of these and concomitant processes. On the other hand, the part of the Iran-Iraq war experience relating to the chemical aggression of Iraq and the killing of 3500 non-combatants in Iran [143] unambiguously shows that production of PTC and OTC long ago ceased to be a secret to Iraq. At any rate, the presence of stockpiles of yperite, tabun and sarin in Iraq has never been a secret either to chief of RCB forces General S. V. Petrov [144], or to the international community [143]. And these stockpiles clearly were produced by the Iraqis themselves. if one discounts the fantastic assumption that technological secrets were turned over to Iraq by her long-time strategic ally, the USSR. Thus, the army and the Russian authorities in general still have to give their partners in talks more complete information about chemical weapons of the former Soviet Union--both quantitative and qualitative. Apparently, the authorities have come to understand the necessity of this step more acutely than formerly. At any rate, talks have already started in recent months about a forthcoming Russian-U.S. exchange of "more exact data on chemical weapons, location of facilities, and conditions of TC storage" [41]. And this means that the confidential exchange of military-chemical information made by the Soviet Union and the United States in accordance with the Wyoming Memorandum of 23 September 1989 [93] was not quite complete. III.3. Lack of Trust Between the Authorities and the People Interaction and mutual understanding of the authorities and the people is a necessary condition of successful destruction of chemical weapons. This has become especially clear over the past 20-25 years as the Soviet Union and the United States, in parallel with talks about chemical disarmament, have also had to start getting ready for actually carrying it out.

Long before the start of practical work on chemical disarmament, the United States had been preparing the appropriate legislative base in support of both general ecological safety (safe drinking

water act--1974, law on conservation and restoration of natural resources--1976, clean air act--1977, and clean water act--1977) and ecological comfort of existence of the population under conditions of getting rid of chemical weapons. It is important to stress that the laws passed were multipurpose: they ensured not only ecologically safe elimination of chemical weapons, but also kept the population safe from any other highly toxic ecotoxicants of man-made origin (law of protection of the seas, including a ban on getting rid of TC by disposal in the ocean--1972, toxic waste dump cleanup act--1980).

Finally, in 1980 the United States passed law 99-145, obligating the Department of Defense to destroy all stockpiles of chemical weapons accumulated up to that time [116]. There are three points that should be emphasized in this connection. First of all, implementation of this decision had nothing to do with the "aggressive intent" of the Soviet Union or Iraq; the only imperative was the interests of the people themselves. Secondly, U.S. military authorities responsible for destroying chemical weapons had been engaged for roughly 20 years in a tense dialog with the population living near eight chemical weapons storage bases on the continent before reaching an agreement enabling the start of actual work [145] (officials of the Soviet Union have acknowledged the importance of this preparatory stage of operations [146]). In the third place, it is the U.S. army command that has offered financial aid to groups of the public sector for doing an alternative ecological study near each chemical weapons storage and destruction facility, and has organized public hearings and meetings with local residents, and with representatives of federal and local organs of authority [116].

In the Soviet Union, work in preparation for large-scale destruction of chemical weapons was not begun until 1986 [116]. No legislative acts have been passed to date. It has been proposed that destruction of chemical weapons is to be done only on the banks of the Volga [100].

From the psychological standpoint, the time that has passed since the 1987 declaration of chemical weapons production [13] has been wasted: the attitude of the MCC toward the people is practically unchanged [105]. The chairman of the RF President's Committee on Conventional Problems of Chemical and Biological Weapons, Academician-General A. D. Kuntsevich, feels that "the authority of Russia in the international arena depends on the readiness of the population to cooperate" with the committee [135]. This is a typical purely Soviet psychological error. A representative of authority, groundlessly associating himself with Russia, forgets about the two-way nature of any interaction. The other direction of cooperation--looking out for the interests of the population--was never even considered by corporate bodies and persons (the Politburo of the CPSU Central Committee, the Military-Industrial Commission, the Ministry of the Chemical Industry, the Committee, and A. D. Kuntsevich himself), and the public had the corresponding attitude toward the actions of the MCC.

The first alarm went off in 1989 in Chapayevsk, where a classified facility had been built in 1986 by a resolution of the Military-Industrial Commission and the CPSU Central Committee Politburo. When the population learned from a speech given by E. A. Shevardnadze in a distant foreign city that it was at this facility, just 12 km from their town, that chemical weapons were to be destroyed, and even that they would be brought in from far away, only later confirmed by press reports, there was a social explosion.

Residents demanded data of an ecological expert evaluation, and got none. They also formulated their own requirements for the project based on shortcomings that were clear to them; they sent to the capital the list of flaws to be eliminated [28]. They got no response to that either, but the Government deemed it well to announce that the facility was being mothballed, and that chemical weapons would not be destroyed there [147]. This was followed by a lot of mutual reproaching, preponderantly aimed at the intractable populace [135]. Reasons given were the bad ecological situation in Chapayevsk [21], inability to work with the populace [148], and a number of others.

However, the reason for rejection by the people was plain. People were being dealt with imperiously, as before, they were being lied to [28], they were not being given data of ecological expert examination of the newly constructed plant for destruction of chemical weapons [95]. And it is so amazing that it did not occur to anyone to apologize to these people for the hell of past years that had been caused by production of yperite and lewisite [36]. At any rate, the high commission that arrived in Chapayevsk in 1989, dispatched primarily to persuade the population to end their

protests, could not find time to put flowers on the graves of their parents who had died in the war and in the early post-war years because of participation in the production of yperite and lewisite.

Meanwhile, Western specialists who visited Chapayevsk found that fifties technology had been used in the newly constructed plant, and the approaches used for dealing with problems of safety and ecological control were rather dubious. Their conclusion sounded like a condemnation: the plant near Chapayevsk is fraught with coming disasters that will make Chernobyl look like a Sunday school picnic [149]. Officials offered no refutation.

Nor did the authorities give any thought to the past before they told residents of Chuvashia in the autumn of 1992 that, at the order of the Military-Industrial Commission, construction was being planned for a major facility at Novocheboksarsk to destroy OTC in chemical munitions [88, 148, 150]. Incidentally, there had been no chemical weapons in this republic for a long time, and they were going to be brought in from a long way off, among other places, from Shchuchye, Kurgan Oblast [88]. Once again there was no apology for the past, nor any offer to the populace of compensation for it. Once again no ecological expert examination because the Ministry of Ecology had endorsed the project without looking at it [102]. Once again the authorities had made a deal behind the backs of citizens of Chuvashia, the outcome of which was learned from a propagandistic article in the central press [148]. Even a visit by the president of Russia to "Khimprom" Production Association was presented as if it were the President's approval of the MCC proposal for organizing destruction of chemical weapons. And once again social resistance ending in cancellation of the idea [151].

The events in Chapayevsk and Chuvashia are separated by five years. However, they were not just random episodes, but were cut out of the same cloth. The citizens of Udmurtia [152, 153] and Saratov Oblast [73, 154, 155] gave a similar reception to proposals of the authorities on organizing destruction of chemical weapons already located there. So one can't deal with the people. Protests will continue until the authorities come to understand that talking to the people without listening is not going to work any more, that they are going to have to work with the population directly, respectfully, that the interests of the people must be their first concern.

III.4. People's Questions Remain Unanswered

It will be especially clear that the MCC is not psychologically ready to talk to the people, if we consider its reluctance to deal with those residents of Russia who live near chemical weapons storage bases, and who will soon be living near sites of destruction of these weapons [105].

However, psychological unreadiness does not stop here. Several reasons can be given why there is not a single place in Russia so far where the people could be talked into agreeing to participate in destruction of chemical weapons until they, the people, become participants with equal rights in the process and feel that their interests are being served, and equally that they are completely safe.

Until now the people of Russia (and of the entire former Soviet Union) have never been told, even briefly, about the circumstances of starting preparations for chemical warfare. Until now, nothing has been known about the offensive targets of a future chemical war, about the justification for developing and producing the world's largest stockpile of the most powerful chemical weapons, about the fate of this vast chemical arsenal that was created at the cost of the health and lives of thousands of people. There just aren't any detailed data about the chemical weapons of Russia that are accessible to the people. This is especially astounding in light of the fact that U.S. partners of the Russian military in chemical disarmament talks already know a lot, and soon will know even more [4].

The people of this country have not been told about the actual course of production of chemical weapons in Chapayevsk, Stalingrad (Volgograd), Dzerzhinsk, Berezniki, Kineshma (Zavolzhsk), Novocheboksarsk, Moscow and other cities. They have not been given trustworthy information about the health and life of people by whose hands the military-chemical potential of the nation was created. There are no open and correct data about the consequences of past production of TC: neither about the rate of illness, nor about the ecological situation of these cities, especially near the sites of the corresponding plants (ChZKhU, the Kaprolaktam Production Association, the Orgsteklo Production Association, the Soda Production Association, the Khimprom VPO imeni S. M. Kirov,

the Zavolzhsk Chemical Plant, and the Khimprom ChPO imeni the Leninist Komsomol).

In Novocheboksarsk in "1973-1986 a systematic study was done on levels of contamination of gas emissions in production of agent VX and its intermediates"; however, the results of this work "are for the internal use of an agency," and therefore still await a "decision on the question of publishing them" [157]. The agency that is master of the concealed information is the Federal Administration of Medical-Biological and Emergency Problems affiliated with the RF Ministry of Health and the Medical Industry. Nevertheless, in 1992 at Novocheboksarsk, MCC forces tried to find residues of VX OTC [156] (which could scarcely be expected, and no one was looking for transformation products); the only reason for doing so was to get authorization for starting destruction of chemical weapons in this city of 30,000 [115].

The country's people have not been officially informed about a single disaster, not to mention accidents of various degrees of severity, associated with the development, testing, storage and use of chemical weapons. For example, it was stated in [88] that specialists in Novocheboksarsk who had developed new chemical weapons "had not had a single accident." However, this was a bare-faced lie [39, 89, 90, 91].

Just as groundless is the statement of chief of RCB forces General S. V. Petrov to the effect that "there has not been a single case of emissions of toxic agents beyond the confines of working zones at chemical weapons production facilities" [158]. This is contradicted just by the well known ecological disaster on the lower Volga in 1965 due to emissions of the Volgograd Khimprom Production Association [39, 80].

At the same time, the lack of openness regarding chemical weapons contradicts the standards of ecological safety, since there is no way that incidents with chemical weapons can occur without affecting the completely unsuspecting population. The people of this country do not know about the international destiny of the Soviet Union's chemical weapons. In the interests of politics of the moment, it was intentionally leaked that there was a "possibility" of proliferation of Soviet chemical weapons throughout the world [161]. However, they forgot to report how everything was in actuality, apparently due to a loss of urgency for those who had arranged the "leak." Now everyone knows about the military contacts of "eternal brothers" in the fifties, culminating in transfer of technological secrets of producing nuclear weapons and missiles from the USSR to the People's Republic of China. So far, we have no official information that this was not done for chemical weapons as well.

The same applies to the possibility that chemical weapons were transferred in ownership or for storage to former socialist nations. At one time no one was being kept in the dark about the efforts of the former German Democratic Republic and Czechoslovak Socialist Republic to establish areas free of chemical weapons on their territories. These reports do not jibe with the Soviet declaration of 1987 to the effect that the Soviet Union had never transferred its chemical weapons, and was not storing them in other nations [13], and even cited data of "expert examination" to confirm it [14].

Thousands of residents of the former Soviet Union--military chemists, military and civilian seamen--personally took part in secret operations of underwater disposal of not only German [112a, 162, 163], but also Soviet [99, 101, 129] chemical weapons, as well as burial [98, 99] and burning [99, 101, 129]. At the same time, so far there have been no official reports on the subject, and only recently has General S. V. Petrov confirmed the fact of "small-scale disposal" of chemical weapons in the White Sea [158]. The information is held by structures of the RF Ministry of Defense: the VMF and RCB forces.

The Soviet authorities have conducted international negotiations on chemical disarmament for decades without lowering themselves to inform their own people [142]; their occasional statements have been exclusively propagandistic [137, 165]. But now, since the Convention on Chemical Disarmament has been signed [35] and is awaiting ratification in the RF Federal Assembly, any breakdown in implementation as a result of their failure to inform the untrained public is accompanied by typical groans of the MCC "about the fate of international agreements" [106].

III.5. Condition of Trust: Declassification of Old Documents

One of the signs that the MCC is not psychologically ready to restore the faith of the people is reluctance to begin the process of declassifying documents. At the same time, disclosure of information about preparations of the Soviet Union for chemical warfare is the only way to a correct statement of the problem of actual chemical disarmament as a nation-wide job.

Without disclosure of information about our chemical weapons, we can only try--by fits and starts--to destroy the weapons themselves and thus solve the problems of our former Cold War opponents under the scrutiny of a group of foreign verifiers (the services of these "monitors" will cost half a billion dollars [102, 106] to be paid out of the niggardly cash reserves of Russia) with no monitoring [kontrol] by the public of our own country. However, in this way we cannot ensure resolution of national problems, i.e. problems of overcoming the consequences of preparations for chemical warfare on foreign soil. This refers primarily to consequences associated with ecology and the state of health of people in our own country. And we, having destroyed the weapons themselves, will not have solved the problem of ensuring the country's ecological safety. We can point out at least three groups of reasons for immediately carrying out operations of declassifying information about chemical weapons of the Soviet Union.

First of all, Russia's withdrawal from the chemical weapons confrontation by signing the Convention on Chemical Disarmament (January 1993). This left no military-chemical secrets save for the shameful ones pertaining not to Russia, but to the USSR. Delivering them up could only add to the world community's trust in Russia and respect for her.

Secondly, the legislative prohibition against concealing ecological and medical information regardless of who are now "guardians of the secrets"--a group which is unfortunately large and varied. Some of these "guardians" have already been mentioned.

In the third place, passage of the Law on State Secrets in 1993, which permits maintaining secrecy for documents of 1964-1993 only if necessary (ecological information is excepted, as already mentioned), i.e. if they contain State secrets (in the given case, defense secrets), rather than an agency's technological (production) secrets.

Even today's imperfect body of law requires that the RF Ministry of Defense (and its numerous "mini-ministries"--RCB forces, VMF, VVS, GRAU, military-ecological administration of the General Staff and so on), Roskomkhimnefteprom, the RF Federal Administration of Medical-Biological and Emergency Problems affiliated with Minzdravmedprom Rossii (and the entire Minzdravmedprom in general), the Federal Counterintelligence Service, MVES, the Ministry of Agriculture and a number of other ministries and agencies immediately carry out the following steps:

- declassify all documents containing ecological and medical information (for any years),
- declassify documents containing military-chemical information (for any years),
- declassify documents containing chemical-technological information and issued up to 1963 inclusive.

In addition, this body of law provides for: declassification of documents about chemical weapons of 1964-1993 that do not contain trustworthy chemical-technological information.

The beginning of information disclosure may start preparation of a program of overcoming the ecological and medical consequences of past preparations for chemical warfare. Without declassification, this is impossible in principle, as is the timely destruction of stockpiles of chemical weapons, no matter how insistent our foreign partners may be. The people will not allow it.

And finally, without declassification we cannot bring about conditions for appreciably reducing the cost of the process of destroying chemical weapons. Only an atmosphere of trust will dramatically reduce expenses of accepting and paying for international monitors [kontrolery] [106, 138].

III.6. The Mirzayanov Case: Relapse of the Cold War

The state of the problem of secrecy is nicely illustrated by a regrettable incident that occurred with Russia's punitive system in an action brought by the MCC in 1992-1994. This is the so-called case

of V. S. Mirzayanov, who was falsely accused of divulging State secrets having to do with chemical weapons [52].

In October of 1992, many Russians were upset by the report of searches conducted by State Security at the apartments of two doctors of chemical sciences: V. S. Mirzayanov and L. A. Fedorov. The searches were followed by interrogation at State Security's Lefortovo investigation-detention prison. For V. S. Mirzayanov, the incident grew into an arrest (with subsequent release under a written promise not to leave) and months of investigation in connection with charges in accordance with article 75 of the Criminal Code of the RSFSR for "divulging State secrets entrusted in service." L. A. Fedorov, who was not privy to "State" chemical weapons secrets, was a witness in the case of V. S. Mirzayanov.

The problem got an even greater wave of attention in January-February 1994, when Moscow Municipal Court, upon representation of the office of the Procurator-General of the Russian Federation, attempted to hold a closed hearing in the case of V. S. Mirzayanov. The hearing ended with return of the case to the procurator's office at the request of the latter with the judgment (only after the entire cycle of judicial inquiry had been conducted) that there were insufficient grounds for confirming the charge. The case will die in the procurator's office.

The instigator of the judicial-inquiry insanity owing to the hypertrophied secrecy game, which was rather unexpected for many in the new Russia, was the MCC in the person of GSNIIOKhT director V. A. Petrunin (doctor of chemical sciences and holder of the Lenin Prize for developing binary chemical weapons). In early October 1992, he asked the security organs to conduct an investigation, his alleged motive being that State secrets had been divulged. His request was fulfilled.

The officially designated justification was the article "Poisoned Politics" that had been published in September of 1992, signed by Vil Mirzayanov and Lev Fedorov, in the weekly newspaper MOSKOVSKIYE NOVOSTI [29]. There subsequently proved to be another unmentioned but more serious justification: a second article in the BALTIMORE SUN [51] that talked about the program of development of the Soviet chemical weapon "Foliant" and newly developed TC's of the "Novichok" series, in which V. S. Mirzayanov and L. A. Fedorov had no part (a first article in the same newspaper had been published a month earlier with participation of the persecuted Mirzayanov and Fedorov, and had the same content as the MOSKOVSKIYE NOVOSTI article [29]). The real reason was the obvious wish of the MCC to stop the process of initiation of the public into "military-chemical secrets" about which it had no knowledge (save for information that was doled out and partly false, promulgated by MCC officials and by journalists on their payroll). By chance, this process began with articles by V. S. Mirzayanov [45] and L. A. Fedorov [27].

The article in MOSKOVSKIYE NOVOSTI [29] that had served as the pretext for the investigations made mention of three facts: development of a "new TC," development of binary chemical weapons, and finally, testing of new chemical weapons at the proving ground in Nukus. In principle, these facts might have served as a reason for investigatory actions if Russia at that time (September 1992) had not renounced chemical weapons entirely by initialing the Convention on Chemical Disarmament (the text of the Convention was still being reconciled in June 1992), and if these "facts" had had an element of novelty. However, a check revealed that the MCC and security agencies commissioned by them were pursuing a false purpose.

The report about a "new TC" had been published a year ago [45], and news about the Nukus proving grounds had been out for six months before the "case." As to "binary weapons," the text in MOSKOVSKIYE NOVOSTI [29] was not at all based on the fact of development of such weapons, but merely on the propagandistic moves of the MCC in the eighties as they set up a smoke screen around their operations in weapons development: the assurance of General A. D. Kuntsevich that the Soviet Union would not follow in the steps of the United States, who had created binary chemical weapons (1982) [132], and the publication of the U.S. program in the Soviet press (1985) [8]. In other words, the talk about binary weapons was no more than a verbal construct, an argument ex adverso, and only the MCC could corroborate or refute this natural assumption. By entangling V. S. Mirzayanov in investigation, the MCC confirmed the stated hypothesis, advancing it to the ranks of proven facts.

The case itself had no right to life, since the legal basis was lacking. First of all, the motive for investigation was not defense or diplomatic "State" secrets, but rather contrived "secrets" of an agency (in the given case Goskomkhimnefteprom, acting as the initiator), whereas the Criminal Code does not provide for investigation of an agency's secrets. Secondly, lists of agency secrets take on legal force only after publication (this is the norm in the constitution of the RFSFR that remained in effect until December 1993, and in the constitution of Russia, adopted on 12 December 1993). The judicial-inquiry actions were not professionally organized. State Security's inquiry, having no legal basis, facts, or any other motivation, acted only within the scope of the "social demand" of the MCC, and therefore in a blatantly accusatory manner. The court, having no constitutionally formulated right to take the case under advisement, nevertheless did so, likewise condemning itself to accusatory bias. Finally, the procurator's office, allegedly the guardian of the law, could see from the first day that the investigation was outside the law, even as the search warrant was signed. However, it allowed itself to see the obvious only at the end of the court hearings, revealing that it was not ready to oversee the legality of State Security's actions. Thus, none of the three juridical powers could achieve impartiality as a necessary condition for professional fitness. Justice had taken off her blindfold to check the balance of her scales.

Secrecy in the area of chemical weapons is a legacy of the Cold War. Attempts of the MCC at using the "Mirzayanov Case" to take away the public's right to know about the great body of information that was its property by law, are a direct indicator of unwillingness to come under the control of society and of efforts to maintain the status quo, to which the MCC has not the slightest right. Society did not grant the MCC the right to go on shaping the image of a foe, and to prolong support of the condition of a besieged fortress in Russia, in the part relating to chemical weapons.

And the greater the resistance of the MCC, the more justified does it seem to disclose military-chemical secrets in general, not to mention the noted ecological and medical information.

IV. PROBLEMS OF ELIMINATING CHEMICAL WEAPONS

The first real experience in elimination of chemical weapons stockpiles was gained immediately after World War I. This experience covered chemical stockpiles that had not been used during military operations.

Larger-scale work on taking these weapons out of circulation in the civilized world by disposing of them in seas and oceans was done by the Allied powers in the early years after World War II had ended [166]. In particular, the following captured German chemical weapons were destroyed by the Soviet Union [112a]:

```
yperite--7600 metric tons,
adamsite--1600 metric tons,
other arsenicals--2200 metric tons,
chloroacetophenone--600 metric tons,
other toxic chemicals--80 metric tons.
```

Captured tabun was deployed in armament of the Soviet Army and eliminated much later.

Chemical weapons were destroyed at that time by many methods [112a]:

- disposal at sea,
- burning at storage sites in special
- incinerators and open pits,
- explosion of chemical artillery
- shells and aircraft bombs on specially equipped firing ranges.

All these methods, as has already been mentioned, are ecologically hazardous and the consequences of such "destruction" may have a prolonged aftereffect. However, ecologically safe methods of destroying chemical weapons are essentially still in the stage of discussion [122, 122a].

IV.1. Pre-Convention Elimination of Chemical Weapons

Comparison of data on first-generation chemical weapons production volumes in the past and on today's stockpiles shows a considerable "shortfall" and indicates that an analysis must be made of the paths and paces of their removal from circulation. Changes in the volumes of TC stockpiles have occurred for several reasons.

On the one hand, toxic agents inevitably age. This applies especially to Levenstein yperite, the basis of the Soviet chemical arsenal. In the industry of the Soviet Union, as contrasted with the West, this yperite because of phantom savings was never distilled, and therefore could not be stored for more than 5-10 years even in stabilized form. Accordingly, estimates [11] show that over a five-year period the stockpiles of yperite as a combat TC had decreased by one quarter, which does not at all mean any loss of ecotoxic properties. In [167], an example is described of underwater disposal of yperite by reason of loss of its combat properties.

On the other hand, notions about the nature of use of chemical weapons in the theater of military operations have repeatedly changed during the twentieth century. This in turn has required continual reexamination of the volumes and nomenclature of stockpiles.

The army of the Soviet Union used several methods for taking TC out of circulation: underwater disposal, burial and burning [94]. Massive underwater disposal was carried out in at least 12 large seas that wash the coasts of the former Soviet Union [95, 163, 168]. Massive burials were carried out on at least 10 sites in the former Soviet Union [158]; these sites were not always close to chemical weapons storage bases. Burning of large amounts of TC was usually done within the confines or close to the storage bases themselves.

Officially, operations on destruction of chemical munitions date from the fifties [94] or earlier years [95]. However, this was not quite the case in reality. In particular, the burial of 3200 metric tons of adamsite at Shikhany TsVKhP mentioned in [96] was done in accordance with USSR Council of Ministers Directive No 82rs dated 14 January 1960 (incidentally, different amounts of this lot of adamsite are stated as being buried at TsVKhP: from 1000 metric tons [158] to 8000 metric tons [169]). The only confirmation that we have of a more realistic pattern of events is unofficial information--press reports and eyewitness accounts. In particular, it is reported that burials and underwater disposal of chemical weapons took place also in 1961-1968, 1972-1973, and 1979 [163]. Thus, we have to use criteria and estimates that do not yet have official confirmation.

There were at least three intense waves of elimination of the Soviet Union's chemical weapons. They were associated mainly with military-political needs, and to a lesser extent with technical needs.

The first, and apparently the most intense, occurred immediately after World War II in 1946-1948. During this period, the Soviet Army got rid of the stockpiles of chemical weapons that had accumulated by that time, which were now surplus, and besides mainly of low quality.

During these years, roughly 60,000-65,000 metric tons of yperite and 14,000 metric tons of lewisite were taken out of circulation. One of the sites of destruction was in southern Kazakhstan, where great quantities of yperite unpackaged in munitions were destroyed in the hamlet of Arys. Yperite was tanked in from various places, e.g. from the chemical site near Chapayevsk (NKO military base No 433) and from ChZKhU [98]. "The yperite was siphoned off from the top of the tank and dumped into a specially prepared pit half a meter in depth. Then lime was dumped in, the yperite blazed up like a torch, and mainly burned up without a trace... Also hauled in were 250-kg aircraft bombs charged with chemical agents... we worked in protective suits and gas masks. Out of a team of 12 men, we had six casualties" [98].

During these same years, top secret operations were going on with underwater disposal of huge amounts of Soviet chemical munitions [95, 163, 168]. The large-scale underwater disposal of captured German chemical munitions being carried out in accordance with the decision of the Allied powers [112a, 166] enabled the Soviets to get rid of their own weapons as well under the guise of captured munitions [95, 163, 158].

The second wave of destruction of chemical weapons dates to 1956-1962 [96]. Chemical rearmament began in these years with conversion from first-generation to second-generation chemical weapons, primarily to munitions charged with sarin. Corresponding changes in the strategy of waging chemical warfare required clearing of military-chemical warehouses. A total of about 10,000-12,000 metric tons of yperite, which was not packaged in munitions, was destroyed, including at the military-chemical bases in Kambarka [104] and Chapayevsk [99]. "...we dug a huge trench... next to the railroad. The yperite had been pumped into tank cars. Compressors were turned on so that the yperite would be forced under pressure through jets into the trench. We poured on DTS-GK powder. And the yperite... burst into flame. That's how the destruction was done. At the time, we were all working in protective suits. In this way a lot of this TC was destroyed in 1961" [99]. At that same time, chemicals weapons were being transported for disposal in northern seas and the Baltic: a large amount of lewisite ammunition from Chapayevsk [99], chemical munitions from a stockpile in the vicinity of Leningrad [170], and from the base at Leonidovka [163, 164]. Chemical munitions from the base at Gornyy settlement were dispatched for disposal in the Sea of Okhotsk [101] and in northern seas [164].

"It was 1961. I was working on the diesel powered ship `N. Ostrovskiy' of the Far Eastern Shipping Company. One time they took the ship off its route and sent it to Posyet... Every crew member was issued an individual gas mask. Then we put to sea, and in some section of the Sea of Japan we offloaded the cargo. That cargo was made up of ordinary bombs with a chemical charge... The offloading region was charted as `explosives dump.' Everything was done only at night. We worked for about a month, making three trips... An ecological explosion can soon be expected in the Sea of Japan" (from a letter not included in the report column [164]).

The third wave of destruction of chemical weapons dates from 1985-1987. During these years, the United States had already announced the disposition of its eight chemical weapons storage bases on the continent. On the threshold of the inevitable announcement of the existence of chemical weapons in the Soviet Union, the army carried out large-scale transfers of chemical weapons in 1987-1989 from the bases where they had been stored in recent years [30] to the seven bases that were to be shown to future foreign inspectors [93]. At the same time, the temptation could not but arise to "erase" the arsenals of Soviet chemical weapons to dimensions that would not shock the world community and would be comparable with U.S. stockpiles.

The Soviet Army then declared 40,000 metric tons of TC reserves (8000 first-generation, and 32,000 second-generation [14, 15], although previously "as much as 50,000 metric tons" had been acknowledged [24]). The U.S. Army had declared and documented 32,000 metric tons in its own stockpiles [21]. The third period pertains to open burning of yperite, and possibly of its mixtures with lewisite at military-chemical bases in Kambarka [129] and Gornyy [101]. This might have included the 438 metric tons of TC that had been reported destroyed as the sole example of elimination of chemical weapons in the Soviet Union "since 1970" [14]. Even stockpiles of poisons were being destroyed in those years. In particular, stockpiles of poisons (cyanides, arsenates) were buried at Semipalatinsk Proving Grounds in 1986 [171].

Although a "deficit" of extremely large amounts of TC and chemical munitions charged with them is apparent, no other official data except for [14] have been reported in the open press about the amount and the methods of taking the "deficit" TC out of circulation of the Soviet Army (RCB forces, air force, artillery, and navy).

Methods of eliminating chemical weapons can be classified on the basis of reports of participants and eyewitnesses:

- underwater disposal of munitions and containers filled with TC, not only in the Baltic, as usually declared, but also in the White, Barents and Kara Seas, the Seas of Okhotsk and Japan, and possibly in other seas; in all, apparently no less than 12 large seas, although there may have been hundreds of specific sites [95, 163, 168],
- burial of TC, including in the form of ammunition, at no less than ten points so far discovered in the former Soviet Union [98, 99],
- burning of TC in the vicinities of military-chemical storage bases (Kambarka, Gornyy, Chapayevsk and so on) [99, 101, 129].

Nothing can be said about sites and methods of destroying captured first-generation chemical weapons or tabun (except for underwater disposal of a small amount at two points in the Baltic Sea) until the army releases the appropriate data. Nor can anything be said about the numbers of sporadically destroyed emergency chemical weapons. They were usually destroyed at (or near) storage bases by explosion followed by burning [32]. These data are held by the army and in special departments of security organs; however, they have not been disclosed.

The army has also sunk chemical weapons in the country's inland bodies of water: rivers, lakes, and bogs [107]. It is important to note that disposal in the inaccessible swamps of Kirov, Tomsk and other oblasts has been done until most recently, and is possibly still going on. Especially hazardous in this connection are experimental specimens of third-generation chemical weapons about which the population knows absolutely nothing, and future generations might not even have documents.

IV.2. Experience in Organizing Destruction of Toxic

Chemicals in the United States and the USSR The overall concept relating to organization of the elimination of chemical weapons in Russia cannot but consider the experience of nations who took the path of civilized chemical disarmament before the Soviet Union.

In particular, the U.S. Army, in presenting a program for destruction of chemical weapons for congressional consideration in 1986, had analyzed several possible approaches to its organization [145]:

- doing nothing,
- construction of a single central facility,
- construction of two facilities, construction of
- enterprises for destruction of chemical weapons at each storage facility (a total of eight on U.S. territory).

As a result of discussion, the United States worked out an approach for destroying chemical weapons that was based on the last idea as ecologically least dangerous. This approach was approved in 1988.

However, practical organization of U.S. chemical disarmament did presume some obligatory preliminary steps [145]:

- preparation of the appropriate ecological legislation prior to starting destruction of chemical weapons,
- continually keeping lines of communication open with the public, during both the preparatory stage and the chemical weapons destruction process itself,
- destroying chemical weapons directly on the eight continental bases where they are now stored,
- not transporting chemical weapons around the country.

In the Soviet Union, practical operations on organizing destruction of chemical weapons started with the "Chapayevsk experiment" of 1988-1989. Munitions with OTC were supposed to be brought in from various storage bases to the destruction facility with capacity of 350 metric tons of OTC per year just built near the city of Chapayevsk [24]. Protests by the population put an end to realization of this idea [17-19]. After the fiasco at Chapayevsk, while it was still possible to take the path of civilized destruction of chemical weapons, public ecological organizations proposed an approach in 1990 that was analogous to the U.S. approach [145] (and different from the approach of official authorities of the Soviet Union [15]):

- no gigantic chemical weapons destruction plants,
- no transportation of chemical weapons around the country, destruction of TC's at storage sites,
- no planning without independent expert examination,
- all stages of work on plans and
- construction of facilities under public monitoring.

The authorities paid no heed to these proposals, apparently because they did not come from the inner sanctum of the MCC, despite the fact that they set no new ecological tasks beyond ecological tracking of elimination of chemical weapons proper. It is important to stress that neither in 1989-1990 nor now has anyone considered overcoming the ecological consequences of preparations for chemical warfare as a problem equally as important as destruction of the chemical weapons themselves, and requiring a simultaneous and independent solution [106]. Until recently, many official Russian spokesmen have seen this approach as more like a "dangerous trend" that has to be overcome [136].

As a result, organizers of the process of chemical disarmament have made quite a lot of new mistakes. From the standpoint of organizing a dialog with the people and selecting a rational plan of operations, the period of 1987-1993 in essence was a failure.

IV.3. Lack of a State Program for Destruction of Chemical Weapons in Russia

A decision to develop a State Program for Destruction of Chemical Weapons was made in the former USSR in 1989. The draft of the program was sent in 1990 to the Supreme Soviet of the USSR and was discussed in several committees; however, it was never adopted. The program provided for five options of eliminating TC, differing from each other both in number and locations for construction of elimination facilities, in capital investments and times for starting and finishing work [15, 173]. In the new Russia, the first option of the chemical weapons destruction program was submitted for consideration by the RF Supreme Soviet in the autumn of 1992 [012]. It is still not clear why the program was transmitted to committees of the RF Supreme Soviet by the Committee on Conventional Problems of Chemical and Biological Weapons prior to preliminary discussion and approval by the Government. If the program had gone through Government machinery, it would inevitably have been subjected to a procedure of coordination with regional administrations (which had not been done in the draft submitted to the RF Armed Forces). The draft was based on two ideas:

- detoxication of PTC at storage sites in Kambarka and Gornyy settlement,
- destruction of OTC in early years only in Novocheboksarsk at Khimprom ChPO using old production personnel and newly constructed incinerators.

Munitions (3.5 million shells [123]) with OTC totaling 9800 metric tons was to be brought into Chuvashia from two GRAU bases: from Shchuchye (Kurgan Oblast) far removed from the destruction site, and from the closer settlement of Kizner (Udmurtia) [88]. According to the statement of General S. V. Petrov, in making the decision, consideration was given to siting the OTC destruction facility in a region "with low population density" [14, 15]; however, in this respect the decision was the poorest of all possible options: Chuvashia is the region of Russian with the greatest population density. The plan was promptly adopted at a joint session, with restricted participation, of two Committees of the RF Supreme Soviet: the Committee for Industry and Transportation, and the Committee on Problems of Ecology and Rational Use of Natural Resources [88]; however, upon condition of regional agreement. It was flatly turned down just a little later during rehearings of the same Committees of the RF Supreme Soviet when regional representatives took part in the session [174-177].

Subsequently, one of the authors of the draft even tried to interpret the outcome of the discussion as "acceptance" [178], taking advantage of the fact that by that time the RF Supreme Soviet had ceased to exist, and its ecological archives had been burned [36].

A basic flaw of the draft was that it was aimed solely at chemical weapons destruction itself (with the motive of meeting international obligations). It contained not the slightest hint of a solution for nation-wide problems associated with overcoming the consequences of preparations for chemical warfare. Among other shortcomings of the draft of the program, we mention the following:

- lack of ecological expert examination (repeatedly declared [14]),
- no mention of steps to restore lands ravaged in preparations for chemical warfare,
- strategic aim of the program at maintaining an offensive chemical capability in the course of

disarmament (thrust at destroying primarily chemical artillery ammunition and retaining missiles and aircraft munitions) [83],
- rejection of the idea of destroying TC only at present storage sites, and
- proposal of destroying chemical weapons both at storage sites (Kambarka and Gornyy) and at other points far removed from storage sites (Novocheboksarsk) with the obvious need for transporting chemical weapons by railroad to sites of future destruction (from Shchuchye, this would be across eight-nine regions of the nation).

Yet another version of the program began to go around in official circles in the summer of 1993 [96]. Although this version considered only the destruction of PTC and so far contained no data about destruction of OTC, it suffered from the same flaws as the first:

- no provision was made for the sole unarguably rational concept of destroying chemical weapons: only at the sites where they are now stockpiled,
- no provision was made for eliminating railroad transportation of chemical weapons,
- no provision was made for rehabilitating territories ravaged by past destruction of chemical weapons (belonging to the army), as well as by production, testing, storage and destruction of chemical weapons.

So this proposal could expect no better fate, and that began to be understood by its creators themselves. At any rate, in late autumn of 1993 "the option of eliminating stockpiles of chemical weapons at their storage sites" became for the army the "most probable" [41], although no practical actions in this direction had yet been taken [105].

In discussing problems of destroying chemical weapons at a session of the Interagency Commission of the RF Security Council for Ecological Safety on 14 December 1993 [158], it was learned, among other things, that interested agencies had never even developed a general concept, a unified system of principles of chemical weapons destruction. In this connection, the Committee on Conventional Problems was commissioned to work out a Concept on Destruction of Chemical Weapons in the Russian Federation, and to confirm it before February 1994.

Subsequent examination of this problem at a session of the Interagency Scientific-Technical Council on Conventional Problems of Chemical and Biological Weapons on 8 February 1994 did not result in any essential shifts. On the one hand, the army was ready to destroy all chemical weapons at current storage bases. On the other hand, the management of Roskomkhimnefteprom had not budged from the idea of taking upon themselves the destruction of OTC and the associated target governmental appropriations. And this, as before, only boils down to the idea of "siting the facility at the Cheboksary Khimprom Production Association" [114].

The unresolved contradiction was reflected in the proposal of two versions of the concept of chemical weapons destruction. The document offered by the Committee on Conventional Problems of Chemical and Biological Weapons [114a], like previous programs, fails to address the key point of just where chemical weapons are to be destroyed: only at storage sites, or both at production sites and at storage sites. In the document presented to the government by the Defense Ministry [114b], the question of sites of destruction was given a firmer interpretation: at the places where they are now stockpiled. This document now mentions operations on "cleaning up sites of past TC destruction" and tasks of a future National Agency for Monitoring Destruction and Nonproliferation of Chemical Weapons that in the army's opinion must be attached to the RF Government (to replace A. D. Kuntsevich's Committee).

The unfolding of events shows that Russia has not yet worked out a system of goals to be pursued in withdrawing from the years of the chemical weapons confrontation, or means of attaining such goals. In essence, the MCC is not psychologically ready to work on destruction of chemical weapons, although the Defense Ministry is somewhat closer to an understanding of national problems. So far, there are no legislative acts that would regulate the process of chemical weapons destruction, not to mention the many-sided process of getting out of the chemical weapons confrontation. Accordingly, the process of chemical weapons destruction itself can hardly be carried out by the deadline set by the Convention on Chemical Disarmament [35]. IV.4. Choosing Technologies for Destroying Chemical Weapons In the United States, the optimum approach to eliminating chemical weapons is taken to be a single-stage method: direct destruction. The method

adopted for destruction is high-temperature incineration (both with consideration of lower financial expenditures, and because of a lesser amount of wastes) [116]. The United States also has experience gained in the seventies with two-step elimination that amounts to detoxication followed by incineration of the products. This experiment was acknowledged as a failure. In this case, six times as much hard-to-recycle organic waste was generated per unit weight of TC. Moreover, there were problems not only with completion of detoxication, but also with analytical confirmation that the toxic agents had indeed been destroyed [122, 145].

In Russia, two-stage technology has been adopted for destroying all TC stockpiles: irreversible conversion of highly toxic TC's with subsequent destruction of the resultant reaction masses [96, 102, 123]. However, there is a difference in details of destruction of PTC and OTC.

In 1980-1987, the Soviet Army tested a mobile facility for destroying emergency chemical munitions. This facility used the method of detoxication (for sarin and soman by using monoethanolamine, and for V-gas by using a mixture of ethylene glycol and orthophosphoric acid) with subsequent incineration of the resultant reaction masses [25, 116]. On the facility at Chapayevsk (not put into operation in 1989 because of residents' protests), almost the same technology was going to be used (alcoholysis was supposed to be used for detoxication of V-gas and its viscous formulas). However, the hardware had not been finalized for the second stage to be used on this project, both because of large energy expenditures, and in consequence of the considerable volume of emissions of combustion products into the atmosphere [116].

The most troublesome issue is technologies of lewisite destruction. The former Soviet Union had a monopoly on stockpiles of this arsenic-containing PTC, and there is not a single state, anywhere in the world, that has serious experience with its large-scale destruction. For example, at a facility constructed at chemical proving grounds in Munster (Germany), only 75 metric tons of Lewisite were destroyed in 1982-1992. In virtue of considerable ecological danger, the method of destroying lewisite accompanied by inevitable release of arsenic is a topic of especially heated arguments (the maximum permissible concentration of compounds of this kind as referenced to arsenic are: atmospheric air of centers of population--0.003 mg/m3, water sources--0.05 mg/liter, soil--2 mg/kg).

Originally, back in top-secret days, lewisite was fused with sulfur, and the reaction masses were then buried (as much as nine tons of waste are produced per ton of lewisite) [21, 116]. Later [9, 102, 116], at least six technologies were considered for treating lewisite, four of which were selected as promising for the final solution [123].

The best so far is said to be a method of alkaline hydrolysis of lewisite developed at GSNIIOKhT [123], which amounts to "preneutralization of lewisite by alkali with subsequent electrolysis of the resultant reaction masses." In a propagandistic presentation, the advantages of the method are seen to great effect; it is purported to have "almost no impact on ecology" ("no gaseous emissions, no incinerators, and nothing burns") [123]. In reality, things are not so simple. On the stage of hydrolysis in this technology, acetylene is formed that is blown out by inert gas, and the process of electrolysis produces several gases simultaneously: hydrogen and arsine (highly toxic and readily flammable arsenic hydride) in the cathode space, and chlorine and oxygen in the anode space [116].

The method of high-temperature oxidation of lewisite was developed by the Scientific Research Institute of Chemistry of Nizhniy Novgorod University [123]. Lewisite is completely oxidized in the flame of a gas burner with excess air. Disadvantages are the complexity of trapping the resultant highly dispersed arsenic oxide aerosol, organizational problems on the stage of filtering the lewisite, the necessity of using complicated composite materials that are resistant to chlorine under high-temperature conditions, and so on [116].

The method of hydrogen reduction of lewisite to metallic arsenic, in the opinion of the developer--the Obninsk (Kaluga Oblast) branch of the V. Ya. Karpov Physicochemical Institute--ensures reliable destruction. Reactor gases contain arsenic in the vapor state, gaseous arsenic hydride, arsenic trichloride, unreacted hydrogen, and so on. The method is inferior to others in its level of safety [116].

GITOS (Volsk) proposes detoxication with conversion of lewisite to trialkyl arsenates and

especially pure arsenic by the method of alcoholysis. As a result of reaction with tinctures of sodium alcoholate, lewisite is converted to an aggregate of several substances (acetylene, sodium chloride and trialkyl arsenate) that are in three different phases. Still residues after removal of toxic trialkyl arsenate (first class of danger), containing as much as 30 percent of all the arsenic, are treated. The authors consider an advantage of the method to be reliable destruction of lewisite and comprehensive recycling of the reaction mass; a disadvantage is the fire hazard of acetylene and flammability of the reaction mass [116].

One other possible method of processing was also developed by GSNIIOKhT, and amounts to chlorination of lewisite (see section II.2) [123]. "Significant disadvantages" of the method are the insufficiently complete conversion of lewisite, the difficulty of separating the mixture of chlorine-containing hydrocarbons into individual substances--which, moreover, are themselves poisonous besides--the impossibility of detoxifying packaging in which lewisite has been stored, the generation of considerable quantities of viscous still residues that contain traces of lewisite, and so on [116]. Possible formation of dioxins is not mentioned [116].

IV.5. Estimate of Costs of Destroying Chemical Weapons

Destruction of TC is undoubtedly a costly process [135]. This can be seen if only from estimates of U.S. expenditures on carrying out their own chemical weapons destruction process: from 3 [73] to 9 [9] billion dollars. Possible expenditures by Russia, according to U.S. estimates, are determined at 20 billion dollars [179].

However, views on the problem of funding chemical disarmament have evolved somewhat. At first, residents of the Soviet Union were totally uninformed about possible expenditures. In the age of "chemical openness," two premises showed up as the basis for discussion of the problem of destruction of chemical weapons: imaginary "returns" from chemical disarmament [129, 135] ("Russia might get rich from destroying chemical weapons"), "participation" of the United States in covering Russian expenditures ("the United States will pay for destruction of chemical weapons in Russia" [180]).

On the early stages, attempts to benefit under the pretext of "enrichment of Russia" from lewisite had a personified tone, where it was assumed that the State would allocate funds for future gains. In 1991-1992, many persons in judicial posts were trying to flex their muscles as businessmen. During the time of existence of the Kristall Scientific Production Association as a joint-stock company, Academician-General A. D. Kuntsevich decided to take part in its operation (as chief of the Center of Ecotoximetry affiliated with N. N. Semenov Institute of Chemical Physics, USSR Academy of Sciences), along with General I. B. Yevstafyev (from the Military Scientific Research Institute, Military Unit No 64518), division chief of Minprirody V. Ya. Vasin and GSNIIOKhT Director V. A. Petrunin. Testing their powers within the framework of the Arsin limited joint-stock company were chief of the 33rd TsNIII V. I. Danilkin and GITOS Director A. I. Kochergin. Nor was the temptation to participate passed up by chief-generals of chemical forces (formerly V. K. Pikalov and currently S. V. Petrov). They acted in the name of the Association in business cooperation with Western nations in the field of utilization and protection from the effect of hazardous substances and materials. No noticeable traces of this commercial activity remain.

This activity is based on the seriously discussed economic profit to be expected from converting lewisite to especially pure arsenic, since 2000 tons of arsenic can be obtained from 6000 tons of lewisite [14, 15, 129, 135,173, 179]. In the future, gallium arsenide was supposed to be obtained, as well as epitaxial gallium structures, controlled solar power modules, UHF equipment components, and so on [129]. There were even calculations that accounted for the future profit from sale of arsenic at world prices: the price of one kg of ultrapure arsenic was determined at from 3000 [88] to 5000 dollars [100]. However, these plans may be left hanging in mid air when it is suddenly learned that no one is waiting for this arsenic on the world market. Then it is seen that the anticipated large-scale amounts of highly pure arsenic will considerably exceed the internal needs of Russia, which come to from 15-20 [88] to 30 metric tons per year [129].

Touted among other advantages of lewisite treatment products are fractions which, when added to rubber, will increase the guaranteed life of tires from 50,000 to 120,000 km [100]. It has been suggested that after detoxication, yperite could be processed into reaction masses to be used, for

example, for acceleration vulcanization of rubber [123].

Particularly diverse prospects are planned for OTC. Academician-General A. D. Kuntsevich, for example, proposes converting them to safe antiseptic liquids and resins suitable for treating ties and industrial lumber, improving the quality of building materials, ensuring rapid extraction of oil from wells and so on [41, 123, 135]. For the sake of justice, it has to be said that General S. V. Petrov does not believe in such rosy prospects of using OTC [14].

So far, there have been no serious assessments of comparative expenditures associated with storage and destruction of chemical weapons, and there are essential differences between estimates given by diplomats and by generals.

Ambassador Extraordinary and Plenipotentiary, Representative of Russia at the international Conference on Disarmament S. B. Batsanov, who has taken an active part in preparing the Convention on Chemical Disarmament on the last stages, feels that it is less expensive to destroy chemical weapons than to store them [14], e.g. with the expectation that safe technologies will be developed. Conversely, General of Chemical Forces I. B. Yevstafyev feels that the storage of chemical weapons itself is not so costly [113], and this assumption seems more reasonable.

Estimates are given in [173] of expenditures on destruction of chemical weapons as applied to two options: destruction of all toxic agents at their storage sites, or destruction of OTC at their past production sites. In the author's opinion, the option of TC destruction only at sites of present storage when the population within a radius of 100 km is more than 10 million is unacceptable. In this case, assurance of safety of destruction of chemical weapons requires capital investments of 1.1 billion rubles (in 1990 prices), alienation of 24,000 hectares of land, and hiring of 6000-7000 service personnel. The author leans toward the option of destroying OTC at the site of past production (Novocheboksarsk), because in this case capital investments would supposedly be reduced to 540 million rubles, reconstruction of railroads requiring only 100 million rubles. These estimates are not to be trusted, as they come from untrustworthy and unrealistic notions about expenditures for safeguarding ecological safety and the social infrastructure during chemical weapons destruction. The same applies to estimates of expenditures on rebuilding railroad tracks. In the case of Novocheboksarsk, for example, it is not rebuilding that is needed, but rather construction of an entirely new railroad (and incidentally, it needed to be constructed even before 1972, before hauling V-gas munitions), and that is another order of expenditures altogether.

IV.6. Assurance of Ecological Safety in Destruction of Chemical Weapons

Ecologizing of the approach to solving problems of chemical disarmament has not so far become the norm, despite a lot of talk. Apparently, the time has ended for discussion of such exotic ("unconventional"), and indeed criminal, methods of destroying TC as using the energy of a nuclear explosion (a method of scientific organization operating in the famous city of Arzamas-16, and a commercial structure with "limited" responsibility--ChETEK), and pumping the products of detoxication of TC into deep geological formations [173]. In fact, there are a lot of really serious problems relating to the area of ecology of chemical disarmament.

The problem of chemical disarmament of Russia is not now correctly formulated. In existing concepts of chemical disarmament [96, 102, 114a], the task of overcoming the ecological consequences of past preparations for chemical warfare is left out altogether. At the same time, for a country undertaking disarmament, this should be a priority job, even if not now so acutely perceived by the international community, which is thinking primarily in military terms, rather than about the ecological safety of the world.

Until now, there has apparently been no overwhelming majority of normatives without which it is impossible to monitor TC in objects of the environment (water, air, soil) during chemical disarmament, and those that do exist have so far been classified [115].

The technological details of TC production facilities have not been published, and these are needed for assessments of their ecological danger, including retrospective estimates. In particular, we do

not know the process procedures (as relating to toxic emissions), or volumes of past TC production. Without this information, we cannot estimate the extent of emissions of harmful agents into the environment surrounding sites of past TC production, or assess their impact on nature [115].

So far, it is not clear how to get rid of residues of TC and toxic products of their transformation in the environment. The army does not know, because it did not deal with questions of decontamination of civilian facilities that were not involved in military operations, and army requirements for results of decontamination are many orders of magnitude less stringent. Nor has civilian "applied science" worked out these methods and standards, because in the early eighties it was only planning to organize such research at the Novocheboksarsk branch of GSNIIOKhT. These plans died along with elimination of the branch itself [115].

There has been practically no organization of special ecological monitoring around today's chemical weapons storage bases, even though chemical weapons will have to stay there for a long time yet. Until now, for some reason, this task has not been transferred from the army to the jurisdiction of civilian ecological services [105].

The Convention on Chemical Disarmament, which does not lack for oaths of fidelity, has so far not only been unfulfilled by Russia, but has actually been violated. Open destruction of chemical weapons, which has been continuing at TsVKhP in Shikhany in defiance of the Convention (both in the winter of 1992-1993 [83], and in the summer of 1993 [97], is not the only example of this.

V. WHAT IS TO BE DONE

The incentive for taking action in the area of chemical weapons was work associated with preparations for signing the Convention on Chemical Disarmament. Nevertheless, it is necessary to formulate and solve not one, but two nation-wide problems of ecological safety in ending the chemical weapons confrontation: analysis of the military-chemical past, and development of work on overcoming ecological and other consequences of preparations for chemical warfare, ecologically safe elimination of chemical weapons.

Being of nation-wide importance, these two problems must be formulated simultaneously, although in principle they may be solved at different paces, and possibly by different programs. In accordance with the Convention on Chemical Disarmament, Russia must form a National Agency in the near future that will act as a coordination center. Advantage should be taken of this opportunity to place before the National Agency not one, but both of the aforementioned problems. There must be no repetition of the errors of A. D. Kuntsevich's Committee which, in its eagerness to meet international obligations, ignored the solution of national problems. And finally, the National Agency should be organizationally incorporated into the system of governmental institutions, rather than being part of the presidential machinery.

The specific activity of the public in eliminating the consequences of the chemical weapons confrontation should get the requisite legal basis: a special chemical weapons law should be passed that would define the rights and obligations of legal entities and individuals in Russia on all stages of overcoming the consequences of preparations for chemical warfare, laws should be passed regarding ecological safety, as well as amendments that more precisely define already existing laws (e.g. on the environment), without which it is completely impossible to overcome the status of the chemical weapons confrontation, to prevent the MCC from dragging the nation into new ventures with chemical weapons, including unconventional weapons in the future, the development of chemical weapons will have to be ranked with criminally punishable acts, just like all other violations of the Convention on Chemical Disarmament, concealment of information regarding past military-chemical activity should be outlawed, and officials should be subject to criminal prosecution for such an act.

Work on overcoming the "chemical heritage" should include the public and governmental sectors on several levels:

- on the level of the community, including the ecological community, which by its natural concern brings about prerequisites to formulation of practical tasks,

- on the level of local authorities who organize operations within the scope of available forces and means, and who formulate orders for decision making on the federal level,
- on the nation-wide level, where the problem arises of general governmental programming of operations on eliminating the "chemical heritage,"
- on the level of experts and specialists who provide the necessary substantiation for practical activity on all levels.

There is a lot of work to be done on practical support of expeditious and ecologically safe withdrawal from the chemical weapons confrontation:

- organizing a retrospective look at the military-chemical past, without which it is impossible to take adequate and comprehensive steps to overcome it,
- organizing monitoring at present chemical weapons storage sites and at every single site where operations with such weapons were and are conducted,
- "chemically" oriented examination of the state of health of the residents of the corresponding territories, and provision for privileges and compensation to victimes, where such have not been stipulated by existing legislation, developing standards of relative safety that regulate the maximum levels of TC content and toxic products of their dissociation, and other normatives for the environment, equipment and living organisms,
- developing ecologically safe technologies for eliminating chemical weapons,
- developing methods of revitalizing territories ravaged in the past by chemical weapons operations.

And finally, it should be stressed that it would be dangerous for any of this work to have the slightest commercial taint. Despite a lack of means for eliminating the consequences of the chemical weapons confrontation, no efforts should be taken to profit from destroying chemical weapons. Such money might, as has so often happened, distort the purpose, which will inevitably be detrimental to the ecological safety of Russia.

REFERENCES

1. Soborovskiy, L. Z., Epshteyn, G. Yu., "Khimiya i tekhnologiya boyevykh khimicheskikh veshchestv" [Chemistry and Technology of Chemical Warfare Agents], Moscow, Gosudarstvennoye izdatelstvo oboronnoy promyshlennosti, 1938, 587 pp.
2. Plets, V. M., "Organicheskiye soyedineniya fosfora" [Organic Compounds of Phosphorus], edited by A. Ye. Arbuzov, Moscow, Gosudarstvennoye izdatelstvo oboronnoy promyshlennosti, 1940, 404 pp.
3. Los, K., "Artificial Poisons," Moscow, Izdatelstvo inostrannoy literatury, 1963, 259 pp.
4. Franke, S., "Chemistry of Toxic Agennts," Vol 1, Moscow, Khimiya, 1973, 438 pp; Franke, S., Franz, P., Warnke, W., "Chemistry of Toxic Agents," Vol 2, Moscow, Khimiya, 1973, 407 pp.
5. Myasnikov, V. V., ed., "Zashchita ot oruzhiya massovogo porazheniya" [Protection from Weapons of Mass Destruction], Moscow, Voyennoye izdatelstvo, 1989, 399 pp.
6. Aleksandrov, V. N., Yemelyanov, V. I., "Otravlyayushchiye veshchestva" [Toxic Chemicals], Moscow, Voyennoye izdatelstvo, 1990, 272 pp.
7. Hersch, S., "Chemical and Biological Weapons. America's Secret Arsenal," Moscow, Voyennoye izdatelstvo, 1970, 208 pp.
8. "Kholodnaya smert. Khimicheskoye oruzhiye i sredstva massovogo unichtozheniya" [Cold Death. Chemical Weapons and Means of Mass Destruction], Progress, 1985, 247 pp.
9. KRASNAYA ZVEZDA, 14 January 1993.
10. Hirsch, W., "Soviet BW and CW Preparations and Capabilities (Plans, Training and Intelligence Division)," U.S. Army Chemical Warfare Service, 1951.
11. Krause, J., Mallory, C. K., "Chemical Weapons in Soviet Military Doctrine. Military and Historical Experience,

1915-1991," Boulder, Westview Press, 1992, 247 pp.
12. Pikalov, V. K., ed., "Khimicheskiye voyska Sovetskoy Armii" [Chemical Forces of the Soviet Army], Moscow, Voyennoye izdatelstvo, 1987, 76 pp.
13. IZVESTIYA, 3 October 1987.
14. PRAVDA, 2 August, 1990.
15. IZVESTIYA, 6 August, 1990.
16. IZVESTIYA, 30 August, 1991.
17. VOLZHSKIY KOMSOMOLETS (Samara), 23 July 1989.
18. CHAPAYEVSKIY RABOCHIY, 1 April 1989.
19. CHAPAYEVSKIY RABOCHIY, 17 August 1989.
20. "Khimicheskaya entsiklopediya" [Chemical Encyclopedia], Vol 2, Moscow, Izdatelstvo "Sovetskaya entsiklopedia," 1990, pp 271 and 1215.
21. ROSSIYSKAYA GAZETA, 8 April 1992.
22. TRUD, 15 April 1992.
23. PRAVDA, 18 September 1987.
24. PRAVDA, 15 February 1989.
25. KRASNAYA ZVEZDA, 4 October 1987.
26. PRAVDA, 4 October 1987.
27. SOVERSHENNO SEKRETNO, (Moscow), No 7, 1992, pp 6-8.
28. MOSKOVSKIYE NOVOSTI, No 26, 28 Jun 1992.
29. MOSKOVSKIYE NOVOSTI, No 38, 20 October, 1992.
30. "Soviet Chemical Weapons Threat," Washington, Department of Defense of USA, 1985, 21 pp.
31. MOSKOVSKIYE NOVOSTI, No 44, 1 November 1992.
32. NOVOYE VREMYA (Moscow), No 44, 1992, pp 4-9.
33. ROSSIYSKIYE VESTI, 21 January 1993.
34. TRUD, 20 January 1993.
35. "Conference on Disarmament Document CD/1170 26 August 1992," in: "Draft of Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction," 227 pp.
36. ROSSIYA, No 50, 8 December 1993.
37. Ipatyev, V. N., "Zhizn odnogo khimika. Vospominaniya" [Life of a Chemist. Recollections], Vol II: 1917-1930, New York, 1945.
38. "Sixteenth Congress of the All-Union Communist Party (Bolsheviks). Stenographic Report," Moscow, Partizdat TsK VKP(b), 1935, Vol 2, p 921.
39. IZVESTIYA, 2 October 1992.
40. KRASNAYA ZVEZDA, 16 June 1993.
41. KRASNAYA ZVEZDA, 22 October 1993.
42. STOLITSA (Moscow), No 23, 1993, p 9.
43. KHIMIYA I ZHIZN (Moscow), No 7, 1993, pp 67-70.
44. TSEMENT (Volsk), 17 December, 1993.
45. KURANTY (Moscow), 10 October 1991.
46. KURANTY (Moscow), 23 January 1993.
47. SEGODNYA (Moscow), 13 January 1994.
48. NOVOYE VREMYA (Moscow), No 6, 1993, pp 40-41.
49. MOSKOVSKIYE NOVOSTI, No 5, 31 January 1993.
50. NOVOYE VREMYA (Moscow), No 50, 1992, pp 46-49.
51. BALTIMORE SUN, 18 October 1992.
52. "Materials of Inquiry Against V. S. Mirzayanov," 1993.
53. MOSKOVSKIYE NOVOSTI, No 50, 8 December 1993.
54. MOSKOVSKIYE NOVOSTI, No 44, 31 October 1993.
55. EKSPRESS-KHRONIKA, No 3, 1993.
56. MOSKOVSKIYE NOVOSTI, No 48, 29 November 1992.
57. IZVESTIYA, 16 May 1992.
58. STOLITSA (Moscow), No 36, 1993, p 12.
59. NOVOYE RUSSKOYE SLOVO, 19 February 1993.
60. SEGODNYA (Moscow), 30 December 1993.
61. STOLITSA (Moscow), No 23, 1992, p 30
62. STOLITSA (Moscow), No 50, 1992, p 10.
63. TRUD, 29 January 1993.
64. BALTIMORE SUN, 19 March 1993.
65. STOLITSA (Moscow), No 8, 1993.
66. NABAT (Saratov), No 4, 1993.
67. TSEMENT (Volsk), 6 August 1993.
68. "Stranitsy geroicheskogo truda khimkov v gody Velikoy Otechestvennoy voyny 1941-1945" [Pages of Heroic Labor of

Chemists During the Second World War, 1941-1945], Moscow, Nauka, 1989, 288 pp.
69. SEGODNYA (Moscow), 10 August 1993.
70. ROSSIYA, No 9, 24 February 1993.
71. VEK (Moscow), No 9, 1993.
72. PRAVDA, No 4, 9 January 1993.
73. TSEMENT (Volsk), 21 December 1993.
74. NEZAVISIMAYA GAZETA (Moscow), 27 January 1993.
75. CHAPAYEVSKIY RABOCHIY, No 9, 16 January 1993.
76. SANKTPETERBURGSKIYE VEDOMOSTI, 15 October 1992.
77. KOLLEKTIVNYY ORGANIZATOR (Chapayevsk), 3 February 1993.
78. SEGODNYA (Moscow), 11 February 1994.
79. BEREGNIYA (Nizhniy Novogorod), No 3, 1993.
80. VECHERNIY VOLOGOGRAD, 1 and 3 June 1993.
81. Feshbach, M., Friendly, A., "Ecocide in the USSR. Health and Nature Under Siege," Golos, Moscow, 1992, 309 pp.
82. DZERZHENETS, 14 August 1992.
83. NEZAVISIMAYA GAZETA (Moscow), 19 January 1993.
84. SOVETSKAYA CHUVASHIYA, 22 January 1992.
85. CHEBOKSARSKIYE NOVOSTI, 19 November 1992.
86. GRANI (Novocheboksarsk), 29 December 1992.
87. THE MOSCOW TIMES, 4 May 1993.
88. IZVESTIYA, No 241, 3 November 1992.
89. GRANI (Novocheboksarsk), 27 October 1992.
90. SOVETSKAYA CHUVASHIYA, 23 February 1993.
91. MK (Cheboksary), 25 February 1993.
92. CHEBOKSARSKIYE NOVOSTI, 20 November 1992.
93. IZVESTIYA, 9 May 1992.
94. PRAVDA, 9 February 1993.
95. VEK (Moscow), No 27, 1993.
96. Draft. Program of Priority Measures for Russia to Meet International Obligations in the Area of Destroying Chemical Weapons (Phase 1), Moscow, 1993, 104 pp.
97. SEGODNYA (Moscow), 16 October 1993.
98. CHAPAYEVSKIY RABOCHIY, 14 May 1993.
99. CHAPAYEVSKIY RABOCHIY, 17 October 1992.
100. ROSSIYSKAYA GAZETA, 27 February 1992.
101. SARATOV, 10 March 1993.
102. Draft. Comprehensive Program of Staged Destruction of Chemical Weapons in the Russian Federation. Phase 1. Priority Measures on Preparing to Meet International Obligations in the Area of Destroying Chemical Weapons Stockpiles, Moscow, 1992, 49 pp.
103. IZVESTIYA, 29 August, 1990.
104. MOSKOVSKIYE NOVOSTI No 12, 21 March 1993.
105. SPASENIYE (Moscow), No 5, February 1994.
106. SEGODNYA (Moscow), 10 February 1994.
107. Private report of eyewitness.
108. NEZAVISIMAYA GAZETA (Moscow), 22 August 1992.
109. Sobchak, A., "Tbilisskiy izlom, ili krovavoye voskresenye 1989 goda" [The Tbilisi Rebellion, or Bloody Sunday, 1989], Moscow, "Stroyeniye," 230 pp.
110. IZVESTIYA, 27 August 1991.
111. WIRELESS BULLETIN, 23 March 1982.
112. NEW YORK TIMES, 12 August 1985.
112a. "Comprehensive Analysis of the Danger of Captured German Chemical Weapons Disposed of in the Baltic Sea During the Post-War Period," Research Report, Moscow, Military Unit No 64518, 1992, 183 pp.
113. NEZAVISIMAYA GAZETA (Moscow), 23 March 1991.
114. Minutes of Session of Interagency Scientific-Technical Council attached to the RF President's Committee on Conventional Problems of Chemical and Biological Weapons, 8 February 1994.
114a. Draft. Concept of Destruction of Chemical Weapons in the Russian Federation, Moscow, 1994, 21 pp.
114b. Concept of Destruction of Chemical Weapons in the Russian Federation, Moscow, 20 pp.
115. GRANI (Novocheboksarsk), 9 September 1993.
116. ROSSIYSKIY KHIMICHESKIY ZHURNAL, Vol 37, No 3, 1993.
117. Trapp, R., "The Detoxication and Natural Degradation of Chemical Warfare Agents," London, Taylor and Francis, 1985, 104 pp.

118. "Past Production of Chemical Warfare Agents in the United Kingdom," Conference on Disarmament Document CD/856, 11 August 1988.
119. "Summary Report on a Database for Predicting Consequences of Chemical Disposal Operations," ESAP 1200-12, Headquarters, Edgewood Arsenal, Aberdeen Proving Ground, MD, 1973.
120. D'Agostino, P. A., Provos, L. R., "Identification of Compounds in Mustard Hydrolysate," Canada, DRESSR-488, 1988.
121. Kurata, H. in: "Chemical Weapons: Destruction and Conversion," London, Taylor and Francis, 1980, 201 pp.
122. "Alternative Technologies for the Detoxification of Chemical Weapons: An Information Document," Washington, Greenpeace, 1991.
122a. "Disposal of Chemical Weapons: Alternative Technologies-- Background Paper," Washington, U.S. Government Printing Office, 1992, 42 pp.
123. IZVESTIYA, 22 September 1992.
124. KOMSOMOLSKAYA PRAVDA, 12 August 1993.
125. THE NEW YORK TIMES, 26 November 1993.
126. IZVESTIYA, 27 August 1992.
127. KHYPAR (Chuvashia), 19 November 1993.
128. ARGUMENTY I FAKTY, No 5, 1993.
129. NEZAVISIMAYA GAZETA (Moscow), 24 April 1992.
130. ZARYA MOLODEZHI (Saratov), 2 October 1993.
131. Pechura, C. M., Rall, D. P., editors, "Veterans at Risk. The Health Effects of Mustard Gas and Lewisite," Washington, National Academy Press, 1993, 427 pp.
132. "Information on the Presentation at the Shikhany Military Facility of Standard Chemical Munitions and of Technology for the Destruction of Chemical Weapons at a Mobile Unit," Conference on Disarmament Document CD/789, 16 December 1987, 54 pp.
133. NEZAVISIMAYA GAZETA (Moscow), 24 March 1993.
134. IZVESTIYA, 26 January 1994.
135. IZVESTIYA, 27 January 1992.
136. NEZAVISIMAYA GAZETA (Moscow), 27 January 1994.
137. SPIEGEL, 12 April 1982.
138. MOSKOVSKIYE NOVOSTI, No 30, 25 July 1993.
139. Lundin, S. J., ed., "Verification of Dual-Use Chemicals Under the Chemical Weapons Convention: The Case of Thiodiglycol," New York, SIPRI, 1991, 144 pp.
140. ROSSIYSKAYA GAZETA, 30 September 1992.
141. MOSKOVSKIYE NOVOSTI, No 50, 13 December 1992.
142. CHEBOKSARSKIYE NOVOSTI, 3 and 4 December, 1993.
143. "World Armaments and Disarmament," SIPRI Yearbook, 1985, pp 205-219.
144. IZVESTIYA, 28 January 1991.
145. SOVETSKAYA CHUVASHIYA, 19 March 1993.
146. IZVESTIYA, 21 October 1991.
147. PRAVDA, 7 September 1989.
148. KRASNAYA ZVEZDA, 24 September 1992.
149. CHEMICAL AND ENGINEERING NEWS (USA), 13 August 1990.
150. IZVESTIYA, 3 November 1992.
151. MOSKOVSKIYE NOVOSTI, No 11, 14 March 1993.
152. UDMURTSKAYA PRAVDA, (Izhevsk), 3 April 1992.
153. MOSKOVSKIYE NOVOSTI, No 51-52, 20 December 1992.
154. EKONOMIKA I MY (Saratov), January 1993.
155. TSEMENT (Volsk), 10 February 1993.
156. SOVETSKAYA CHUVASHIYA, 8 July 1993.
157. "Health Evaluation of the Level of Contamination of Atmospheric Air in the Vicinity of Khimprom ChPO and the City of Novocheboksarsk in Dynamics for Ten Years (1980-1990)," Report of NIIGP, St. Petersburg, 1993.
158. Minutes of Session of Interagency Commission of Security Council of the Russian Federation on Ecological Safety, No 4, 14 December 1993.
159. KURANTY (Moscow), 9 August 1991.
160. IZVESTIYA, 27 November 1993.
161. IZVESTIYA, 20 November 1992.
162. IZVESTIYA, 25 January 1991.

163. ZELENYY MIR (Moscow), No 26, 1993.
164. KOMSOMOLSKAYA PRAVDA, 13 and 20 June 1991.
165. Israelyan, V. V., "Restraint of the Arms Race and the UN," MEZHDUNARODNAYA ZHIZN, No 2, 1976, pp 55-65.
166. POISK (Moscow), No 19, 2 May 1992.
167. IZVESTIYA, 11 August 1992.
168. MOSKOVSKIYE NOVOSTI, No 20, 16 May 1993.
169. IZVESTIYA, 18 February 1994.
170. KOMSOMOLSKAYA PRAVDA, 19 Jun 1991.
171. KOMSOMOLSKAYA PRAVDA, 11 April 1992.
172. IZVESTIYA, 2 November 1990.
173. IZVESTIYA, 25 November 1990.
174. MEGAPOLIS-EXPRESS (Moscow), No 5, 1993.
175. BEREGINYA (Nizhniy Novogorod), No 2, 1993.
176. STOLITSA (Moscow), No 5, 1993.
177. KOMMERSANT-DAILY (Moscow), 21 April 1993.
178. ROSSIYSKAYA GAZETA, 15 January 1994.
179. IZVESTIYA, 23 March 1992.
180. IZVESTIYA, 30 July 1992.

LIST OF ABBREVIATIONS

AMN--USSR Academy of Medical Sciences
ChKhZ--Chernorechensk Chemical Plant imeni M. I. Kalinin
ChPO--Cheboksary Production Association
ChZKhU--Chapayevsk Chemical Fertilizer Plant (former plant No 102)
GIPROKhLOR--former GSPI-3
GIPROSINTEZ--the current name for Volgograd Affiliate of GSPI-3
GITOS--State Institute of Organic Synthesis Technologies (former Volsk Branch of GSNIIOKhT)
GKhK--State Committee of USSR Council of Ministers on Chemistry (later State Committee on Chemistry Attached to the USSR State Planning Commission)
GosNIIkhlorproyekt--former Plant No 93 and GNIIEZ-93
GOSNIIOKhT--State Union Scientific Research Institute of Organic Chemistry and Technology (today's GNIIOKhT, in the past GSNII-42, GSNII-403)
GRAU--Main Missile and Artillery Administration of Defense Ministry
GSPI-3--State Union Design Institute No 3 (later GIPROKhLOR)
MCC--Military-Chemical Complex
MKhTI--Moscow D. I. Mendeleyev Institute of Chemical Technology
MO--Defense Ministry
MVES--Ministry of Foreign Economic Relations
NIKhI RKKA--Scientific Research Chemical Institute of the Workers and Peasants Red Army
NKKhP--People's Commissariat of the Chemical Industry
NKO--People's Commissariat of Defense
NKTP--People's Commissariat of Heavy Industry
NKVD--People's Commissariat of Internal Affairs
NTC--non-persistent toxic chemical
OTC--organophosphorus toxic chemical
PTC--persistent toxic chemical
RASKhN--Russian Academy of Agricultural Sciences
RCB--Radiation, Chemical and Biological Protection (Forces)
RKKA--Workers and Peasants Red Army
SA--Soviet Army
TC--toxic chemical
TsNIVTI SA--Central Scientific Research Military-Technical Institute (Moscow), heir to NIKhI RKKA
TsVKhP--Central Military-Chemical Proving Grounds (Shikhany, site of today's 33rd TsNIII SA)
VAKh SA--Soviet Army Military Academy of Chemical Protection (Moscow)
VIShKhIMZ--Visherskiy Chemical Plants (abbreviation to designate construction of Berezniki Chemical Combine)

VKhTOP--All-Union Chemical Trust of Organic Production Facilities
VMF--Soviet Navy
VNIIKhSZR--All-Union Scientific Research Institute of Chemical Agents for Plant Protection (Moscow)
VNITIG--All-Union Scientific Research Technological Institute of Herbicides (Ufa)
VOKhIMU--Military-Chemical Administration of the Workers and Peasants Red Army
VPK--Military-industrial complex
VPO--Volgograd Production Association
VVS--Soviet Air Force
33rd TsNIII--Soviet Army Central Scientific Research and Testing Institute (Shikhany), heir to TsNIVTI and NIKhI RKKA

APPENDICES

Excerpts From Chemical Weapons Convention

["Convention on the Prohibition of the Development, Production, Stockpiling, and Use of Chemical Weapons and on Their Destruction (signed on 13 January 1993 at a special International Conference in Paris)"]

Article II: Definitions and Criteria For the purposes of this Convention:
1. "Chemical Weapons" means the following, together or separately:
(a) Toxic chemicals and their precursors, except where intended for purposes not prohibited under this Convention, as long as the types and quantities are consistent with such purposes;
(b) Munitions and devices, specifically designed to cause death or other harm through the toxic properties of those toxic chemicals specified in paragraph (a), which would be released as a result of the employment of such munitions and devices;
(c) Any equipment specifically designed for use directly in connection with the employment of munitions and devices specified in paragraph (b)....
3. "Precursor" means:
Any chemical reactant which takes part in any stage in the production by whatever method of a toxic chemical. This includes any key component of a binary or multicomponent chemical system. (For the purpose of implementing this Convention, precursors which have been identified for the application of verification measures are listed in Schedules contained in the Annex on Chemicals).
4. "Key Component of Binary or Multicomponent Chemical Systems (hereinafter referred to as "key component") means:
The precursor which plays the most important role in determining the toxic properties of the final product and reacts rapidly with other chemicals in the binary or multicomponent system.
5. "Old Chemical Weapons" means:
(a) Chemical weapons which were produced before 1925; or...
8. "Chemical Weapons Production Facility":
(a) Means any equipment, as well as any building, housing such equipment, that was designed, constructed or used at any time since 1 January 1946:
(i) as part of the stage in the production of chemicals ("final technological stage") where the material flows would contain, when the equipment is in operation:

(1) Any chemical listed in Schedule 1 in the Annex on Chemicals; or
(2) Any other chemical that has no use, above one tonne per year on the territory of a State Party or in any other place under the jurisdiction or control of a State Party, for purposes not prohibited under this Convention, but can be used for chemical weapons purposes;
or
(ii) For filling chemical weapons including, inter alia, the filling of chemicals listed in Schedule 1 into munitions, devices or bulk storage containers, the filling of chemicals into containers that form part of assembled binary munitions and devices, and the loading of the containers and chemical submunitions into the respective munitions and devices;
(b) Does not mean: ["Does not mean" missing from Russian text]
(i) Any facility having a production capacity for synthesis of chemicals specified in subparagraph (a) (i) that is less than one tonne;...
Article IV: Chemical Weapons
1. The provisions of this Article and the detailed procedures for its implementation shall apply to all chemical weapons owned or possessed by a State Party, or that are located in any place under its jurisdiction or control, except old chemical weapons and abandoned chemical weapons to which Part VI (B) of the Verification Annex applies....
7. Each State Party shall:
(a) Submit detailed plans for the destruction of chemical weapons specified in paragraph 1 not later than 60 days before each annual destruction period begins, in accordance with Part IV (A), paragraph 29, of the Verification Annex; the detailed plans shall encompass all stocks to be destroyed during the next annual destruction period;
(b) Submit declarations annually regarding the implementation of its plans for destruction of chemical weapons specified in paragraph 1, not later than 60 days after the end of each annual destruction period; and...
9. Any chemical weapons discovered by a State Party after the initial declaration of chemical weapons shall be reported, secured and destroyed in accordance with Part IV (A) of the Verification Annex.
10. Each State Party, during transportation, sampling, storage and destruction of chemical weapons, shall assign the highest priority to ensuring the safety of people and to protecting the environment. Each State Party shall transport, sample, store and destroy chemical weapons in accordance with its national standards for safety and emissions....
16. Each State Party shall meet the costs of destruction of chemical weapons it is obliged to destroy. It shall also meet the costs of verification of storage and destruction of these chemical weapons unless the Executive Council decides otherwise. If the Executive Council decides to limit verification measures of the Organization pursuant to paragraph 13, the costs of complementary verification and monitoring by the Organization shall be paid in accordance with the United Nations scale of assessment, as specified in Article VIII, paragraph 7.
17. The provisions of this Article and the relevant provisions of Part IV of the Verification Annex shall not, at the discretion of a State Party, apply to chemical weapons buried on its territory before 1 January 1977 and which remain buried, or which had been dumped at sea before 1 January 1985....
A. GUIDELINES FOR SCHEDULES OF CHEMICALS
Guidelines for Schedule 1
1. The following criteria shall be taken into account in considering whether a toxic chemical or precursor should be included in Schedule 1:
(a) It has been developed, produced, stockpiled or used as a chemical weapon as defined in Article II;
(b) It poses otherwise a high risk to the object and purpose of this Convention by virtue of its high potential for use in activities prohibited under this Convention because one

or more of the following conditions are met:...
Guidelines for Schedule 2
2. The following criteria shall be taken into account in considering whether a toxic chemical not listed in Schedule 1 or a precursor to a Schedule 1 chemical or to a chemical listed in Schedule 2, part A, should be included in Schedule 2:
(a) It poses a significant risk to the object and purpose of this Convention because it possesses such lethal or incapacitating toxicity as well as other properties that could enable it to be used as a chemical weapon;...
Guidelines for Schedule 3
3. The following criteria shall be taken into account in considering whether a toxic chemical or precursor, not listed in other Schedules, should be included in Schedule 3:
(a) It has been produced, stockpiled or used as a chemical weapon;
(b) It poses otherwise a risk to the object and purpose of this Convention because it possesses such lethal or incapacitating toxicity as well as other properties that might enable it to be used as a chemical weapon;...
Presidential Directive on CW Export Controls
["Directive of the President of the Russian Federation No 508-rp, dated 16 September 1992: On Introducing Control Over Export From the Russian Federation of Chemicals and Technologies That Can be Used in Developing Chemical Weapons" (ROSSIYSKAYA GAZETA, 30 September 1992)]
1. To Approve a List presented by the Government of the Russian Federation, naming chemicals and technologies that have a peaceful purpose, but that can be used in developing chemical weapons, and that are exported by franchises (appended).
2. The Government of the Russian Federation shall approve a Statute on control over export from the Russian Federation of chemicals and technologies that have a peaceful purpose, but that can be used in developing chemical weapons.
[signed] President of the Russian Federation, B. Yeltsin
Presidential Directive on CW Destruction
["Directive of the President of the Russian Federation No 304-rp, dated 12 June 1992: On Priority Measures in Preparation for Meeting International Obligations of Russia in the Area of Destroying Stockpiles of Chemical Weapons"]
To give responsibility to the RF President's Committee on Conventional Problems of Chemical and Biological Weapons for organizing operations to ensure that Russia is ready to meet international obligations in the area of destroying stockpiles of chemical weapons.
The RF President's Committee on Conventional Problems of Chemical and Biological Weapons shall, with participation of interested ministries and agencies within a period of two months develop and, upon agreement with local agencies of governmental authority, submit to the Government of the Russian Federation proposals on staged development of a system of facilities for destroying stockpiles of chemical weapons, and a procedure for material- technical, financial and personnel support of these operations.
In preparing the proposals, to make provisions for social protection of workers in said facilities, for comprehensive development of a social infrastructure, and for improvement of the material and social support of citizens living where these facilities are sited, including:
establishing for workers employed in operations on destruction of chemical weapons privileges and benefits with respect to working conditions, wages, and pension benefits;
creating social welfare facilities in a 15-km zone around chemical weapons destruction facilities (in lists, on a scale, and at times agreed on with the appropriate local organs of State authority);
constructing in centers of population located in a 10-km zone around facilities for destruction of chemical weapons individual housing of farmstead type with heating, central water supply and sewage for workers at these facilities and members of their families and military personnel (except for draftees), service

facilities, and also construction of health camps for children of school and preschool age, providing passes for all children residing in said centers of population. In this context, as many as 20 percent of such individual dwellings shall be transferred to local organs of State authority;
setting up diagnostic centers at medical treatment institutions that serve the workers of chemical weapons destruction facilities where, along with these workers, examination services will be provided for all citizens living in centers of population situated in a 15-km zone around said facilities;
setting up ecological monitoring systems and information points in all centers of population situated in a 15-km zone around chemical weapons destruction facilities;
introducing mandatory State insurance for the person, chattels and real estate of citizens living in a 15-km zone around chemical weapons destruction facilities with compensation for total loss due to accidents;
taking additional steps to provide foodstuffs and industrial goods for workers of chemical weapons destruction facilities (including military personnel) and members of their families, as well as for citizens living in a 10-km zone around such facilities.
[sealed]
[signed] President of the Russian Federation, B. Yeltsin

Statute for President's CBW Committee

["TEMPORARY STATUTE for the Russian Federation President's Committee on Conventional Problems of Chemical and Biological Weapons, APPROVED By Edict of the President of the Russian Federation, 25 May 1992, No 523"]
1. The Russian Federation President's Committee on Conventional Problems of Chemical and Biological Weapons (hereinafter--the Committee) is an agency that provides cooperation and supervision in the area of supporting fulfillment of Russia's international obligations with respect to conventional problems of chemical and biological weapons.
2. The Committee performs the functions of a national coordination center within the framework of international cooperation and control with regard to the aforementioned problems.
3. Basic tasks of the Committee are:
coordinating the activity of agencies of State administration of the Russian Federation with respect to development and implementation of a unified State policy of Russia in the area of conventional problems of chemical and biological weapons;
organizing the development, performance and support of operations on destruction of chemical weapons and supervising their execution;
supervising fulfillment of the requirements of international treaties in the area of chemical and biological weapons on the territory of Russia, and of the legislative acts passed on the basis of these treaties;
supporting Russia's participation in organizing and implementing international supervision of meeting the requirements of the said international treaties;
disclosing scientific and engineering prerequisites for development of new generations of chemical and biological weapons and weapon modifications based on analysis of Russian and foreign information, and working out proposals for preventing the advent of such types of weapons;
participating in international cooperation on conventional problems of chemical and biological weapons, and representing Russia's interests with respect to these problems on the international level.
In the Area of Destruction of Chemical Weapons:
shall develop with participation of interested organizations a concept of unified State policy in the area of destruction of chemical weapons, the draft of a State program for their

destruction, and also proposals for financial, material-technical, personnel and other kinds of support of these operations;
shall organize the development and execution of specific plans of operations on destruction of chemical weapons and support of these operations, and supervise their execution;
shall work out jointly with interested organizations comprehensive research and development plans and supervise their execution;
shall organize operations on selection and agreement of sites for construction of facilities for destruction of chemical weapons stockpiles, and expert examination of the corresponding designs and technologies;
shall organize scrutiny of proposed drafts of programs for destruction (recycling) of individual kinds of chemical weapons, including on a commercial basis, bringing in foreign companies when necessary.
shall issue licenses (franchises) in accordance with established procedures for reprocessing stockpiles of chemical weapons and products of their detoxication, and also permits for doing experimental work in this area;
jointly with other State agencies shall supervise the organization of operations on ensuring safety of storage, transportation and destruction of chemical weapons stockpiles.
6. For purposes of clarifying State policy in the area of chemical and biological disarmament and measures carried out for these purposes, the Committee shall conduct ongoing work in cooperation with representatives of the community and mass media.

Supreme Soviet Decree on Treaty Compliance

["Decree of the Supreme Soviet of the Russian Federation No 3244-I, dated 8 July 1992: On Ensuring Fulfillment of the Russian Federation's International Obligations in the Area of Chemical, Bacteriological (Biological) and Toxin Weapons"]
Having examined the status of fulfillment of the Russian Federation's international obligations in the area of chemical, bacteriological (biological) and toxin weapons, the Supreme Soviet of the Russian Federation decrees:
1. To confirm succession of the Russian Federation in respect
of obligations of the USSR according to the Convention on Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons (1972), and according to Soviet-U.S. treaties on control of chemical weapons and on destruction of weapons stockpiles, and also succession of the course to conclusion of a global convention on prohibition of chemical weapons.
2. To recommend to the President of the Russian Federation that drafts be submitted to the Supreme Soviet of the Russian Federation for legislative acts of the Russian Federation on prohibiting the development, production and stockpiling of chemical, bacteriological (biological) and toxin weapons in accordance with the Russian Federation's international obligations, and also on the responsibility of authorities for violation of said obligations.
3. To acknowledge the advisability of allocating as a separate item in the republic budget of the Russian Federation in the line "Implementation of International Agreements on Arms Elimination, Reduction and Limitation" appropriations for expenditures, including in freely convertible currency, associated with fulfillment of the Russian Federation's international obligations regarding conventional problems of chemical and biological weapons.
4. To commission the Government of the Russian Federation jointly with the Committee of the Supreme Soviet of the Russian Federation for Industry and Power and the Committee of the Supreme Soviet of the Russian Federation on Problems of Ecology and Rational Utilization of Natural Resources to present to the Supreme Soviet of the Russian Federation, by 15 September 1992,

drafts of comprehensive programs for staged destruction of chemical weapons and utilization of special biotechnological potential for organizing the development and production of medicinal drugs.
[sealed]
[signed] Chairman of the Supreme Soviet of the Russian Federation, R. I. Khasbulatov
Moscow, House of Soviets of Russia

Parliamentary Committee Hearings on CW Destruction Program

[Letter on letterhead: "Supreme Soviet of the Russian Federation, Committee for Industry and Power, Moscow, House of Soviets of Russia, 2 Krasnopresnenskaya Embankment," dated 19 September 1993, No 77[illegible], to Chairman of the Council of Ministers of the Russian Federation V. S. Chernomyrdin, document number GKh-P7-09534]
Dear Viktor Stepanovich,
I am sending you the Decision of Parliamentary Hearings on the draft of the "Comprehensive Program for Staged Destruction of Chemical Weapons in the Russian Federation."
ENCL: Decision (4 pages).
[signed] A. Ye. Yeremin, Committee Chairman
Decision by Parliamentary Committees
[document headed "SUPREME SOVIET OF THE RUSSIAN FEDERATION, Committee for Industry and Power, Committee on Problems of Ecology and Rational Utilization of Natural Resources, Moscow, 19 January 1993: DECISION OF PARLIAMENTARY HEARINGS on the draft `Comprehensive Program for Staged Destruction of Chemical Weapons in the Russian Federation'"]
For purposes of meeting obligations undertaken by the Russian Federation in the area of destroying chemical weapons stockpiles, the Russian Federation President's Committee on Conventional Problems of Chemical and Biological Weapons, jointly with the Defense Ministry of the Russian Federation and other ministries and agencies, in 1992 developed and submitted to the Supreme Soviet of the Russian Federation for examination a draft of the first stage of a Comprehensive Program for Destruction of Chemical Weapons.
This draft provides for setting up three primary destruction facilities. Two at chemical weapons storage sites (vicinity of Kambarka, Udmurt Republic, and vicinity of Gornyy settlement, Saratov Oblast), and a facility based on a former chemical weapons plant subsidiary to the Cheboksary Khimprom Production Association of the Chuvash Republic.
The draft of the program was examined by committees and commissions of the Supreme Soviet of the Russian Federation, and by the official authorities and public organizations of regions of the proposed siting of facilities for destruction (recycling) of chemical weapons, who gave their comments and suggestions.
The Presidium of the Supreme Soviet and the Council of Ministers of the Udmurt Republic and the Oblast Soviet of People's Deputies and the Administration of Saratov Oblast consider it possible to approve the draft of the first stage of the Comprehensive Program, upon condition that it be revised with introduction of their comments and amendments.
The Supreme Soviet of the Chuvash Republic in accordance with
Article 5 of the 1991 law of the Chuvash Republic "On the Procedure for Making Use of the Natural Environment and Resources," which prohibits importation, utilization and storage of hazardous wastes and materials, has decided to prohibit creation of a facility for destruction of chemical weapons on the territory of the republic.
In connection with the foregoing, the committees have decided:
1. To recommend to the Government of the Russian Federation, jointly with the Russian Federation President's Committee on Conventional Problems of Chemical and Biological Weapons, that the draft of the first stage of the Comprehensive Program be

revised with allowance for the received comments and suggestions, and that, upon its approval by the authorities of regions of siting of primary facilities for chemical weapons destruction, in the fourth quarter of 1993, it be submitted to the Supreme Soviet of the Russian Federation. To determine a State Initiator of the program of destruction of chemical weapons in the Russian Federation.
To acknowledge the advisability of examining the revised concept of the program for destruction of chemical weapons in committees of the Supreme Soviet of the Russian Federation.
2. In the course of carrying out the operations specified in point 1, to make provisions for, in particular:
2.1. Elaboration and public discussion of technical-economic underpinnings (assumptions) for creating chemical weapons destruction facilities with estimates of their impact on the environment.
2.2. Working with interested subjects of the Federation on issues associated with safe transportation of chemical munitions from storage bases to the destruction site, proceeding from the fact that, given the existing state of Russia's transportation system, the shipping of chemical weapons, poisons, toxic agents and reaction masses by any means of conveyance is highly hazardous.
2.3. Carrying out a State ecological expert examination of the revised draft of the Comprehensive Program for Staged Destruction of Chemical Weapons in the Russian Federation.
2.4. Submitting to the Supreme Soviet of the Russian Federation an annual report on progress in implementing the Comprehensive Program for Destruction of Chemical Weapons (including on disbursement of budgetary funds in rubles and freely convertible currency).
2.5. Submitting to the Supreme Soviet of the Russian Federation a list of territories and water areas where disposal and destruction of chemical weapons has occurred in the last 70 years.
To develop a federal target program on eliminating the consequences of chemical weapons production in the Russian Federation. The program shall provide for:
assessment of the impact on the environment and health of the populace from previous burials, tests, production and destruction of chemical weapons,measures to eliminate discovered detrimental aftereffects (including development of the necessary legislative acts).

3. To recommend to the Government of the Russian Federation:
3.1. That it work out the draft of a law in the third quarter of 1992 "On Destruction of Chemical Weapons in the Russian Federation," other legislative acts aimed at safeguarding the population, service personnel and the environment when storing, transporting and eliminating chemical weapons, and submission for examination by the Supreme Soviet of the Russian Federation.
3.2. That it accelerate development and submission to the Supreme Soviet of the Russian Federation of proposals regarding kinds, amounts and procedures for offering economic and other incentives for high-quality and timely execution and support of operations in the program for destruction of chemical weapons as provided for by the resolution of committees of the Supreme [as published] of the Russian Federation dated 30 October 1992, No 70 (with allowance for local conditions).
3.3. That it step up work with the States Parties to the Convention on Prohibition of Chemical Weapons in bringing about conditions for reducing expenditures of the Russian Federation on the problem of destruction of chemical weapons as a whole and, in particular, reducing currency disbursements on international inspection of military-chemical and industrial facilities located on its territory.
4. To recommend to the Government of the Russian Federation jointly with the Russian President's Committee on Conventional Problems of Chemical and Biological Weapons and agencies of authority of regions of proposed siting of facilities for destruction (recycling) of chemical weapons that planned

measures be developed and implemented for wide-ranging education of the private and public sector, including with the use of mass media, regarding the basic goals, directions and specific paths of solving the problem of chemical weapons destruction in Russia.
[signed] A. Ye. Yeremin, Chairman of the Committee for Industry and Energy
V. P Vorfolomeyev, Chairman of the Committee on Problems of Ecology and Rational Utilization of Natural Resources

Presidential Statement on CW

["Report of Press Service of the President of the Russian Federation"]

We are circulating the text of Russian Federation President B. N. Yeltsin's statement on the problem of chemical weapons destruction. [signature illegible]

Statement of President of the Russian Federation Concerning the Problem of Chemical Weapons Destruction

In recent months, the public in many regions has been alarmed by the problem of chemical weapons destruction.
Over the past decades, tens of thousands of metric tons of combat toxic chemicals have been produced and stockpiled in Russia. The world has changed, Russia's position in the world has changed, we have no intention of attacking anyone. The time has come to get rid of chemical weapons--a past that we have inherited. This is not just Russia's opinion, but the consensus of the 138 nations that signed the Convention on Prohibition of Chemical Weapons this year in Paris.
We must begin the destruction of chemical weapons based on requirements of not only international, but also national safety, as missiles and bulk storage units are gradually falling into disrepair, and we cannot keep them indefinitely. These weapons were produced over the course of many years at several plants. The destruction process will be complicated, and a lot of time will be needed to carry it out. But we have to start. A State Program for Destruction of Chemical Weapons is now being prepared. It will be based on the following principles:
1. Unconditional guarantee of safety for the life and health of citizens, and also for the state of the natural environment;
2. Unconditional satisfaction of all demands for social protection of citizens living in the zone of influence of enterprises for destruction of chemical weapons.
3. Use of the latest technologies that minimize risk and where possible yield valuable chemicals as a result of destruction.
4. Minimizing the volume of transportation of toxic chemicals on the territory of Russia.
Operations on destruction of chemical weapons will be started only after a positive conclusion has been reached by ecological expert examination with respect to the Program as a whole, and with respect to each facility. It is mandatory that such expert examination include not just scientists and specialists, but also representatives of society, including ecological organizations, both across Russia and locally.
I have requested agencies of executive authority of Udmurtia, Chuvashia and Saratov Oblast to take an active part in developing this Program, determining priorities and conditions of preparation for carrying out operations on destruction of chemical weapons. Such participation will help to transform this unavoidable step for Russia to a powerful lever of socioeconomic development of considerable territories of the nation, while strictly guaranteeing safety of citizens.
A significant percentage of the means for this Program will be directed at solving regional problems of safeguarding public health, protecting mothers and children, housing construction, building public amenities, roads, and other engineering infrastructure.

The mountains of now useless and dangerous chemical weapons are the painful heritage of our past. Russia must get rid of them in the interests of her own safety, and in the interests of the safety of the entire world.
[signed] B. Yeltsin, 20 April 1993.

Presidential Directive on Procedure for Choosing CW Destruction Sites

["Directive of the President of the Russian Federation: On the Procedure of Selecting Regions for Siting Chemical Weapons Destruction Facilities on the Territory of the Russian Federation"]
For purposes of carrying out steps in preparations for Russia to meet international obligations in the area of destruction of chemical weapons:
1. The Council of Ministers-Government of the Russian Federation shall form within a month's time a Government Commission on Selecting Regions for Siting Chemical Weapons Destruction Facilities on the Territory of the Russian Federation and confirm a statute for it.
2. The operation of the Government Commission on Selecting Regions for Siting Chemical Weapons Destruction Facilities on the Territory of the Russian Federation shall be funded by monies allocated from the republic budget of the Russian Federation for implementing ratified international treaties on arms elimination, reduction and limitation.
3. Facilities for destruction of chemical weapons shall be sited in accordance with legislative acts of the Russian Federation in regions determined by the Government Commission on Selecting Regions for Siting Chemical Weapons Destruction Facilities on the Territory of the Russian Federation and approved by the President of the Russian Federation.
[sealed]
[signed] President of the Russian Federation B. Yeltsin

Security Ministry: No Information on CW Disposal

[Letter on letterhead of the Ministry of Security of the Russian Federation, dated 23 April 1993, No 1427-G, to Deputy Chairman of the Committee of the Supreme Council of the Russian Federation on Problems of Ecology and Rational Utilization of Natural Resources V. F. Menshikov]
Dear Valeriy Fedorovich,
The Ministry of Security has studied problems associated with burial of toxic chemicals on the territory of Russia, and in the territorial waters of Russia. There are no documentary materials on this problem in the operative subdivisions and archives of the Ministry of Security of Russia.
No provision is made by orders of the RF Ministry of Security (KGB of the USSR) or by orders of the Ministry of Defense for drafting documents that verify the presence or absence of measures of this nature by representatives of military counterintelligence agencies.
At the same time, we have established that data on burial of toxic chemicals are found only in the Central Naval Archives of the Ministry of Defense of Russia ([illegible], Leningrad Oblast, [illegible]).
In connection with the foregoing, we would suggest that you inquire about the issues of interest to you at the Ministry of Defense of Russia, as well as the Russian Federation President's Committee on Conventional Problems of Chemical and Bacteriological Weapons.
[signed] Deputy Minister I. Golushko