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11/19/79

Dear Prof. Meselson:

We meet again through a highly likely source-- George Berdes. As you will recall, I interviewed you some years ago in connection with my dissertation research on U.S. chemical and biological warfare policies. I worked with George for the Foreign Affairs Committee for two and a half years and have recently joined the staff of Rep. John B. Anderson as his defense and foreign policy (mostly defense) adviser.

I generally liked the paper and have made a few marginal comments, particularly on the defense side.

I am distressed by the continuing and virtually exclusive focus both by opponents and proponents of CW on the NATO-Warsaw Pact scenario. My own judgment is that such a confrontation is the least likely of all those in which CW will be used. More likely situations would be the case of Laos today, and perhaps Southern Africa tomorrow.

Proponents of CW, binary or nonbinary have to be made to make the case for CW in terms of our world-wide responsibilities, not just Europe, before I will suggest to Rep. Anderson that as President he should spend billions revitalizing our CW capabilities.

Opponents could be especially useful in this regard by pointing out how a retaliatory capability does not deter Vietnam from using CW in Laos, and probably wouldn't stop the crazies in Sub-Saharan Africa either.

Hope my comments are somewhat helpful. Enclosed is a new card to help you find me in the future.

Sincerely yours,



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CHEMICAL WARFARE AND CHEMICAL ARMS LIMITATION

by

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The use of poison gas and other chemical weapons is prohibited by the Geneva Protocol of 1925, to which all major nations are now parties. Some nations accept the Geneva Protocol as an absolute prohibition while others--including the United States, Great Britain, France, the Soviet Union and China--view it as a no-first-use agreement, having formally reserved the right to retaliate in kind if the Protocol is violated by an adversary. Among NATO allies, only the U.S. and France have militarily significant stocks of chemical weapons. Maintenance of these weapons is predicated on their possible retaliatory role in view of what is believed to be a formidable capability of the Soviet Union to wage chemical warfare.

Starting in 1976, the Americans and the Soviets have been engaged in a series of bilateral technical discussions and negotiations in Geneva aimed at bringing about chemical disarmament, including the prohibition of development, production and stockpiling of chemical weapons. (Although a recent treaty--the Biological Weapons Convention of 1972--embodies such prohibitions against biological weapons, it does not apply to chemical weapons.) The American-Soviet talks have achieved considerable agreement on what is to be prohibited and also on the general principle of incorporating both national and international arrangements for verifying compliance. Little progress has yet been made, however, in reaching agreement on specific verification measures.

Recent developments of Pugwash may be especially relevant.

think it's possible to be a bit more encouraging.

While talks continue between the Americans and the Soviets and, concurrently, within the multilateral Committee on Disarmament in Geneva, the U.S. and other countries in NATO are embarked upon a major program to increase and modernize the protection of their forces against chemical attack. These ^{defensive} measures have found general support within Allied governments, for they are viewed as important ~~defensive~~ precautions in the present situation and as a safeguard to be retained if a chemical weapons

Such a CW defensive program is also welcome by the U.S. Congress which has been urging such an emphasis since 1975

ban comes into being.

Though protection against chemical weapons is being improved, the U.S. has not added to its stocks of the weapons themselves since 1969. The American stockpile, although substantial, is in some respects not optimally suited to contemporary delivery systems and military tactics. Its utility for retaliation is further limited by reluctance within NATO, especially by West Germany, to integrate chemical weapons into the force structures and defense planning of the alliance.

Lower
} over

Repeated requests by the U.S. Army for funds to build production lines for a new generation of poison gas artillery projectiles called binary munitions have been rejected by the Congress and the White House--partly on grounds that such action could impede negotiations for a chemical arms limitation treaty. Moreover, there is debate about the military value of a retaliatory chemical capability and about its possible interactions with nuclear deterrence.

Somehow long believe Eastline process must work
on this world
is your view?

Should the emergency have for a CW treaty in the near future fail the long range prospect for any treaty will be virtually nil.

Thus, U.S. policy for chemical weapons appears to be nearing a crossroads. If a satisfactory treaty can be obtained, there will be chemical disarmament. Otherwise, the U.S. may decide to go ahead with the production of new chemical weapons and to make a determined effort to persuade NATO to integrate them into its defense planning. In this article, we describe some of the technical, military and political considerations that bear most directly on the choices facing the U.S. and its NATO allies. In the wider international context there are questions that may be no less important, but we do not attempt to address them here.

* * * * *

Modern lethal chemical weapons are based on organophosphorus esters known as nerve gases or nerve agents, chemically related to certain insecticides--but much more toxic. The first of these compounds, tabun, was discovered in Germany in 1936 in the course

of insecticide research. Its military possibilities were soon recognized by the German Government which proceeded secretly to produce it and to develop production methods for a related agent encountered in 1938--sarin. Chemical weapons were not used, however, by the European belligerents in World War II, and nerve gases have never been used in combat. *you might check with CIA on leads; you really should.*

Nerve gases are stored as liquids. Depending on the volatility of the particular agent, they may be disseminated from munitions as a cloud of vapor or aerosol or as a spray of liquid droplets by explosive, mechanical or thermal means. They may enter the body by inhalation or absorption through the skin. The nerve gas then exerts its lethal effect by binding to the enzyme acetylcholinesterase, thereby inactivating it. Blocking the enzyme causes rapid accumulation of the synaptic transmitter substance acetylcholine, which normally is decomposed by acetylcholinesterase within milliseconds after being released at nerve endings. The build-up of acetylcholine at autonomic ganglia and effectors, at skeletal neuromuscular junctions and at synapses in the central nervous system causes a wide array of symptoms. These include intense sweating, filling of the bronchial passages with mucus, bronchial constriction, dimming of vision, uncontrollable vomiting and defecation, convulsions and, finally, paralysis and respiratory failure. Death from acute nerve gas poisoning is caused by asphyxia, which generally will occur within a few minutes but, if the dose is only marginally lethal or is received through the skin, may take up to several hours. There is evidence that delayed neurological and psychiatric disorders can develop after sublethal intoxication. Nerve gas is to some extent cumulative in its action, so that approximately the same total dose may be lethal whether received all at once or over a period of many hours. Antidotes of limited effectiveness are available, but far more effective defense against nerve gases and indeed against all chemical warfare agents is provided by a gas mask and, for agents which penetrate or attack the skin, protective clothing.

F. D. I. interesting point relevant to the you ORANGE wish to develop for the below

Many hundred organophosphorus anticholinesterases have been considered for use in weapons. The three which have dominated attention are O-isopropyl and O-1,2,2-trimethylpropyl methylphosphonofluoridate (otherwise known as sarin and soman, respectively, or as GB and GD), and O-ethyl S-2-diisopropylaminoethyl methylphosphonothiolate (known as VX). It is estimated that about one milligram of sarin or 0.4 milligrams of VX is the median lethal dose for man, with the lethality of soman in between. Sarin is nearly as volatile as water and would be used primarily as an air contaminant. VX, with a volatility like that of heavy lubricating oil, would be disseminated in sprays as a direct or an indirect contact hazard, the latter through contamination of terrain or other surfaces with which people might later come into contact. VX applied at about 300 kg per km² will create a deadly percutaneous hazard that will persist for a period of days or weeks according to the weather. The hazard from sarin, being primarily an airborne one, is of much shorter duration and is highly dependent on vertical and horizontal air movement and on the ambient temperature: the contamination needed to create a lethal respiratory dosage could vary between less than 100 kg/km² and upwards of 3000 kg/km².

Sarin and VX are the two standard U.S. nerve gases. Soman, first prepared in Germany in 1944, is believed by Western officials to be the standard Soviet nerve gas. Its volatility approaches that of sarin, but greater persistency can be obtained by thickening with synthetic polymers. What the Soviets are reported to call VR-55 is thought to be a stockpiled formulation of this type. Tabun (O-ethyl N,N-dimethylphosphoroamidocyanidate, also known as GA), the original but now superceded nerve gas, was said at one time to figure prominently in the Soviet chemical arsenal; if true, the stocks could still exist.

For use in regular battlefield weapons, few other poisons possess the combination of properties which imparts so aggressive a potential to the nerve gases. Their toxicity and rapidity

of action, their effectiveness through the skin as well as the lungs, their easy disseminability, their relatively low cost within an advanced industrial economy and their stability set them apart from all other chemical warfare agents. The older agents may now be considered obsolete for the industrialized countries, though some must still be taken seriously, chiefly because substantial supplies remain available. Hydrogen cyanide is one example; bis(2-chloroethyl) sulfide, commonly known as mustard gas, another.

The nerve gases likewise overshadow the category of incapacitating agents--substances that can put soldiers out of action for a period of several hours or days but with a low probability of death or lasting ill effect. Although many candidate incapacitants have been screened, none has proven very satisfactory. The anticholinergic psychotropic drug known as agent BZ (3-quinuclidinyl benzilate) was for a few years an approved fill for U.S. incapacitating munitions, but its many military shortcomings, including its unpredictable tendency to elicit maniacal behavior, led to its abandonment in 197 . The only "non-lethal" anti-personnel weapons now in the U.S. CW inventory are those employing the irritant agents CS (o-chlorobenzylidene malononitrile) and CR (dibenz[b,f][1,4]oxazepine). Classified as riot control agents, CS, CR and the like are essentially irrelevant to combat between modern military forces because of the brevity of their effects and the protection afforded by gas masks.

*included
in
inventory of US
Armed
forces*

*what does this
mean*

The size of the U.S. stockpile of lethal chemical munitions is classified information, but estimates may be made from open sources. Around 15,000 tons of sarin were produced during 1953-57 and around 5000 tons of VX during 1961-67. About 5000 tons of nerve gas, mostly sarin, have been consumed in the destruction of obsolete munitions and surplus stocks. Of the remainder, about one quarter is held in 1-ton bulk storage containers and three quarters in munitions. Thirty or so different varieties of nerve gas munition have been approved for the operational inventories

of U.S. armed forces over the past 30 years, about half of them having been produced in quantity. Some are now obsolete and have been or are being discarded. Remaining in the stockpile are around three million artillery projectiles (105-mm GB, 155-mm GB and VX, and 8-inch GB and VX) and several thousand bombs (500-pound and 750-pound GB) procured intermittently during 1953-69; some hundreds of thousands of two-gallon VX land mines procured during 1961-66; and about 1500 160-gallon VX aircraft spray tanks procured during 1965-68. Supplies of World War II mustard gas are also maintained, both in munitions and in bulk stock, the total quantity of the agent being about the same as that of nerve gas. U.S. stocks of lethal chemical munitions amount to some 150,000-200,000 tons, referring to the weight of projectiles, bombs, etc., not just the chemical agent they contain, of which nerve gas munitions comprise about two-thirds. This total equals about thirty percent of the weight of ammunition which the U.S. Army currently has on hand in Europe. However, only a small fraction of U.S. chemical stocks has been positioned abroad, on Johnston Island in the mid-Pacific and in West Germany. Solely under U.S. control, the stocks in Germany, which are mostly ground munitions, contain perhaps a thousand tons of nerve gas, a supply thought to be similar in size to that of France.

~~It seems that~~ Little is known for certain about Soviet chemical weapons, either quantitatively or qualitatively. The Soviets themselves have said nothing in public. U.S. defense officials have stated that little confidence can be placed in current estimates of the size of the Soviet stockpile but that a considerable amount is deployed in both European and Asian forward areas. A recent unofficial West German estimate is that the Soviet Union has 200,000-700,000 tons of chemical munitions; and that for particular weapon systems 5-30% of the munitions available may be chemical. Some are believed to be nerve gas munitions, the remainder mostly mustard gas and hydrogen cyanide. U.S. officials have drawn attention to several differences

between the U.S. and the presumed Soviet weapons capability. The principal one is the large disparity in the sizes of the forward deployed stocks of munitions, important in view of the fact that a major fraction of the total U.S. airlift capacity would be required for the ^{safe and} timely transportation of continental U.S. stocks to Europe. A second [^] difference is the wide deployment by Soviet and other Warsaw Pact forces of multiple rocket launchers for which chemical as well as conventional rockets are believed to be available. Such weapons, which are well suited to surprise chemical attack of company or battalion sized area targets, have existed in the U.S. arsenal but are being phased out; their successor is still in the prototype stage. A third difference is the availability of chemical ground weapons having a much longer range than those of the United States, particularly heavy artillery rockets and tactical guided missiles. Here again the United States is currently in between obsolete and successor weapons. Whether the Soviets, like the United States, regard their stocks solely as retaliatory is, of course, not known. A build-up in their supplies, both of weapons and of protective equipment, is said to have been in progress since the mid-1960s. If so, the instigating decisions would have been taken during the last high point of U.S. chemical weapons procurement. According to the 1979 military-posture statement by the Chairman of the U.S. Joint Chiefs of Staff, initial release authority for Soviet weapons lies at the Politburo level.

* * * * *

To a degree not approached by other categories of weapon, it is possible to protect people from the effects of chemical weapons without at the same time preventing them from engaging in most of their normal activities. Important and distinctive aspects of military and arms-control policy making with regard to chemical warfare largely stem from this feature. The first and most important line of defense against chemical warfare agents,

on its face value this stuff is misleading.

which have no sense we don't have bit of and we suspect the Soviet Union

also needed in part against nuclear fallout, is the physical protection that can be provided by respirators, protective clothing and air filters for collective shelters. Respirators for the individual soldier have been in continuous development since 1915. Properly fitted, current gas masks are capable of reducing the concentration of chemical warfare agents in inspired air by a factor of at least a hundred thousand. The filters contain activated charcoal for vapor adsorption, and paper or similar material for particulate retention. To increase protection against small-molecule agents such as hydrogen cyanide, the charcoal is impregnated with copper compounds or other reactants. Gas masks currently deployed in NATO can be donned in less than ten seconds and thereafter worn indefinitely, even in sleep. The physiological stresses imposed are minor, and the psychological ones removable by training and practice. The new U.S. mask, due to enter service next year, incorporates several refinements over the existing one. It is lighter and interferes less with the use of optical and audio equipment. The current Soviet mask, though effective, is less easy to don quickly than the principal NATO masks and is heavier and more uncomfortable.

disagree

George pan is an U. well taken

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problems
still
are

All U.S. Army forces in Europe have been equipped with the British Mark 3 NBC Protective Suit. Like the new U.S. suit now entering service, this is a disposable two-piece overgarment which, for full protection, is worn with polychloroprene gloves and butyl-rubber overboots. The suit weighs less than three pounds and is flameproofed, waterproofed, and permeable to air. The outer of its two layers of fabric is of wear-resistant woven synthetic, treated to be rapidly wettable by drops of nerve gas so as to accelerate their evaporation. Penetrating vapor is adsorbed by activated carbon bonded to the inner side of the inner layer, the outer side being treated with a water-repellent fluorochemical. Because the material can breathe and pass perspiration, it interferes little more than ordinary clothing with the ability of its wearers to shed heat; below 80°F, a temperature rarely exceeded in central Europe, the degradation of combat performance

not really
see USAF
studies m
CBR protect
see also
NAIT
Harris

disagree -9-

You really need to talk with people at Natick, Mass also Aberdeen they now have data that refutes this

due to heat stress is minimal. Current Soviet protective garments are made of air-impermeable rubberized fabric. At 60°F, they can be worn for about 4 hours before the heat stress builds up to casualty levels; above 70°F, the tolerance time is less than half an hour. The Soviets are said to be working on an improved suit.

For armored fighting vehicles, collective rather than individual protection may be provided. The latest tanks, both Soviet and European NATO, have seals and positive-pressure filtered air supplies so that their crews are fully protected without having to wear masks. Soviet forces appear to be relying increasingly on this method for the armored personnel carriers and combat vehicles in which their infantrymen would move during battle. The U.S. preference is to provide armored vehicles with a central pressurized supply of filtered air to which individual respirators may be connected, allowing flexibility in entering and leaving the vehicle and in operating with hatches open, while restricting full collective protection to such things as command, control, and communications vans, and certain mobile guided-missile units. Collective protection is also available on both sides for fixed installations, including command posts and temporary shelters through which front-line units can be rotated for medical care and rest.

9 I Hawk

NATO troops are trained to don their masks and other protective equipment in response to commanders' orders, warnings given by chemical agent detection personnel or individual detection by a variety of means, including the sensing of characteristic symptoms, such as runny nose, dimmed vision and tightness in the chest. Capacity for determining the proper degree of protection is now being enhanced by the deployment of sensitive automatic nerve-gas field alarms. Automation is important because nerve gas contamination at casualty threatening levels may be undetectable by the unaided human senses. The latest alarm to enter service

also Honeywell do detector cover

is the 30-pound British NAIAD. This monitors the voltage across an electrochemical cell in which covalently-immobilized cholinesterase is continuously irrigated with a solution of butyrylthiocholine substrate; nerve gas in the sampled air inhibits the enzyme, just as it would in the human body, resulting in a drop in the thiocholine level which triggers the alarm.

*Note. Dashiell & Sessions
can comment on the
Honeywell NAIAD
difference
both
work
J. Well*

Although masks and clothing can provide effective protection against nerve gas, a second line of defense is available to the individual should these be circumvented. This comprises self-administerable antidotes; there is also some ^{limited} prospect of prophylaxis. Antidotes would come into play when protective equipment had not been donned promptly enough or when it had become damaged. They would also be necessary in the more remote eventuality of the sorptive capacity of respirator filters or protective suits becoming saturated under circumstances that did not allow immediate replacement. The most widely available antidote consists of atropine, which blocks acetylcholine at autonomic but not at skeletal muscle receptors, used in conjunction with an oxime derivative that can displace bound nerve gas from inhibited acetylcholinesterase. Compact auto-injectors are issued to be self-administered as soon as the symptoms of nerve gas poisoning begin to be felt. The formulation used in current U.S. and Soviet auto-injectors, referred to as "TAB", consists of trimedoxime, atropine and a second antagonist of acetylcholine, benactyzine. This may save the lives of people receiving somewhat more than the median lethal dose of nerve gas and reduce the severity of symptoms due to sublethal doses. More severe intoxication, up to several median lethal doses or less in the special case of soman, can be countered only if positive pressure artificial respiration is also applied. Prophylactic use of oximes, as by means of pills swallowed a short while prior to nerve gas exposure, may improve the prognosis. However, notwithstanding the advances in therapy and prophylaxis that now seem possible, it is doubtful whether these medical defenses would significantly reduce casualties in the sense of soldiers put out of action, though

they could certainly save lives and support morale

Shortage of Trained
Med. Pers.
Shortage of TAB
Improper Storage of
TAB
Shortage of workspace

The third principal component of anti-chemical protection comprises equipment and procedures for decontamination. Soldiers are provided with kits for decontaminating their skin and personal equipment. The other main requirement is a capacity for insuring that crucial combat and support equipment remains usable. This would not require complete decontamination, since the operators of the equipment would be in full protection. Contamination must be destroyed which because of its density or location would otherwise over-stress the protection of the operators or be transferrable to critical clean areas, such as the inside of vehicles. This can be accomplished with portable dispensers and scrubbers which can apply decontaminating agents to door handles, sights, controls, entry-ways, etc. Effective decontaminants are available in the form of oxidizing agents, such as bleaching powder, or diethylenetriamine formulations working by base-catalyzed hydrolysis. Available though perhaps less critical, is large-scale decontamination capacity for use in logistical centers and staging areas. The Warsaw Pact has deployed large numbers of decontamination vehicles, including the TMS-65 turbojet-powered large-volume dispenser first observed in the 1960s, said to be capable, when used in pairs, of decontaminating the outer surfaces of a tank in less than 3 minutes. Comparable NATO equipment is more in development than deployment.

for how long?

over

the U.S. uses mops.

we have one. wait now in test

it may be for us force

The new physical, medical and chemical protective items now surging into NATO-wide deployment are greatly increasing the capacity of NATO forces for operating effectively on contaminated battlefields, and for preserving support and resupply functions. Equipment is, however, only a part of what is needed. An adequate protective posture must also embody a detailed and widely diffused understanding of the problems involved, extensive training and exercising of personnel, and an organization efficient enough to operate smoothly under the chaotic conditions of war which large-

at least for USAF
their views

scale chemical operations would undoubtedly aggravate.

All the major NATO and Warsaw Pact armies provide training for anti-chemical protection at the individual level, but there are many tasks which must be performed by groups requiring special equipment and expertise. These requirements overlap those for biological and radiological defense and all three tasks--nuclear, biological and chemical (NBC)--are generally organized together. The American tendency is to assign such tasks to teams under local field command, down to and including the company level, with key personnel in each team receiving NBC school training. A typical U.S. Army company of 100-130 men includes an NBC Defense Team numbering upwards of 15 people, most of whom will usually have other duties as well. The team includes separate groups assigned to chemical detection, radiological monitoring and decontamination. In addition, there are career chemical-specialty troops attached to brigade and higher command levels, such as the NBC Defense Companies recently authorized for each U.S. combat division and Corps support command. The Soviet organization, somewhat as in the West German Bundeswehr, places much more emphasis on career NBC troops organized as a separate branch, of whom there are estimated to be about 80,000.

*too low - 120,000 was
the figure I saw used by Falter.*

Chemical defense procedures are routinely practised during Warsaw Pact maneuvers. Evidence of such close attention to protection has been available to NATO since the 1950s, not least in the pages of Soviet military journals. Soviet-supplied protective equipment of many kinds was found among Israeli-captured Arab material after the Six Day War of 1967, indicating that the equipment was standard Soviet issue. Similar NBC material was captured during the Yom Kippur War of 1973. In neither case were any stocks found of Soviet-supplied chemical munitions. In 1974, citing the Yom Kippur findings, the U.S. Army announced that it was assigning a high priority to anti-chemical preparedness. Procurement and forward deployment of individual-issue protective items had in fact

been proceeding steadily over the years and had resulted in the warehousing of at least quantitatively-adequate supplies for all U.S. troops in Europe. The importance of the 1974 decision was its recognition that these supplies, and the procedures necessary for their use, were inadequately assimilated, and that this could be rectified only through expanded indoctrination and training activities, backed up by deployment of improved and additional equipment. To this end, the Army is now launched upon a \$1.5 billion program intended to provide, by 1983, a greatly improved capability to withstand chemical attack and to conduct operations in a toxic environment. Battle training exercises are routinely conducted in full protective gear. Likewise, the Air Force has begun a program, currently estimated at \$234 million and due for completion by 1984, to improve the chemical defenses of its European air bases. These programs are rapidly bringing the quality of the antichemical protection of U.S. forces in Europe up to that of those allied forces that have long given it priority, particularly the British, Canadian, French and German. NATO itself is now embarked upon an alliance-wide program to smooth out disparities and upgrade overall defenses.

baloney suggest "periodical"

non-stories about - talk to the EM about this.

* * * * *

Even with the advanced methods of chemical protection now available, a sufficiently determined chemical attack will still make an impact, both in terms of casualties among troops caught off guard or with defective or improperly used protective equipment and also in terms of the degradation of mission performance imposed by the protective measures themselves. But the better the protective stance of a fighting unit, the less economical will the use against it of chemical weapons become in comparison with other weapons. For casualty production, the principal non-nuclear competitors with non-persistent agents such as sarin are flame and airburst high-explosive or fragmentation munitions against troops in the open, and fuel-air explosives against dug-in troops; competitive with persistent agents such as VX for area-denial are

depend on the chance to which are chemical & together.

the many varieties of scatterable mine. Though side-by-side comparisons of these different munitions have not, apparently, been undertaken in any great detail, the existing munitions expenditure tables for each one provide a rough guide. While for unprotected or unprepared troops the casualty effects of chemical weapons can be competitive with conventional weapons, this is not so for the attack of prepared troops with good anti-chemical protection. Moreover, it must also be taken into account that, at least for NATO, resources devoted to chemical weapons contribute nothing to combat capability unless the other side chooses to use chemicals first.

new OR systems are now making these comparisons

On pp 1, 8, 9, you clearly minimize negative effect of protective gear.

True but they may also contribute as well

Considerably more difficult to assess than the casualty effects of chemical weapons is the degree to which anti-chemical protection degrades mission performance. Large-scale controlled experiments adequately designed to provide the necessary data have only recently commenced in the United States. There is bound to be some degradation, and for some missions it will be worse than others. Current estimates range from near-zero, as in a recent British exercise at an air base in Germany measuring tactical aircraft turn-around times with the air and ground crews in full protection, to upwards of 30 percent for some unspecified types of front-line mission cited in Defense Department testimony before the U.S. Congress.

Data does exist, and as you note it is mixed esp. bad for close air support.

Because the civilian population is unlikely to be provided with protective equipment and trained in its use to the same extent as combat units, noncombatants stand to suffer more severely from the effects of chemical attack. Existing chemical weapons are not designed for strategic purposes and military doctrine does not envisage intentional chemical attack of civilians. ~~But~~ clouds of nerve-gas vapor or aerosol may drift long distances downwind of a battlefield before becoming harmless, and terrain contaminated by low-volatility nerve gases may remain hazardous long after fighting in the region has ceased. Battlefield chemical weapons thus carry with them an immense potential for collateral damage

Nonetheless, the inherently non-discriminatory nature of CW weapons is clear.

in terms of civilian casualties. It may be estimated that on-target sarin contamination intended to cause 20 percent casualties among soldiers carrying, but not at first wearing, respirators, could, under weather conditions that occur frequently in central Germany, seriously endanger unprotected people living up to 50 km or more downwind. Civilian casualties on the order of millions could result from battlefield chemical warfare in Europe.

Comparison with ERW meaningful?

* * * * *

Quite apart from the purely military factors determining the utility of chemical weapons, there are, within NATO, major political and policy considerations limiting their deployment and use. The United States and France are alone among the NATO allies in possessing them. Britain and Canada have renounced them for the time being and disposed of their stocks, their decisions in this regard no doubt having been eased by the existence of the U.S. nerve-gas capability. (Italy (like Bulgaria, Hungary and Rumania in the Warsaw Pact) is under international treaty constraints limiting acquisition of chemical weapons. West Germany, also restricted by treaty, has renounced them altogether in perpetuity, and, as the sole European repository of U.S. stocks, is a reluctant host. In an official White Paper, the Federal Armed Forces have disavowed any intention both now and in the future of seeking access to the stocks or of training combat units in the use of chemical weapons.

*capability was high by
responsible even for bulk
reference*

Thus, in contrast to attitudes on antichemical protection, there is wide disparity between NATO governments on the desirability of possessing chemical retaliatory capability. The arguments advanced for doing so are somewhat different, according to whether it is supposed that the Soviets will use chemicals in an otherwise conventional war or if instead theater nuclear weapons are also in use. In the event of a major Soviet conventional attack on Europe, a NATO capability for retaliating in kind is seen as an important,

yet minimally escalatory, deterrent against Soviet initiation of chemical warfare. It is considered that NATO retaliation would be seen by the Soviets as substantially offsetting any gain from their use of chemicals. Moreover, since such a NATO response would be only a continuation of what the enemy had started, the NATO retaliatory threat would be credible where the much more escalatory threat of nuclear retaliation might be less so. (It is further argued that if deterrence fails, NATO can discourage escalation of the extent and intensity of the use of chemicals and possibly bring it to an end by being able to use its chemicals to match the effect of Soviet chemical strikes at each level, both on the battlefield and in rear support areas.) U.S. chemical weapons doctrine promulgates these ideas in current field manuals as follows:

needs rewriting for clarity

The objective of U.S. policy is to deter the use of chemical weapons by other nations. If this deterrence fails, and the use of chemical weapons is authorized by national command authorities, the primary objective is to achieve early termination of chemical warfare operations at the lowest level of intensity.

Under the different presumption that theater nuclear weapons are already in use, the anti-escalation benefits seen for a chemical retaliatory capability largely disappear. The utility of chemical retaliation would then hinge on its battlefield effectiveness in inflicting casualties and imposing delays on enemy military units.

burdens of countermeasures would none the less be important in slowing down WP forces

These views in support of NATO having chemical weapons have encountered criticism both in terms of immediate military effectiveness and in relation to broader strategic questions. If the Soviets were to use chemical weapons in support of a conventional offensive, NATO retaliation in kind at the same level would compel Soviet forces to adopt more stringent antichemical precautions than their own chemical attack had necessitated. While this might or

might not have some significance in determining overall outcome, its possibility would hardly be likely, it is argued, to be seen by the Soviets as offsetting the immediate gains that resort to chemicals could promise. An initial chemical strike, in contrast to retaliatory ones, might have substantial probability of catching opposing forces at a low level of antichemical protection and would hold out a correspondingly greater prospect of major tactical impact. It is therefore maintained that NATO's chemical weapons would add little to the deterrence of chemical warfare unless the retaliation threatened were highly escalatory: heavy enough to overwhelm Soviet front line protection or deep enough to reach targets in the Soviet rear whose protectedness would intrinsically be low. But serious liabilities for NATO are seen to be attached to such a response, reducing its credibility. Extension or intensification of the chemical battlefield could slow NATO counter-offensives and greatly increase civilian casualties. Long-range chemical attacks could precipitate escalatory responses of a kind that NATO might prefer to avoid or to preserve as its own initiative. The retaliatory options available in a chemical capability of such a kind would, in terms of potential target effects, overlap those at present afforded by NATO's theater nuclear weapons ^{so} ~~that~~ its deployment could be perceived by the Soviets as a sign of diminished nuclear resolve. Increased capacity for deterring Soviet chemical attack ^{through inkind retaliation} could then carry a cost of reduced capacity for deterring war itself.

not necessary - over

Thus

As it happens, these latter considerations are, for the present, largely academic since the chemical weapons which NATO has available in Europe are sufficient only for relatively small-scale and localized retaliation. The leading NATO allies have made it clear that they are unwilling to countenance any expansion of the stocks, whether through procurement actions of their own or by expanding the chemical depot facilities available to the United States. Domestic political considerations and concern for the hazard to civilian populations have been influential,

marginal at best - wrong weapons, wrong location

but it is also recognized that the resources needed to expand and modernize the NATO stocks--in money terms, on the order of some billions of dollars--would represent a substantial drain on other NATO programs, such as the present upgrading of conventional capabilities.

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Maintaining a chemical retaliatory capability and entering into a chemical arms limitation agreement are alternative approaches to the same objective--the minimization of the threat posed by adversary chemical weapons. Only arms limitation, however, seeks to remove the opponent's weapons and to reverse the usual cycle whereby the military programs of one side act to drive those of the other. And only arms limitation addresses the problem of the possible proliferation of chemical weapons to conflicts and confrontations between parties other than the NATO and Warsaw Pact countries. Both approaches entail risks. Maintaining chemical weapons perpetuates and may augment the already existing threat. Entering into an arms limitation agreement ^{lacking assured verification} may, in the worst case, expose us to a similar threat while denying us a chemical capability of our own. Both approaches are subject to important political constraints, quite apart from the constraints imposed by the purely military strengths and weaknesses of the weapons themselves. On the one hand, there are political limits to the measures attainable for verification of compliance with an agreement. On the other hand, there are political constraints on the nature and effectiveness of the chemical retaliatory force we can maintain. These are rooted not only in public opinion, but also in the deeper national defense policy of key NATO allies, such as the Federal Republic of Germany.

But there are two essential factors that allow NATO considerable flexibility in shaping its policy for chemical weapons. One of these factors is the greatly improved chemical protective

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posture now coming into being in Europe. This sharply limits the threat to NATO forces posed by Warsaw Pact chemical weapons--both in the present situation and also in the environment of an arms limitation agreement, should the other side retain or produce chemical weapons in violation of the agreement. The other factor allowing flexibility in NATO policy making is the wide range of modern conventional and nuclear weapons which overlap and overshadow the capabilities of chemicals, both for deterrence and for combat. These considerations help to set the boundary conditions within which the current U.S.-Soviet talks on chemical disarmament proceed.

At the Moscow summit meeting of July 1974, President Nixon and General Secretary Brezhnev declared they had agreed to consider a joint initiative on the prohibition of chemical weapons. This was reaffirmed by President Ford and Brezhnev at Vladivostok the following November, and led in August 1976 to the start of the U.S.-Soviet negotiations in Geneva. By the end of the tenth round of the talks, in August 1979, agreement had been reached that both lethal and incapacitating chemical weapons should be included within the scope of a chemical weapons convention, and that highly toxic chemicals and precursors of types and in quantities having no justification for purposes other than chemical warfare should also be prohibited, subject to certain additional criteria intended to facilitate verification. It is also agreed that, upon ratifying the convention, states should declare their chemical weapons stockpiles and means of production, and that verification of their elimination within a specified period should be based on a combination of national and international measures, including a provision for requesting on-site inspection to investigate suspected violations. While these agreements represent substantial progress, critical negotiations still lie ahead. ⁶ ~~for~~ Little agreement has yet been reached on the particular information to be provided in the required declarations or on the pivotal issue of specific methods for verifying the destruction of chemical weapons and the elimination of production facilities.

Already existing means of surveillance, comprising a variety of intelligence gathering and evaluation procedures, possess

an important if limited ability to detect chemical warfare activities in the Warsaw Pact area. According to statements by U.S. officials, forward deployment of chemical weapons can be detected with some confidence, while the production and maintenance of stocks inside the Soviet Union are more difficult to determine. National verification procedures by themselves are not considered by the U.S. and other NATO countries to be adequate for monitoring compliance with a chemical disarmament treaty. (Neither is it considered necessary however, that a verification system be able to detect all of the activities and facilities that go into creating or maintaining a chemical warfare establishment.) What is required is a high likelihood of detecting chemical warfare preparations on a scale large enough to constitute a major military threat. It is important to note in this regard that the effectiveness of verification measures--both national and international--is enhanced by a high level of chemical defense. Good defense greatly raises the scale of chemical warfare preparation needed to constitute a major military threat, making concealment more difficult and intrusive inspection less necessary.

Though there is wide divergence between the approaches of the United States and the Soviet Union to problems of verification, the concepts of declaring weapons and means of production and of using a combination of national and international measures to verify their elimination might provide the basis of a convention acceptable to both sides. One approach for the verified destruction of declared weapons and chemicals would be to transport them to one or a few sites chosen by the possessor, where destruction would be carried out under international observation. Even with automated disposal techniques, this process would require several years, during which the participants might take various measures to assure themselves that the agreement was being implemented as expected. The elimination of declared production facilities could, generally be monitored by remote means, without requiring on-site observers. These procedures would guarantee the elimination of large quantities of chemical weapons and the destruction of sizeable production facilities. The problem of verifying the absence of undeclared stocks or facilities

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could be addressed by providing limited but carefully designed measures for on-site inspection where national means had indicated questionable activities.

The search for political accommodation within these and the various other possibilities that can be conceived for a chemical arms limitation agreement has developed a pace of its own, one which is governed, however, by inflexions in the broader course of international relations. The tri-lateral U.S.-Soviet-British negotiations on a comprehensive nuclear test ban, for example, could prove rate-determining for the chemical negotiations through precedents which they may set as regards on-site inspection. Should the United States and the Soviet Union come to terms on chemical warfare, the next step would be to present a proposal for a multilateral agreement to the Geneva disarmament conference. The exploratory negotiations and technical study which have been continuing there for the past eleven years could then finally result in a chemical weapons treaty with wide international support. But it will clearly be some while yet before the ultimate success or failure of these endeavors becomes apparent.

*Do you want to say something about the
women from Geneva*~~ed~~* by* the Japanese of
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What is at stake in the negotiations goes beyond the problem of dealing with the threats which chemical weapons may now present to the security of nations. We have entered a period of rapid and accelerating understanding of the fundamental biochemical and cellular processes of life. As this knowledge expands, so too will the range of its possible applications for good and ill. Over the long term, the existence of a chemical disarmament agreement alongside the present biological one could allow establishment of the principle that our increasingly profound knowledge of life processes be directed solely to beneficial purposes.

Figures and Photographs

- US (or UK) infantryman wearing gas mask and protective suit.
- Soviet troops wearing protective equipment.
- Anti-chemical defense measures at an RAF base in Germany during Exercise Mini Val, a tactical exercise designed to evaluate the working efficiency of an air base while under attack.
- Graph showing annual US expenditures for anti-chemical defense.
- Cut away views of binary and non-binary sarin 155-mm artillery projectiles.
- Stocks of chemical weapons and bulk agent at Tooele, Utah.
- Map showing hazard downwind of possible chemical warfare targets in West Germany.
- Table comparing performance of conventional and nerve gas artillery.
- Chemical weapons disposal facility at Tooele, Utah.
- U.S.-Soviet negotiations on chemical arms limitation in Geneva.

or

Chart showing possible steps in the implementation of a chemical weapons ban.