..... AN AMERICAN JOURNAL OF CIVIL DEFENSE



VOL. 2 NO. 5

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See: "Primer of Biological Weapons" – Page 7



Also in this issue:

Soviet Civil Defense Instruction in Grades Five, Six and Seven

- by Joanne Levey Gailar

Sweat, Smoke and Hard Work -Swedish Civil Defense Training

- by Sven Jardestål

CIVIL DEFENSE FORUM

OAK RIDGE CIVIL DEFENSE SOCIETY

ASSOCIATION FOR COMMUNITY-WIDE PROTECTION FROM NUCLEAR ATTACK "The need for an effective Civil Defense is surely beyond dispute... No city, no family nor any honorable man or woman can repudiate this duty..."

-Sir Winston Churchill

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COVER PICTURE



Beauty under the microscope can also be deadly. Here a group of disease germs (pseudohyphae and blastospores of *Candida albicans*) form a lattice work of color. See "Primer of Biological Weapons", page 7.

SURVIVE

... AN AMERICAN JOURNAL OF CIVIL DEFENSE

Sponsored by

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READER COMMENT

Buffalo, New York

To: Survive

Having given the question of the installation of an ABM system considerable thought I feel it my duty to express myself definitely in its favor both as a citizen and also as one who has had a connection with nuclear armament and operational analysis concerned with warfare. It is my opinion, furthermore, that to let ourselves be inferior to the U.S.S.R. in any matter pertaining to defense against nuclear attack is utter folly.

I hear and read arguments by the opposing side to the effect that to have such a defense could only lead to the improvement of the U.S.S.R. missiles and that we cannot be sure that our ABM installations will work. But similarly it could be said during World War II that building bigger and better tanks would only lead to the Germans coming at us with bigger and better antitank guns or that protection of our destroyers by better artillery fire could only lead to better bombing techniques on the part of the Japanese. And who could be sure beforehand that any of the new devices would work perfectly? Clearly to every measure there is a counter measure. All of us concerned with the evaluation of the effectiveness of various types of armament during World War II knew that. But we also knew that suitable measures on our part could make the enemy's position difficult.

Similarly in the present case it may be impossible for us to construct an ABM system functioning perfectly. But there is little doubt regarding the possibility of building one that will decrease the effectiveness of the enemy's missiles markedly, or else will keep him busy trying to develop missiles capable of delivering a lethal blow in spite of our defense.

Gregory Breit

(Dr. Breit has done extensive work on mine detection equipment, in nuclear research, and in anti-aircraft weapons development. He is at present with the State University of New York at Buffalo with the title of Distinguished Professor of Physics and also has the title of Donner Professor Emeritus at Yale University where he reached the statutory retirement age about a year ago. -Ed.)

Holtwood, Pennsylvania

To: Survive

Survive is of much interest to me. However, I believe that you and others have the wrong approach to public acceptance.

The greatest obstacle to civil defense is public apathy and hostility. Despite claims to the contrary, I believe there is massive public resistance. "Civil Defense" recalls the confused and panicky days of 1960/61 – the days of makeshift home shelters, interstate quarrels, community bickering.

I urge, therefore, that the term "Civil Defense" be changed to CONTINENTAL DEFENSE (also CD). This new term implies that passive defense, like active defense, is a responsibility of the Department of Defense, with the same priority, professionalism, and dedication as active defense. National defense is indivisible. The responsibility should not be scattered among states, communities, and individuals.

The term CONTINENTAL DEFENSE will have readier public acceptance, for it means defense of our homeland against possible invasion. It should appeal to young protestors. It is something in which they can contribute directly to the saving of millions of lives.

I should like to see the slogan on your front cover changed to read "An American Journal of Continental Defense."

In Hawaii, Puerto Rico, Virgin Islands, etc., the term would still be "Civil Defense."

Also, by "passive defense" I mean essentially an adequate shelter program.

> John D. Kenderdine Colonel AUS, Retired (Hon)

> > Kansas State University Manhattan, Kansas

To: Survive

Wouldn't it be an eye-opener to many, if every American could read and *fully understand* Mrs. Joanne Levey's article in the March-April issue of *Survive*? This article is obviously well documented and proof of Soviet action. Anti-civil defense people in the United States who argue that we do nothing to show good faith to an enemy are not realistic. Would these same people leave all their valuables on the front lawn unattended and expect thieves to ignore them? Would they leave their children unprotected in an area where crime and violence occur regularly?

To ignore civil defense and even an ABM system, is ignoring responsibility. How can they guarantee survival of our country? From actions of some, I firmly believe a small, but loud, group of people do not want us to survive. To those who argue that shelters have no value, I would ask why a controlled society like Russia has spent so much time and money on shelters and elaborate training. Every U.S. citizen has a duty to study the nuclear threat and not just to accept statements without supporting facts.

Everyone has a right to opinion, but some liberal writers go beyond opinion when they recommend that I do not have a chance for survival through an adequate civil defense program.

Elwyn S. Holmes

SOVIET CIVIL DEFENSE INSTRUCTION IN GRADES FIVE, SIX AND SEVEN^{*}

- by Joanne Levey Gailar

Russian school children get an early and practical indoctrination in modern weaponry, its effects, and defenses against it. Effective Civil Defense planning east of the Iron Curtain thus becomes part of growing up, one of the basic responsibilities of citizenship.

Compulsory Civil Defense Instruction

Of the Soviet Union's forty-four million school children, prior to 1967 only the ninth graders received civil defense instruction. But with the passage of the Law on Universal Military Duty in October 1967, compulsory civil defense instruction was introduced into all fifth, sixth, and seventh grades.

Thoughtful evaluation of the program during its first year has already resulted in a shift to a new civil defense curriculum during the 1968-1969 school term. The emphasis of the new program, which has been published in full and transmitted to the schools in time for the 1968-1969 school year, is on continuity and increasing complexity. Thus, while the same general subjects are taught each year, they are approached with greater depth as the child advances from grade to grade. Just what do the children learn during the total fortyfive hours of training they receive in the fifth, sixth, and seventh grades? Instruction each year covers four major topics: 1

- (1) Weapons of mass destruction,
- (2) Means of defense against these weapons,
- (3) Rules governing the responses of the population during threat of attack and upon hearing the civil defense warning signals, and
- (4) Administration of first aid.

Weapons of Mass Destruction

All lectures on the first subject, methods of mass destruction, are accompanied by posters or film strips. Fifth graders receive only general information on nuclear weapons, such as the appearance of a nuclear weapon and how to defend against one. More detail is given about chem-

^{*}Research sponsored by the United States Atomic Energy Commission under contract with the Union Carbide Corporation.

SOVIET CIVIL DEFENSE INSTRUCTION

	5th GRADE	6th GRADE	7th GRADE
WEAPONS OF MASS DESTRUCTION	Nuclear Weapons Charactersitics Chemical Weapons Characteristics Defense Capabilities	Effects of Nuclear Weapons: Blast Heat Radiation Effects of Chemical Agents Introduction to Biological Warfare	Nuclear Weapon Yields Effects Related to: People Animals Structures Effects Related to: Terrain Weather Distance from Ground Zero
MEANS OF DEFENSE	Shelters: Types Purpose Design Equipment Gas Masks: Assembly Packing Checking Storage Shelter Exercises	Shelters: Filter—Ventilation Systems Entrances Emergency Exits Gas Masks: Use Size Shelter Exercises	Shelters: In Basements In Cellars In Homes Expedient Gas Masks: Use on Injured Use of Damaged Masks Shelter Exercises
BEHAVIOR WHEN ATTACK THREATENS	Basic Shelter Conduct Warning Methods Warning Responses: At Home In School In Public Areas	Measures Required for: Threat of Radioactivity Presence of Radioactivity Chemical Attack Evacuation Emergency Build Up Period: Preparation of Hasty Shelters Protection of Food & Water Fire Prevention	Exercises in Response to: Nuclear & Chemical Emergency Situations Behavior Patterns: Biological Warfare Situations Quarantine Procedures of Contaminated Areas
FIRST AID IN EMERGENCIES	Familiarization with school Medical Aid Post Use of: First Aid Kits Stretchers	Practical Work: Bandaging Tourniquets	Practical Work: Splints Burns Shock Heat Stroke Artificial Respiration Movement of Injured Treatment of Radiation Casualties

ical weapons — the ways in which they penetrate the human organism and the means of protection against toxic substances.

Upon arrival in sixth grade, the children's knowledge of nuclear explosions is expanded through descriptions of such weapons effects as blast waves, thermal radiation, penetrating radiation, and fallout and through delineation of the injurious effects on people, animals, and buildings. Their understanding of toxic substances is enlarged when they are taught how to classify these substances according to their effect on the human organism: convulsant gases (V-gases, sarin), vesicants (mustard gas), systemic poison gas (hydrocyanic acid), and choking gas (phosgene). Sixth graders are introduced to biological weapons and to the pathogenic microbes (bacteria, viruses, Rickettsia, fungi) and the toxins excreted by certain bacteria which provide the means of the biological weapons. Protection against both toxic and bacterial substances is part of the curriculum.

When these students reach seventh grade, their knowledge of nuclear weapons is further refined by information on their effects on people, animals, and structures in relation to the type and yield of the explosion, its distance from ground zero, the nature of the terrain, and even weather conditions.

Means of Defense

Under the second broad subject, means of defense, fifth graders are introduced to the gas mask, which they learn how to assemble, check, pack, and store. Sixth graders are taught how to use the gas mask and how to determine the required size. Seventh graders learn the more complicated procedure of putting the gas mask on an injured person and ways of using a damaged gas mask.

Children in all three grades are given first-hand experience with shelters through exercises in them. Fifth graders are instructed in the purpose and types of shelters, their overall design, the equipment they contain, and how to behave in them. Sixth graders are introduced to the filter-ventilation system of the shelter, the entrance, and the emergency exit. And seventh graders are taught, step by step, how to adapt homes, basements, and cellars for use as shelter.

Behavior When Attack Threatens

On the third topic, rules governing behavior and actions of the population during threat of attack and in response to the civil defense signals, fifth grade children are simply taught the methods of warning the population and the action to be taken in response to the air raid signal under various conditions — at home, in school, on the street, and in public places. Sixth graders learn how to respond not only to the air raid alarm and the all clear, but also to the warning signals indicating the threat of radioactive contamination, the presence of radioactive contamination, and chemical attack. In addition, their instruction encompasses the basic measures conducted during periods of crisis escalation, including the evacuation of the population from large cities, preparation of hasty shelters, fire prevention measures, and the protection of food and water.

Seventh graders take part in actual exercises designed to train them how to respond to the warning signals for air raids, radioactive contamination, and chemical attack and are taught by means of lectures and film strips the appropriate behavior during warning of bacteriological contamination and during quarantine of a contaminated area.

First Aid

The same procedure of increasing the complexity of the material as the child progresses from grade to grade applies to the fourth and last broad subject taught under the new program: first aid. Fifth graders are shown the medical aid post in their schools and acquainted with such equipment as first aid kits and stretchers. Sixth graders are given instruction with exercises in methods of stopping bleeding and applying bandages, and seventh graders are taught first aid techniques in cases of fractures, sprain, and other injuries. They learn ways of making splints out of handy materials; first aid techniques in cases of burns, traumatic shock, and heat stroke; and methods of administering artificial respiration, including Silvester's, Shafer's, Kallistov's, and Nielsen's, as well as mouth-to-mouth breathing. They are also taught methods of moving seriously injured people and extending aid to those affected by radioactive or toxic substances.

Steps to Improve the Program

There is an unmistakable earnestness on the part of the Soviets to instruct their school children in civil defense: they not only want to do it; they want to do it well. Many articles have been written about the program in its first year and many letters received from parents with criticism and suggestions.² The Soviets make no claims of perfection for the first year of the program. On the contrary, they are quick to point out the flaws and to try to eliminate them. They freely admit, for instance, that the quality of instruction suffered because of untrained teachers, lack of civil defense equipment, inadequate visual aids, and uncertainty over how best to fit civil defense instruction into the school schedule.

These difficulties, however, neither surprise nor dismay them: they simply recall that until 1967 their eight-year schools had no equipment (gas masks, respirators) or training aids (slides, posters) for civil defense, and their teachers no instruction in how to teach it. What *is* impressive is the progress made in one year's time in resolving these problems. Already the decision has been adopted to train all fifth through seventh grade teachers in a thirty-five hour training course. It has further been established that the best time to teach the children civil defense is during the fifth or sixth period — outside of the hours allotted to academic subjects, but within the daily school schedule, because it is strongly felt that inclusion of civil defense classes serves as a "disciplinary measure for the students and influences their attitude toward the subject." There have been substantial efforts to supply the schools with the necessary civil defense equipment. By now all schools, according to regulations, have a central supply of gas masks, respirators, first aid kits, and stretchers. Other materials either presently supplied to the schools or to be supplied shortly include:

- (1) Two or three sets of teaching manuals for training fifth, sixth, and seventh graders,
- (2) The handbook What Everyone Should Know,
- (3) A set of posters including ninety photographs, each with fifteen stands, to accompany the handbook *What Everyone Should Know*.
- (4) Twenty film strips created for the schools with such titles as: "What Must Be Known About Nuclear Weapons," "How to Act when Attack Is Threatened," "Know How to Use the Gas Mask," "It is Possible to Avoid Injury," and "If the Alarm Should Be Sounded."

Skillfully organized competitions and games are suggested to spur the children's interest, help to consolidate the knowledge gained in the classroom, and enable them to perfect their experience in using gas masks, responding to the civil defense signals, and administering first aid.

Teachers may or may not heed such suggestions to enlist the interest of their students. They doubtless have at least some leeway in choosing their methods of instruction. However, there is no question that Soviet school children in grades five, six, and seven are being shown the means and methods of defense against nuclear weapons, that their teachers are being trained to teach them or that their classrooms are equipped with gas masks, respirators, and first aid equipment. These are all facts attesting to the earnestness of the Soviet civil defense effort.

References

¹ "Secondary School Civil Defense Curriculum" (originally entitled "Civil Defense Training Program for Students in the Fifth, Sixth, and Seventh Grades of the Eight-Year and Secondary General Educational Schools"), *Voyennyye Znaniya (Military Science)*, No. 9 (Moscow, 1968), 26-27, JPRS 46, 811, Soviet Military Translations No. 487 (6 November 1968, 40-46.)

²A. A. Sychev, "Civil Defense Training in Secondary Schools" (originally entitled "Study and Expand Experience"), *Voyennyye Znaniya (Military Science)*, No. 9 (Moscow, 1968), 12-13, JPRS 46, 811, Soviet Military Translations No. 487 (6 November 1968), 14-19.



ACTION AND REACTION - by Herb Sawyer

HEADLINES THAT WEREN'T

SOVIET'S TOTAL MISSILE EXPLOSIVE POWER FOUR TIMES THAT OF U.S.

PENTAGON REJECTS IDEA OF PROTECTING CITIES FROM RUSSIAN NUCLEAR ATTACK

Although Survive is sent to many news editors, to our knowledge none caught facts in the last issue (July-August) summarized by the headlines above - headlines which could, or should, do as much to startle Americans into revising our national priorities as Sputnik did in 1957. The superior power and blast-damage potential of Soviet missiles was delineated by Dr. Eugene P. Wigner on page 16, and Deputy Secretary of Defense Packard's testimony to Congress on the policy of holding our city people hostage to war was quoted by Dr. Arthur A. Broyles on page 9.

In allowing, through the years, these headlines to become true, surely our national leaders thought their policies were furthering the cause of peace. But, ironically, unless Americans awake to these facts, peace cannot last long. It takes no expert to predict what will happen when, of two antagonists, one (with a history of opportunistic aggression) has a superior offense and a vastly superior civil defense and knows it, while the other, ignorant of his inferiority, behaves as if he has all the prerogatives of superiority.

For the sake of peace Americans must face these facts. Then they will either act with a subservience appropriate to their position as hostages, or they will act to restore the balance of power, especially with respect to civil defense.

Actually, subservient hostages will not preserve peace. First, it is unlikely that an authoritarian antagonist would grant America more mercy than republican Rome granted to subservient Carthage in 146 BC.

Furthermore, with more and more nations getting the "bomb", with time's subtle erosion of these nations' safety measures, and with history's continuous succession of these nations' rulers, varying from benevolent to malevolent, a firing, accidental or purposeful, will come.

Then hostage America would be suicidal America. Worse, America in the throes of suicide would probably trigger world conflagration.

But with a facing of the facts and with a strong civil defense America and the world can rise above these dangers and gain time for establishing a durable peace.

EDITORIAL . .

(The following appeared recently in The Times of London, England. In January, 1968 British Civil Defense was in effect discontinued as an active government program.)

Civil Defense Is Necessary

"... Britain has less protection for the civil population in the event of war - and not only nuclear war - than any other European country. Yet as long as the Government goes on maintaining and operating nuclear weapons such as the Polaris and the V-force as part of the country's defense policy, it cannot logically dispense with the requirement for an active civil defense program as well.

"There would be no point in operating a nuclear force of our own if all our subsidiary policies and declarations utterly denied our willingness to use it in emergency. There would be no point in subscribing to an allied strategy - indeed in taking the initiative to get the alliance to adopt such a strategy - which is intended to demonstrate our willingness to face outright nuclear war, rather than surrender, when by their dismissal of the civil defense requirement the Government have already shown that they think the consequences of such an act would be suicide.

"The futility of devising such a nuclear policy without showing the slightest willingness to face up the the implications has been adequately criticized by Mr. Robert McNamara, who said: 'The threat of an incredible act is not an effective deterrent.' To a potential adversary, the threat to use nuclear weapons first would hardly be credible, when set against the obvious Government view that such a decision would be so calamitous that civil defense preparation would not be worth taking. This policy pre-supposes that although the Government's defense posture accepts the possibility of nuclear warfare, the Government nevertheless have no particular responsibility to the survivors of such an emergency – not even the limited and distant responsibility which could be met by the minimum organization of civil defense.

"By putting civil defense on a so-called 'care and maintenance' basis last year, the Government showed they were willing to condone a practical disuse, but did not have the courage to admit it, since if they had done so they would have destroyed most of the remaining credibility in their nuclear policy."

"A strong Civil Defense might prove an even greater deterrent to war than some of our most lethal weapons. The enemy's knowledge that much of our civilian population would survive would indicate to him the futility of aggression against us."

- Porter Hardy, former U.S. Congressman (Virginia)

PRIMER OF BIOLOGICAL WEAPONS^{*}

- by Conrad V. Chester

Effective defense against thermonuclear weapons can be achieved through a well dispersed system of shelters against blast and fallout. Such shelters have been the focus of much debate at all levels of government, and have been the subject of many articles in this Journal. Just how effectively can we defend against biological warfare? Are shelters of any value against such weapons? What are some of the facts concerning the effectiveness of biological warfare? This article is drawn from books on biological warfare by Rothschild and Clarke^{7, 1} and other references $3 \cdot It$ deals with the civilian population under overt biological attack. Some reassuring conclusions can be drawn for a civilian population that is prepared.

A biological weapon is one that will produce a cloud or aerosol of live, infectious disease-producing organisms near the ground in the target area where they can be breathed by the target population. The most important route of infection is by inhalation of the pathogenic organisms. Contamination of water supplies and food sources is a theoretical possibility, but is not likely to be important on a large scale. Disease transmission by fomites, i. e. contaminated articles, food, or clothing, may become important for the production of secondary casualties under conditions expected in fallout or blast shelters, but it is not a likely choice as a means of attack. We are most concerned, therefore, with weapons designed to contaminate the air over heavily populated land areas.

Logistic Comparison

One of the most important properties of any weapon of mass destruction is the weight of active material required to produce casualties in some area, a square mile, for example. This weight becomes the dominating factor when different weapons are competing for space on expensive delivery systems, such as Intercontinental Ballistic Missiles, or ICBMs. For the Civil Defense planner, there are three classes of weapons of mass destruction to consider: thermonuclear, chemical, and biological. An estimate of the weight of destructive agent required to produce heavy casualties over a square mile of target can be calculated. Some comparative weights are shown in Table 1.

A one-megaton thermonuclear weapon burst at optimum altitude for maximum blast effect will produce 5 pounds per square inch or greater pressure and produce heavy casualties among unsheltered people over an area of about 60 square miles. If one assumes that a megaton weapon weighs one ton, then the weight required to attack this area is about 17,000 gm per square mile. This number should be used for comparison with the weights of chemical and biological agents in Table 1.

The thermonuclear weapon lies between the chemical agents and the biological agents in weight per square mile of target. This is not quite a fair comparison because the weight of the dispensing or dispersal system for the toxic weapons must be included, and account taken for the inefficiencies in the dispersal operations. A moderately efficient system might multiply the payload weights by as much as one hundred, which would still leave thermonuclear weapons between chemical and biological weapons.

*Research sponsored at the Oak Ridge National Laboratory by the U. S. Atomic Energy Commission under contract with the Union Carbide Corporation. Opinions in this article are the author's own and do not necessarily reflect those of the Oak Ridge National Laboratory or the U. S. Atomic Energy Commission.

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DISEASE	AGENT	INFECTIVITY VIA AEROSOL	VIABILITY OF AEROSOL	FATALITY RATE UNTREATED	
Anthrax	Bacillus anthracis bacterial spore	10,000 20,000 spores inhaled	Very durable	90 – 100%	:
Blastomycosis (South American)	Blastomyces brasiliensis fungal spore	Unknown Probably Iow	Durable	Usually fatal	
Cholera	Vibrio comma bacterium	Anomalously low	Probably rapid decay	10 - 80%	
Cryptococcosis	Cryptococcus neoformans fungal spore	Unknown Probably Iow	Very durable	Usually fatal	
Encephalitis, Japanese B	Virus	Unknown Probably high	Probably rapid decay	35 – 60%	
Encephalomyelitis Eastern Equine	Virus	Unknown Probably high	Probably rapid decay	65%	
Glanders	Malleomyces mallei bacterium	3200 organisms inhaled	Probably rapid decay	90 100%	
Meliodosis	Pseudomonas pseudomallei bacterium	Unknown	Unknown	95 – 100%	
Pneumonic Plague	Pasteurella pestis bacterium	High 3000 organisms	Rapid decay	95 – 100%	
Psittacosis	Virus	High	Probably slow decay	10%	
Rabies	Virus	Probably low	Probably rapid decay	100%	
Rocky Mountain Spotted Fever	Rickettsia rickettsii	High	Probably rapid decay	10 – 90%	
Shigellosis (Dysentery)	Shigella dysenteriae, Sh. flexnerii, Sh. Boydii bacteria	Anomalously low	Rapid decay	2 – 20%	
Smallpox	Virus	Very high Few organisms	Very slow decay	25 – 40%	
Tularemia	Pasteurella tularensis bacterium	Very high < 50 organisms	Rapid decay	5 – 8%	
Typhoid	Salmonella typhosa bacterium	Unknown	Very rapid decay	10%	
Typhus, Classical Epidemic	Rickettsia prowazeki	High	Unknown	10 – 40%	
Yellow Fever	Virus	High	Unknown	30 – 40%	T
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TES FOR LETHAL BW AGENTS

MAN-TO-MAN CONTAGIOUSNESS	VACCINE	TREATMENT	REMARKS
Normally low; Maybe high in shelters via fomites	Yes	Penicillin before symptoms appear	Spore is one of the hardiest organisms known
Very low	No	Difficult; Amphotericin B, Surgery	Slowly progressing fungus disease
Very high in shelters via fomites	Yes Short term	Supportive	Intestinal disease
Very low	No	Amphotericin B	Fungus with predilection for central nervous system
None	Yes	None Supportive	Usually permanent mental impairment in survivors
None	Yes	None Supportive	Few complete recoveries
Low	Unsatisfactory	ls doubtful Sulfadiazine	
Low	Unsatisfactory	ls doubtful	Little known disease
Very high in shelters	Good	Streptomycin + Sulfadiazine	''Black Plague'' of Middle Ages
High	Experimental	Tetracyclines are effective	
Normally low; Bizarre problem in shelter	Excellent	Hopeless once symptoms appear	Normally transmitted by bite
None	Good	Effective; Tetracyclines, Chloramphenicol	
Very high in shelters via fomites	None	Effective; Tetracyclines, Chloramphenicol Supportive	Similar to cholera
Very high among unvaccinated	Excellent	None Supportive	But for widespread vaccination, the perfect BW agent
Low	Yes	Effective Streptomycin	
Very high via fomites	Uncertain	Effective Chloramphenicol	
Normally none High via louse	Excellent	Effective; Chloramphenicol, Tetracycline	
None High via mosquitoes	Excellent	None	

LOGISTIC COMPARISON OF SOME CHEMICAL AND BIOLOGICAL AGENTS TO PRODUCE HEAVY CASUALTIES OVER 1 SQUARE MILE.

Grams Per Sq. Mile*

Thermonuclear Blast (Based on 1 Megaton Explosion)	17,000
Hydrogen Cyanide	3,200,000
Mustard Gas	3,200,000
GB Nerve Gas	800,000
Botulism Toxin	80
Anthrax Spores	8
Tularemia Bacterium	.0024
Psittacosis Virus	.0024

*Single line source, 5 mph night wind, strong inversion, population breathing rate at 10 litres per minute.

Furthermore, an attacker may desire the physical destruction of many target areas, such as manufacturing complexes. Only thermonuclear or other explosive weapons can serve this function. Finally, predictable destruction may be necessary regardless of the weather, and biological weapons may be quite inefficient under some meteorological conditions as will be discussed later.

The comparison might also be drawn between biological weapons and the fallout from a nuclear weapon, which might be lethal without shelter over 1000 square miles from a one-megaton weapon. This coverage is comparable on a weight of agent basis to biological systems under optimum conditions.

Two important points come from these numbers. One is the obvious conclusion that chemical weapons are very unlikely to be used on any large scale against the continental U. S. because of the weights required. The other point, not generally appreciated, is that there is the same decrease in weight of weapon in going from chemical to comparable biological systems as there is in going from conventional to nuclear explosives.

Delivery Systems

While it is theoretically possible to deliver biological agents by ICBMs they present some severe disadvantages. Re-entry Vehicles (RVs) from an ICBM come in high, fast, and impact at a point. Some type of bomblet and dispensing system might be devised for attacking limited areas like a city, but for real area coverage, a long cloud of the agent should be generated on or very near the ground at a right angle to the wind in order that it will be blown across the target. This cloud, called a line source, would be very difficult and expensive to generate with an RV.

A much more efficient method would be to fit spray tanks containing a liquid suspension of the agent to aircraft, which could very conveniently disperse the agent while flying "on the deck" to avoid the local air defense radar and interceptors. A bomber such as the B-52 or the Russian "Bear" could carry several thousand pounds of biological agent. It would not take very many such flights to cover all the significant populated areas of the U. S.

The argument that aircraft are obsolete is premature. Even an undamaged air defense system will let some through, and an air defense that has been carefully targeted by thermonuclear ICBMs before the arrival of the aircraft will let very many more through.

Meteorology and Area Coverage

A long line source of biological aerosol drifting with the wind will lose its virulence through the processes of decay and dilution. Decay is the death or inactivation of the organisms due to exposure to the atmosphere and, in the daytime, sunlight. Sunlight will kill most organisms in minutes, and the arrival of daylight will end the effective life of a cloud of biological agent.

Vertical dilution is the mixing of the cloud with higher layers of air, carrying organisms up where they cannot be breathed. Horizontal dilution in the direction of travel has little effect on the cloud, as the decrease in concentration caused by this dilution is cancelled by the longer time the victims are exposed to the spread out cloud.

The diffusion of clouds or aerosols in the atmosphere is a subject that has been and is being studied extensively. A number of mathematical models of the process have been devised using empirical constants to fit the model to experimental observation. We have chosen that of Pasquill⁶ for this discussion.

Using Pasquill's equations, it is possible to calculate the dosage (product of concentration and time) to which a person will be exposed at a given distance from a given source under given conditions. Assuming the person's breathing rate, one can then calculate the dose absorbed by the person.

The source strength in grams per unit of source length is normalized to a one-mph wind at right angles to the cloud. If the wind is higher, the strength of the source must be increased proportionally to maintain the same normalized dose. This procedure is required to compensate for the shorter time a faster moving cloud is over the target. Downwind ranges of a given total dosage can then be determined for various atmospheric stability conditions.

The neutral atmosphere, common on cloudy days, refers to the condition when the temperature variation with height coincides with the adiabatic lapse rate, that is, the temperature change that an insulated parcel of air would experience expanding adiabatically from ground conditions to the pressure at any given height. In the inversion condition, the air temperatures at increasing height are higher than this (2°F higher at 4 meters for a strong inversion) and a parcel of ground air raised to greater height would find itself at a lower temperature than surrounding air, and due to greater density it would tend to subside to its original altitude. This is the condition of stability of the atmosphere, and is common on clear nights. Aerosol clouds at ground level do relatively little vertical mixing under such conditions, and can travel great distances with little dilution.

Just the opposite is true of the lapse condition. The air is cooler than the adiabatic lapse rate and an element of air once started up will continue to rise. This condition is common on sunny days.

An example of the data that can be derived using Pasquill's equations is shown in Table 2. The effective range of a normalized source of 100 grams per mile (per mile per hour wind velocity) of virulent anthrax is set forth for various atmospheric conditions. An infective dose of this agent is considered to be less than 10^4 spores or 10^{-8} grams, according to Heden³.

The significance of this example is more apparent when it is added that the source strength stated (100 gm/mi/mph) can be obtained by dispensing a pound of anthrax spores per mile of aircraft travel in a 5 mph crosswind, or three pounds per mile in a 15 mph crosswind. It should also be recognized that inversion conditions are not likely to persist

TABLE 2

Δ.

DOWNWIND RANGE OF INFECTIVE DOSE OF VIRULENT ANTHRAX NORMALIZED SOURCE 100 GRAM/MILE/MPH.

Atmospheric Stability	Infective Range in Miles	
Strong Lapse	0.6	
Moderate Lapse	1.5	
Neutral	45	
Moderate Inversion	200	
Strong Inversion	700	

for the periods of time required for a cloud to drift hundreds of miles.

Candidate Agents

As yet no one has been able to synthesize a completely new organism, let alone one that is pathogenic to man. For some time to come, we can expect that all candidates for biological weapons will be drawn from the ranks of the known diseases of man, barring the unlikely chance discovery of a new natural pathogen in some remote area of the world.

Organisms to qualify as biological weapons must be:

- (1) Highly infective;
- (2) Hardy enough to survive useful storage times (days), the dispersal process, and useful times after dispersal (hours);
- (3) Capable of large scale production; and
- (4) Capable of producing militarily useful symptoms in the target population.

In the case of a biological attack delivered in conjunction with a thermonuclear attack, the desired symptoms are rapid prostration followed by death. There would be no point in using incapacitating agents since the population is already incapacitated by being confined to shelters.

A list of the more lethal diseases is given in Table 3, along with their more important properties related to biological warfare.^{1,2,3,4,7} Of these, the pathogens of greatest concern to civil defense are the diseases likely to be man-to-man contagious under shelter conditions. To such well-known scourges as plague, smallpox, typhoid, cholera psittacosis, and shigellosis should be added anthrax, and glanders. While not normally considered man-to-man contagious, under shelter conditions they may transmit by fomites.

Defenses

A cloud of agent from a biological weapon is required by the nature of micro-organisms to be made up of solid particles, and by the human respiratory apparatus to lie within the one-to five-micron size range. Any method of removing these particles from inhaled air will protect people from biological weapons.

The simplest and most familiar device for this is the gas mask. When properly fitted and donned, it provides almost complete protection from biological weapons. An inexpensive (\$3.00) civilian model mask has been developed and tested by the Army, and pilot batches of a few thousand have been produced.

High-efficiency air filters can be installed on the inlet air supply to shelters for about \$7.50 per person under the

worst conditions. These filters eliminate the necessity of wearing masks in the shelter, especially at night, which is a great convenience for those trying to sleep.

Even with masks and a filtered air supply, it is quite likely that some casualties from biological weapons will occur in shelters. These will be among stragglers, persons with improperly fitted or damaged masks, and possibly persons having exposed wounds when the infective cloud passed. Thus the shelter population should be immunized against the lethal man-to-man contagious diseases. An immunization program, which should be an integral part of any shelter planning, would be an inexpensive (\$2.00/person) and very effective way to prevent the spread of most infections within the shelter.

Soviet officials take the threat of biological weapons very seriously. They apparently are deploying masks for their civilian population.⁵ They have a long-standing program of aerosol vaccine development directed toward mass immunization of their population. The existence of those masks and a large-scale immunization program is a much more effective deterrent to an enemy's use of strategic biological weapons than any retaliatory capability the Soviets have. They render biological payloads much less effective as casualty-producing systems than an equal weight of thermonuclear explosives. No strategic planner is going to allocate delivery space to a weapon system he knows in advance to be ineffective.

Of all the weapons of mass destruction, biological weapons are the cheapest and easiest to defend against. However the defenses take some time to deploy. If a crisis arises, a set of plans, no matter how cleverly drawn, is a very poor substitute for a defense in being.

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CD SPOTLIGHT



OCD Chief Davis Accents Local Focus

Recently appointed National Director of Civil Defense John E. Davis has a new approach: eyeball-to-eyeball contact with the local CD scene.

"I intend, as far as my duties in Washington permit," he announced in an address to the National Association of State Civil Defense Directors, "to go directly into our communities, to the people, with the message of Civil Defense."

Davis, World War II combat commander, South Dakota statesman, and American Legion stalwart, could in this way open promising possibilities. Local civil defense spectrums, too often sliced into departmentalized hunks up the line, may be in for teamwork treatment. At least, this is the view – the hope – of grass-roots observers.

A further indication of a freshened approach at the top is the Davis comment on shelter laws. "We need," he said, "legislation in every state to make shelter one of the primary considerations in the planning of public building programs."

In this way Davis appears to be batting in the same ball park with Congressman Charles E. Bennett (Florida), whose bill to require shelter in federal construction (H. R. 109, introduced January 3, 1969) is now pending. If supported by Davis, the present Bennett legislation would stand a much better chance of success than Bennett's 1967 shelter bill – H. R. 229 – which slowly died without being voted on. If enacted, the new Bennett bill will set an example that will give Director Davis the climate he may need to bring about widespread state shelter legislation.

American Medical Association Holds Disaster Medicine Conference

The Second Biennial Symposium on the Handling and Treatment of Mass Casualties will be held in Chicago on November 14-15, 1969. The symposium, planned by the Committee on Disaster Medical Care of the American Medical Association, will examine problems in the following areas:

> Sorting the Acutely Injured Shock and Ventilatory Dysfunction Fractures Soft Tissue and Vascular Injuries Injuries to the Brain and Spinal Cord Abdominal Injuries Management, Complications and Mismanagement of Trauma

Physicians who will serve on the symposium faculty include Dr. David G. Ashbaugh of the University of

Colorado, Dr. H. Thomas Ballantine, Jr., of the Massachusetts General Hospital, Dr. R. S. Bryan of the Mayo Clinic, Dr. John H. Davis of the University of Vermont, Dr. Roger T. Sherman of the University of Tennessee, and Dr. Preston A. Wade, President of the American College of Surgeons.

The symposium will take place at Chicago's Ambassador Hotel, and further information may be obtained from the Secretary, Committee on Disaster Medical Care, American Medical Association, 535 North Dearborn Street, Chicago, Illinois 60610.

AMVETS

AMVETS (American Veterans of World War II) supports civil defense to the point of actively campaigning throughout the nation for shelter in all new construction, the Community Shelter Planning Program, and disaster control training. National Commander Joseph V. Ferrino offers this capsule version of AMVETS CD policy:

> AMVETS, through its convention mandates, has always supported the concept of civilian preparedness, knowing full well the horrors of war and the suffering it can bring to all.

In this vein, AMVETS favors programs of civil defense on local, state and Federal levels and stands ready to participate in recognized programs of preparedness to protect ourselves, families and properties.

Each AMVET Post should serve as a community focal point in the dissemination of Civil Defense information and also possibly serve as community fallout shelters.

As National Commander, I cannot stress too much the importance of preparedness during times of apparent peace and normalcy in anticipation of conflict and disaster.

The presence of alert properly trained civil defense units in your community is your insurance of the availability of ready assistance in times of common disaster.

All AMVETS are urged to participate in Civil Defense Programs in their respective communities.

BOOK REVIEW

Survival and the Bomb

Survival and the Bomb, edited by Eugene P. Wigner (Indiana University Press, 307 pages, \$7.50, on sale September 8, 1969).

A clear and definitive book which examines civil defense from its many angles, answers the serious objections to it, bases its findings on fact and realism, and gives the reader a full exposure to the question of nuclear survival in concise, understandable style has been needed badly for years.

Survival and the Bomb is such a book. It is both a remarkably adequate introduction to the American civil defense dilemma and a stimulating review of vital civil defense issues. Eighteen of America's foremost authorities in their special fields combine years of exhaustive research and analysis in thirteen chapters which cover the latest information on weapons effects, survival techniques, public attitudes, psychological problems, and recovery planning.

For example, the eminent public opinion expert, Dr. Jiri Nehnevajsa, writes a fascinating treatise on what the American man-on-the-street thinks about nuclear war possibilities, disarmament and civil defense, and he presents these views with tables, breaking down to percentages the questions of possible causes of World War III, shelter effectiveness and disarmament. He finds the public to be sympathetic to civil defense. "The basic pattern," he writes, "indicates that the public essentially believes civil defense to be a government job which it approves of but which it does not want to manage. This may simply reflect a desire to avoid having to do anything, at least in the absence of an acute threat; it may mirror a public belief that the defense of the nation, after all, must be planned and implemented by the federal government and not by individual American families or even communities."

Psychologist Irving L. Janis dissects the problem of hysteria in catastrophe and stresses the value of planning and control. "Prior to World War II," he points out, "government circles in Britain believed that if their cities were subjected to heavy air raids a high percentage of the bombed civilian population would break down mentally and become chronically neurotic. This belief, based on predictions made by various specialists, proved to be a myth. Already there are some indications that a similar myth is beginning to develop with respect to future A-bomb attacks: the belief that the news of the first A-bomb attacks in this country will produce panic among the residents of unbombed metropolitan centers and industrial areas."

Francis S. Wagner (who wrote "Budapest Shelter –

World War II" in the May-June 1969 issue of *Survive*) supports the Janis contention with a first-hand account of human behavior during the year-long siege of Budapest in 1944-5. Harold L. Brode and John S. Newman shed fresh light on weapons effects, making particularly good use of entirely readable charts and tables (a characteristic of the entire book).

The coldly debated question of the cost-to-kill vs the cost-to-protect civilian populations is also evaluated. Several experts* who have studied the realities of this issue conclude that blast (and fallout) shelters can be justified in dollars and cents which would protect most of the population against heavy nuclear attack. That is, it would cost an enemy more to overcome these defenses than the shelters and supporting facilities would cost.

ABM, Decontamination, and Civil Defense Abroad are among the other subjects given the same readable and thorough treatment. Alvin M. Weinberg, Director of the Oak Ridge National Laboratory, concludes a jacket statement with this paragraph:

> Professor Wigner and his associates have written a scholarly and dispassionate book on civil defense, a subject that usually generates much passion and little scholarship. One cannot read *Survival and the Bomb* without concluding that most of the excuses, both social and technical, for not taking civil defense seriously are wrong. Perhaps this book will help set our country on a more reasonable course toward civil defense. Our children and grandchildren, who as a result might be spared the cataclysm of thermonuclear war, will thank Professor Wigner for setting us straight on this distasteful, but crucial, element of defense policy." (WM)

*Albert L. Latter, RAND Corporation
E. A. Martinelli, RAND Corporation
James C. Bresee, Project Director, Civil Defense Research Project, Oak Ridge National Laboratory
David L. Narver, Vice-President, Holmes & Narver, Inc.



Sweden looks back on over 150 years of peace and recognizes that its secret of success in remaining aloof to war is a tough "armed neutrality" posture which keeps would-be wolves at bay. A vital part of it is a civil defense posture that pushes odds for citizen survival so high that the country could roll with a nuclear punch and remain intact. Here a Swedish civil defense staff officer describes the type of rescue training that helps to make this concept possible.

SWEAT, SMOKE AND HARD WORK -

SWEDISH CIVIL DEFENSE TRAINING



At Rosersberg Castle, Sweden's Civil Defense Staff College and Training Center near the village of Rosersberg, all instruction focuses on a vital national objective: the defense of Sweden. Here civil defense organization, management and operations are geared to modern weaponry and are continuously revamped to keep pace with changes.

One chief concept is that civil defense units must be adequately equipped and thoroughly trained to meet and master nuclear attack situations. Well-defined rescue missions are assigned to specialized units, with each unit's training oriented to its particular emergency functions. In order to promote the best possible results – to reach stringent training goals – the faculty at Rosersberg is provided with the very best and latest theories in teaching techniques.

Full emphasis is placed on the proper design and construction of functional training aids and equipment, as well as upon their adaptation for different types of individual training and unit training. Rescue units undergoing instruction, for instance, are equipped with up-todate power tools such as pneumatic hand devices, power handsaws, gas-operated cutting equipment and jacks. Firefighting units are provided with late-model pumps, hoses and respirators.

A strict school policy is that no piece of equipment is ever considered to have been improved to perfection. All equipment is continuously revised and developed in pace with organizational and tactical changes and within the framework of technical and pedagogical evolution.

After individual training, during which the students learn how to handle their equipment, group exercises are staged in specially-constructed "ruined cities".

These "ruined cities" have underground shelters, some of them intact under the rubble, some of them partly demolished, all of them built according to regulations covering the construction of private shelters in Swedish population centers. Outside the shelters, usually above them, are special hazard locations which can be equipped with different sorts of obstacles so that rescue units – in a starkly realistic way – can with the aid of their equipment and proper team organization enter the shelters through utility conduits, walls, or blocked passages to help those trapped and to take care of the injured. Those "trapped" and "injured" in the shelters reach their previously assigned posts through small access tunnels which open in remote places just beyond the ruins. These people have become excellent actors who are skilled in simulating shock and are working to get into the shelters - is so intense that it is impossible for the rescuers to continue their work if the fire-fighting units do not screen off the working areas. This is done with wall sections and other appropriate material which can be found in the ruins. These expedients are hosed down continuously with water to keep them from



Entrance tunnels behind rubble of "ruined city" where professional "casualties" enter to assume pre-assigned roles as nuclear attack victims.

pain and are expertly made up to represent all types of casualties. They, too, are given special training in order that they can faithfully fulfill their roles as authentic casualties.

The shelters are well buried by the debris of collapsed buildings. The ruins contain all kinds of building materials, tangled wires and pipes, scattered household appliances,

cars and so on - just as it would be after an actual attack. This delays rescue activities and requires rescue team organization and the use of the special rescue equipment to get to the injured in the blocked shelters. It is a most difficult job.

In order to add the problem of fire to this situation and in order to give fire-fighting units an opportunity to participate in the exercise, oils and other good fuels are spotted through the ruins and ignited to represent a city on fire. Fire-fighting units work side blown over the entire training area.

The Rosersberg "ruined city" is no longer the only one in Sweden. Three others have been constructed, one at Tylosand, one at Katrineholm, and one at Nyadal. In the near future similar training facilities will be constructed at other locations. When civil defense is fully organized about



The day after a training exercise finds the "ruined city" a little more ruined than usual.

by side with rescue personnel. The situation forces the fire fighters to use most of their modern equipment so that they become accustomed to handling it. For this reason the fire situation is often exaggerated. The training is meant to be more rigorous than the real thing.

The heat from these many fires – especially the 1,000-liter oil drums which are ignited as the rescue units

100,000 Swedes in the local rescue and fire-fighting services, in the mobile disaster recovery units, and in industrial civil defense will have completed this same training at least once. They will also return from time to time for refresher courses.

It is no secret that should nuclear war ever affect Sweden, we Swedes will be trained to combat its effects.

burning. It is assumed for training purposes that the big fires are so strong that they cannot be extinguished. Technically speaking, of course, it would be possible to put them out.

Meanwhile, smaller fires are constantly being extinguished. In this kind of fire situation smoke can become very troublesome and can in some instances prevent the men from remaining in the area. To this is added the danger of carbon monoxide. In order to force the men to use respirators, oil smoke is

FOREIGN COMMENT

SOVIET COMMENT

(From "Civil Defense Stressed as Common Concern" by Marshal Vasili I. Chuikov, Chief of Soviet Civil Defense, appearing in Science and Life, a popular Soviet publication.)

"In our country, everything possible is being done to build reliable means enabling us to protect lives in a possible war. It is well known that the task of defense of the population can be accomplished by two methods – by evacuation and dispersal of the population out of the regions which would probably be struck by the enemy, or by sheltering them in special defense installations. There are no other possibilities, but even these two give us a huge advantage over other countries, especially those of Western Europe. Our country has lots of space and a developed transportation network, our cities are surrounded by ample green belts. All this enables us, on short notice, to take people out of the cities and regions which are probable targets for the enemy into rural locations and thus sharply reduce possible losses . . .

"Modern shelters are a reliable means of protecting people from weapons of mass destruction. They are designed for a definite pressure of the shock wave; they are equipped with ventilation with reliable filters, and are supplied with necessary provisions of foodstuffs, water, medications; they are capable of protecting people from all destructive factors of nuclear, chemical, and bacteriological weapons. In the case of threats of attack, underground garages, theaters, cafeterias and cafes, and other service installations located in the basements of buildings could be converted into such shelters. From this point of view, the creation of premises possessing such necessary general defensive or protective features quickly manifests itself as economical since it does not lay a heavy burden on the shoulders of the state and at the same time provides a real potential for protecting people remaining in the cities on work watch."

SWISS CD REEMPHASIZED . . .

(From Bulletin of the International Civil Defense Organization, Geneva, Switzerland)

In Switzerland... owners are obliged to install shelters in all new buildings, with anti-blast doors, emergency exits and if necessary, evacuation ways, artificial ventilation to renew and filter the air, as well as stocks of drinking water and food, first-aid material, and tools to clear a passage through ruins. The shelters must be built according to technical instructions, i.e. they must at least be able to stand up to the collapse of the building and not entail the risk of being flooded by water escaping from damaged pipes or a subterranean pool.

To cover the additional expenses arising from the construction and installation of shelters, the authorities (Federal Government, cantons and cities) grant subsidies which, in the Canton of Geneva, considered wealthy, amount to 70% allotted in the following way: 25% for the Federal Government and 45% for the canton and city together.

It is on this very matter of financing shelters that Mr. Gilbert Duboule, the President of the Geneva Cantonal Government, addressed a memorandum to the members of cantonal government responsible for civil defense ...

"In the event of war, our country's survival depends on four basic mainstays, which are military defense, civilian defense, and economic and psychological defense, which form the national defense. The army, to which we have devoted the main share of our means, is therefore only one of the factors in national defense. It can only fulfill its task if the necessary steps for protecting the soldier's family and place of work have been taken by civil defense. The weakness of one mainstay inevitably entails that of the others."

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PEOPLE PROTECTION?

Excerpts of statement by U.S. Civil Defense Council President Evar P. Peterson to House Appropriations Subcommittee for Independent Offices:

"Gentlemen, we are really talking about a vital part of our national security – or are we? I truly wonder if we are seriously concerned about what I consider to be the other half of a balanced defensive posture. It seems we are willing to protect everything but the citizen who pays the bill. Your honorable body is giving consideration to the protection of our missile sites with an ABM system. It is most appropriate to consider such a matter but of what value is it to protect the missile sites if our citizens are not given a chance to also survive. I wonder if we are not being tremendously inconsistent by allowing ourselves to be exceptionally well prepared militarily but at the same time almost ignoring preparations on the home front . . .

"How is it possible for us to negotiate a sound and safe peace abroad when 200 million Americans at home are so exposed to the hazards as to almost be classified hostages for our enemies. They might as well be held in enemy hands."

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Coming in the November - December issue: EMP IMPACT ON U.S. DEFENSES, - by David B. Nelson