Description of document:	This file contains all 16 U.S. Army Medical Intelligence reports concerning the extent of research and deployment of biological and chemical weapons activities in various nations from the 1970s and 1980s
Requested date:	23-October-2008
Released date:	10-June-2013
Posted date:	12-August-2013
Source of documents:	Commander US Army Intelligence & Security Command Freedom of Information/Privacy Office ATTN: IAMG-C-FOI 4552 Pike Road Fort George G. Meade, MD 20755-5995 Fax: (301) 677-2956 Email: FOIA/Privacy Office Online FOIA Request Form
Note:	All reports may be accessed here: http://www/governmentattic.org/inscomBWCW.html

Description of document:	Defense Intelligence Agency report, Biological Warfare Capabilities-NATO Countries and France, February 1972
Requested date:	23-October-2008
Released date:	10-June-2013
Posted date:	12-August-2013
Source of document:	Commander US Army Intelligence & Security Command Freedom of Information/Privacy Office ATTN: IAMG-C-FOI 4552 Pike Road Fort George G. Meade, MD 20755-5995 Fax: (301) 677-2956 Email: FOIA/Privacy Office Online FOIA Request Form
Note:	This report is one of 16 reports released under Mandatory Declassification Review by the US Army Intelligence & Security Command. All of these reports may be accessed here: http://www/governmentattic.org/inscomBWCW.html

DEPARTMENT OF THE ARMY
UNITED STATES ARMY INTELLIGENCE AND SECURITY COMMAND
FREEDOM OF INFORMATION/PRIVACY OFFICE
FORT GEORGE G. MEADE, MARYLAND 20755-5995

REPLY TO
ATTENTION OF:

Freedom of Information/
Privacy Office

10 JUN 2013

This is in further response to your Freedom of Information Act (FOIA) request of October 23, 2008, and supplements our electronic message of May 12, 2010.

Coordination has been completed with another element of our command and other government agencies and records returned to this office for our review and direct response to you. We have reviewed the records and determined the records are partially releaseable to you. A copy of the records are enclosed for your use.

We have completed a mandatory declassification review in accordance with Executive Order (EO) 13526. As a result of our review information has been sanitized and 4 pages have been withheld in their entirety as the information is currently and properly classified TOP SECRET, SECRET and CONFIDENTIAL according to Sections 1.2(a)(1), 1.2(a)(2), 1.2(a)(3) and 1.4(c) of EO 13526. This information is exempt from the public disclosure provisions of the FOIA pursuant to Title 5 U.S. Code 552 (b)(1). It is not possible to reasonably segregate meaningful portions of the withheld pages for release. The records are enclosed for your use. A brief explanation of the applicable sections follows:

Section 1.2(a)(1) of EO 13526, provides that information shall be classified TOP SECRET if its unauthorized disclosure reasonably could be expected to cause exceptionally grave damage to the national security.

Section 1.2(a)(2) of EO 13526, provides that information shall be classified SECRET if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

Section 1.2(a)(3) of EO 13526, provides that information shall be classified CONFIDENTIAL if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

Section 1.4(c) of EO 13526, provides that information pertaining to intelligence activities, intelligence sources or methods, and cryptologic information shall be considered for classification protection.

In addition, information has been sanitized from the records and 4 pages have been withheld in their entirety as the release of the information would reveal sensitive intelligence methods. This information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(7)(E) of the FOIA. The significant and legitimate governmental purpose to be served by withholding is that a viable and effective intelligence investigative capability is dependent upon protection of sensitive investigative methodologies. It is not possible to reasonably segregate meaningful portions of the withheld pages for release.

The withholding of the information described above is a partial denial of your request. This denial is made on behalf of Major General Stephen G. Fogarty, the Commanding General, U.S. Army Intelligence and Security Command, who is the Initial Denial Authority for Army intelligence investigative and security records under the FOIA. You have the right to appeal this decision to the Secretary of the Army. Your appeal must be postmarked no later than 60 calendar days from the date of this letter. After the 60-day period, the case may be considered closed; however, such closure does not preclude you from filing litigation in the courts. You should state the basis of your disagreement with the response and provide justification for a reconsideration of the denial. An appeal may not serve as a request for additional or new information. An appeal may only address information denied in this response. Your appeal is to be made to this office, for forwarding, as appropriate to the Secretary of the Army, Office of the General Counsel.

Coordination has been completed and we have been informed by the Central Intelligence Agency (CIA) that information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(1) and (b)(3) of the FOIA.

The withholding of the information by the CIA constitutes a denial of your request and you have the right to appeal this decision to the Agency Release Panel within 45 days from the date of this letter. If you decide to file an appeal, it should be forwarded to this office and we will coordinate with the CIA on your behalf. Please cite CIA #F-2010-01292/Army #57F-09 assigned to your request so that it may be easily identified.

Coordination has been completed and we have been informed by the Defense Intelligence Agency (DIA) that their information is exempt from public disclosure pursuant to Title 5 U.S. Code § 552 (b)(1), (b)(2) (b)(3) and (b)(4) of the Freedom of Information Act and Executive Order (EO) 13,526 § 1.4 (c) (d) and (h). The statute invoked under Title 5 U.S. Code 552 (b)(3) is 10 U.S.C. §424, which allows for the protection of organizational and personnel information for DIA.

The withholding of the information by the DIA constitutes a partial denial of your request and you have the right to appeal this decision directly to the DIA. If you decide to file an appeal, it should be forwarded to the Director, Defense Intelligence Agency, ATTN: DAN-1A-FOIA, Washington, DC 20340-5100. Please cite MDR #0155-2010 assigned to your request so that it may be easily identified.

You have received all Army intelligence investigative records pertaining to this request.

There are no assessable FOIA fees.

If you have any questions regarding this action, feel free to contact this office at 1-866-548-5651, or email the INSCOM FOIA office at: INSCOM_FOIA_ServiceCenter@mi.army.mil and refer to case #57F-09.

Sincerely,

Brad S. Dorris
Director
Freedom of Information/Privacy Office
Investigative Records Repository

Enclosure

DEFENSE INTELLIGENCE AGENCY

BIOLOGICAL WARFARE CAPABILITIES NATO COUNTRIES AND FRANCE (U)

PREPARED BY
US ARMY
ARMY MATERIEL COMMAND
FOREIGN SCIENCE AND TECHNOLOGY CENTER

NO FOREIGN DISSEM

~~SECRET~~

CIRC
EFRD

December 1972

ST-CS-03-139A-72

Publication No.
ST-CS-03-139-72
Amendment A

US ARMY MATERIEL COMMAND
FOREIGN SCIENCE AND TECHNOLOGY CENTER
Charlottesville, Va. 22901

EE2021479

BIOLOGICAL WARFARE CAPABILITIES—NATO COUNTRIES AND FRANCE (U)

Publication No. ST-CS-03-139-72, February 1972, is amended as follows:

1. Make the following pen and ink changes:

Front cover, title page, and DD 1473: Delete "CAPABILITY" and substitute "CAPABILITIES".

Page iii, second paragraph, line 2: Delete "Tripartite" and substitute "Quadripartite". Line 3: After "the United Kingdom" add ", Australia,".

Page iv, third paragraph, line 1: Delete "September 1971" and substitute "1 May 1972". At end of paragraph add: "All pages changed are dated December 1972. Pages not changed have been reviewed and are considered to contain information, assessments, and conclusions that are valid as of December 1972."

Page 1, paragraph 1.a.: Add "Belgium is also a signatory of the 1972 BW Disarmament Convention."

Page 23, paragraph 1.b., line 1: Delete "in" and substitute "Amager Boulevard 80". Paragraph 1.b.(2), line 1: Add "WHO" before "International" and delete "WHO" after "Standards". Paragraph 1.b.(3), line 1: Delete "The" and substitute "WHO". Delete "WHO" after "Center".

NATIONAL SECURITY INFORMATION
Unauthorized disclosure subject
to criminal sanctions

NO FOREIGN DISSEM

Classified by Dir DIA/CIA
Exempt from General Declassification
Schedule of Executive Order 11652
Exemption Category: 1, 2, 4
Declassify on: NA

Cy
ST-S-2-14080

~~SECRET~~

Page 25, paragraph 4.a.: Add "Denmark is a signatory of the 1972 BW Disarmament Convention."

Page 44, paragraph 12.b., line 1: Delete "Rhone" and substitute "Lyon".

Page 51, paragraph 18.a., line 5: Delete "Sizer" and substitute "Analyzer".

Page 53, paragraph 20.a., line 1: Delete "Major (Medecin Commandant)" and substitute "*Medecin Commandant* LTC (then Major)". Line 6: Delete "Major".

Page 54, paragraph 20.d., line 5: Delete "Dr." and substitute "LTC".

Page 60, paragraph 4: Add "Greece is a signatory of the 1972 BW Disarmament Convention."

Page 69, paragraph 5: Add "Italy is a signatory of the 1972 BW Disarmament Convention."

Page 69, paragraph 6, line 3: Delete "during 1971." and substitute "beginning in 1971 to replace the standard M-54 mask.".

Page 75, paragraph (2)(b), line 6: Delete "WHO" and substitute "UN". Delete "Agricultural" and substitute "Agriculture".

Page 82, paragraph 4.a.: Delete "." and add "since Luxembourg is a signatory of the 1972 BW Disarmament Convention."

Page 85, paragraph 1.a.(1), line 7: After "1925" add "and the BW Disarmament Convention of 1972,".

Page 88, paragraph (2), line 3: Delete "Ermelo" and substitute "Wezep".

Page 97, figure 15, line 5: Delete "(Adm) C. Groenewegen" and substitute "Dr. Ir. A. Rorsch".

Page 99, paragraph 8.c.(4)(d), line 2: Delete "*globegii*" and substitute "*globigii*".

Page 107, paragraph 5.b., line 6: Delete "no" and substitute "few".

Page 114, paragraph 4: Add "Portugal is a signatory of the 1972 BW Disarmament Convention."

Page 121, paragraph 4: Add "c. (U) Turkey is a signatory of the 1972 BW Disarmament Convention."

Page 125, paragraph 3.a.: Add "Great Britain is also a signatory of the 1972 BW Disarmament Convention."

Page 126, paragraph 4., title: Add "-NFD" to classification. Paragraph 4.a., title: Add "-NFD" to classification.

Page 139, paragraph 1.a.: Add "In 1972 West Germany signed the BW Disarmament Convention."

Page 142, paragraph 3.a.(1), line 2: Delete "Armament" and substitute "Military Technology".

Page 144, paragraph f., classification: Delete "(C)" and substitute "(C-NFD)".

Page 161, paragraph 19: Change "19" to "20".

Page 168, paragraph 20: Change "20" to "21".

2. Remove old pages and insert new or revised pages as indicated below:

Remove	Insert
	o.i and o.ii
	iv.1 thru iv.3 (Reverse Blank)
v thru xviii	v thru xviii
3 thru 12	3 thru 12
15 and 16	15 thru 16.2
21 and 22	21 thru 22.2
25 and 26	25 and 26
29 and 30	29 thru 30.2
33 and 34	33 and 34
45 and 46	45 thru 46.1 (Reverse Blank)
57 and 58	57 thru 58.2
61 thru 63 (Reverse Blank)	61 thru 63 (Reverse Blank)
71 and 72	71 and 72
79 and 80	79 thru 80.2
83 and 84	83 and 84
89 and 90	89 thru 90.2
95 and 96	95 and 96

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December 1972

Remove	Insert
101 thru 108	101 thru 108
111 and 112	111 and 112
117 and 118	117 and 118
121 thru 124	121 thru 124
127 thru 138	127 thru 138.4
147 and 148	147 and 148
155 and 156	155 and 156
159 and 160	159 thru 160.1 (Reverse Blank)
169 thru 176	169 thru 176.8
	178.1 and 178.2
	181 and 182

ST-CS-03-139-72

ERRATUM

Page xix (Reverse Blank), an unclassified map entitled "European Members of NATO and France," is in printing and will be transmitted for insertion in this study in the near future.

ST-CS-03-139-72

ADDENDUM

Attached page xix, a map entitled European Members of NATO and France, is provided for insertion in publication ST-CS-03-139-72, which was distributed in May 1972.

~~SECRET~~

BIOLOGICAL WARFARE CAPABILITIES-NATO COUNTRIES AND FRANCE (U)

(b)(6)

ST-CS-03-139-72

DIA Task No. T70-03-13

February 1972

WARNING

This document contains information affecting the National Defense of the United States within the meaning of the Espionage Laws (18 USC 793, 794), the transmission or revelation of which in any manner to an unauthorized person is prohibited by law.

This is a Department of Defense Intelligence Product prepared by the Foreign Science and Technology Center of the US Army Materiel Command, with contributions from the Department of the Navy Scientific and Technical Intelligence Center, and the Defense Intelligence Agency.

NO FOREIGN DISSEMINATION

ST-S-1-12911

GROUP 3
Excluded from automatic
downgrading and declassification.

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~~SECRET~~

(This page is UNCLASSIFIED)

RELEASE COMMENTS

This DIA produced document, ST-CS-03-139-72, *Biological Warfare Capabilities—NATO Countries and France (U)*, dated February 1972, including Amendment A, dated December 1972, has been predetermined by the Defense Intelligence Agency to be NOT RELEASABLE.

NO FOREIGN DISSEM

Classified by Dir DIA/CIA
Exempt from General Declassification
Schedule of Executive Order 11652
Exemption Category: 1, 2, 4
Declassify on: NA

When separated from
document, this page
becomes CONFIDENTIAL
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NO FOREIGN DISSEM

PREFACE

(U) This report will present a comprehensive evaluation of the capabilities of France and each member of the North Atlantic Treaty Organization (NATO), exclusive of the United States, to conduct biological operations and to defend themselves if attacked with biological weapons. Included is information on Order of Battle for biological warfare; identifications and descriptions of NATO materiel characterized for either offensive or defensive use in the event of biological warfare; commentary concerning production facilities and capabilities; evaluations when possible of stockpiles and storage capabilities; characterizations of doctrine and procedures governing the use of biological weapons; and descriptions of research, development, and testing programs in various member nations.

(U) Diverse information exchange agreements exist between the various NATO members: There are Quadripartite Australia agreements between the United States, the United Kingdom, and Canada; Mutual Weapons Defense Development Exchange Agreements are in force between the United States and many of the Western European countries; and similar exchange agreements exist between the FINABEL nations (France, West Germany, The Netherlands, Italy, and Belgium). These liaisons, and indeed the nature of the NATO alliance itself, have mitigated the necessity for such a study in the past. However, recent changes in the national policy of the United States, curtailing biological warfare programs, emphasize the need to remain abreast of pertinent research and development activities in Western European countries which are technologically advanced. Moreover in the face of ever-shrinking dollars expended on research and development programs within the United States Department of Defense, such studies may illuminate scientific and technical advancements which can be incorporated into more limited programs now in progress in this country.

(U) The data base and analyst experience which must be committed in support of this effort are not available within any single office in the intelligence community. Accordingly, inputs for this report have been solicited from various groups. The US Army Foreign Science and Technology Center is responsible for basic coverage by area and subject matter. The US Navy Scientific and Technical Intelligence Center was tasked to develop sections of this study dealing with the naval offensive and defensive biological warfare capabilities of the NATO countries. The Foreign Technology Division, US Air Force, was queried for inputs covering aerospace offensive and defensive applications. And, finally appropriate elements of the Defense Intelligence Agency were responsible for information concerning Order of Battle, training, doctrine, policy, production, and stockpiles.

ST-CS-03-139-72
Original

(U) As the prime producer of this study, the Foreign Science and Technology Center was charged with the final collation, preparation, and editing of copy material.

(U) Constructive criticisms, comments, and suggestions for changes are solicited. Critical evaluations from readers of this report will provide direct guidance so that future updatings of this study will result in a product which is most responsive to the varied needs of the user.

(U) Although the cutoff date for information in this document is 1May72 major updatings have been made up to the date of final approval for printing.

(U) This study is being disseminated devoid of bibliographic material to facilitate wider distribution. A compiled bibliography has been published separately and can be made available to authorized recipients upon written request to Defense Intelligence Agency, ATTN: DT-1A, Washington, D. C. 20301. Individuals making such requests are cautioned that the addition of the bibliography to (or its association with) the study makes mandatory a more restricted distribution of the study. When the bibliography is attached the study must carry the additional caveats NO DISSEMINATION ABROAD and CONTROLLED DISSEMINATION.

(U) Comments, questions, and requests for additional information concerning this study may be addressed to the Defense Intelligence Agency, Washington, D. C. 20301, ATTN: DT-1A.

* All pages changed are dated Dec72. Pages not changed have been reviewed and are considered to contain information, assessments and conclusions that are valid as of December 1972.

LIST OF EFFECTIVE PAGES

SUBJECT MATTER	PAGE NUMBERS	DATE
Release Comments	o.i and o.ii	December 1972
Title Page	None	Original
Preface	iii and iv	Original
List of Effective Pages	iv.1	December 1972
Record of Changes	iv.	December 1972
Table of Contents	v thru xv (Reverse Blank)	December 1972
List of Illustrations	xvii	December 1972
List of Tables	xviii	December 1972
Frontispiece	xix (Reverse Blank)	Original
Summary	xxi and xxii	Original
Section I	1 thru 12	
	1 and 2	Original
	3 thru 12	December 1972
Section II	13 thru 22.2	
	13 and 14	Original
	15	Original
	16 thru 16.2	December 1972
	17 thru 20	Original
	21 thru 22.2	December 1972
Section III	23 thru 30.2	
	23 thru 25	Original
	26	December 1972
	27 thru 29	Original
	30 thru 30.2	December 1972
Section IV	31 thru 58.2	
	31 thru 33	Original
	34	December 1972
	35 thru 44	Original
	45 thru 46.1 (Reverse Blank)	December 1972
	47 thru 56	Original
	57 thru 58.2	December 1972
Section V	59 and 62.2	
	59 thru 60	Original
	61 thru 62.2	December 1972
Section VI	63 (Reverse Blank)	December 1972
Section VII	65 thru 80.2	
	65 thru 71	Original
	72	December 1972

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December 1972

RECORD OF CHANGES

CHANGE NUMBER	DATE OF CHANGE	DATE ENTERED	SIGNATURE, RANK/RATE AND ORGANIZATION OF INDIVIDUAL ENTERING CHANGE

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TABLE OF CONTENTS

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TABLE OF CONTENTS (Continued)

26

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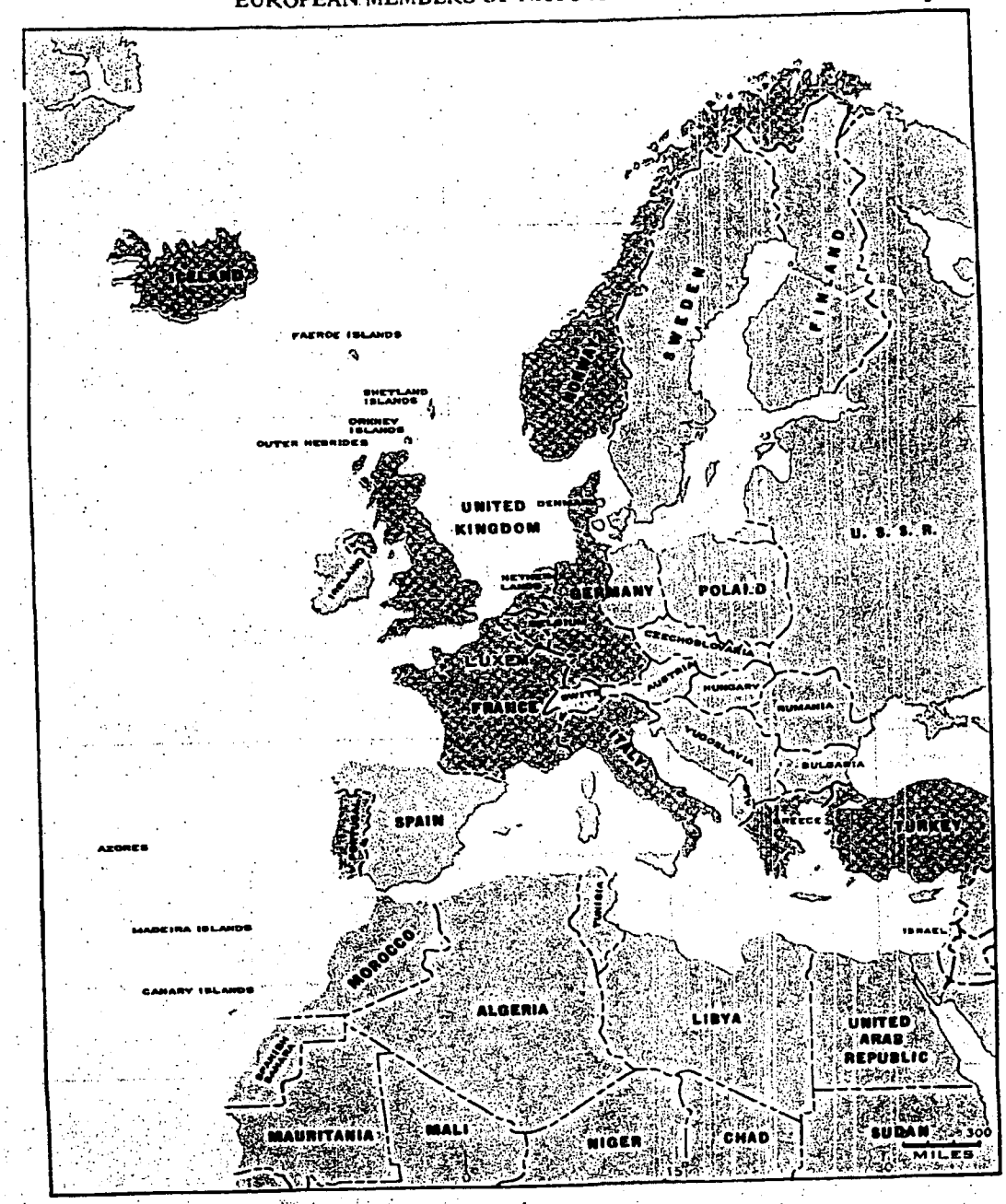
LIST OF ILLUSTRATIONS

Figures

LIST OF TABLES

EUROPEAN MEMBERS OF NATO AND FRANCE

ST-CS-03-139-72
Original



SUMMARY

(S) (b)(1)

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Section I.

BELGIUM

A. INTRODUCTION

1. (e) Historical Background

(b)(1)

(b)(1)

b. (b)(1)

(b)(1)

2. (e) Competence in Microbiology and Public Health

a. (e) (b)(1)

(b)(1)

b. (U) Biomedical research is comparatively high in quality, but is limited by a shortage of funds and personnel. Substantial contributions have been made in physiology, biochemistry, microbiology and pharmacology. Only limited medical research has been conducted at military installations. An effective veterinary research program has made the country essentially free of major epizootics (animal epidemics). Belgian investigators have studied foot-and-mouth disease, African swine fever, brucellosis, anthrax, rabies, hemorrhagic fever, and Aujeszky's disease. All of the organisms causing these diseases could be of interest to a biological warfare program.

c. (C) (b)(1)

(b)(1)

3. (U) (C) **Geographical and Political Factors**

a. (C) (b)(1)

(b)(1)

b. (U) The Belgian nation has existed as a political entity only since 1830. Unlike the Netherlands and Denmark, a national culture does not exist but two cultures dominate: one follows the strong cultural tradition of France, and the other seeks some cultural parity with the Dutch, Germans, and British. Within each sector, there are sharp ethnic divisions which affect stability in scientific affairs as well as politics. Nominally, Belgium is a monarchy, but the Council of Ministers headed by the Prime Minister actually conducts government affairs. The Prime Minister and his associates are appointed by the King from nominees submitted by the parties in parliament. The Ministerial Committee on Science Policy, with the Prime Minister presiding, defines and coordinates scientific activities.

c. (C) (b)(1)

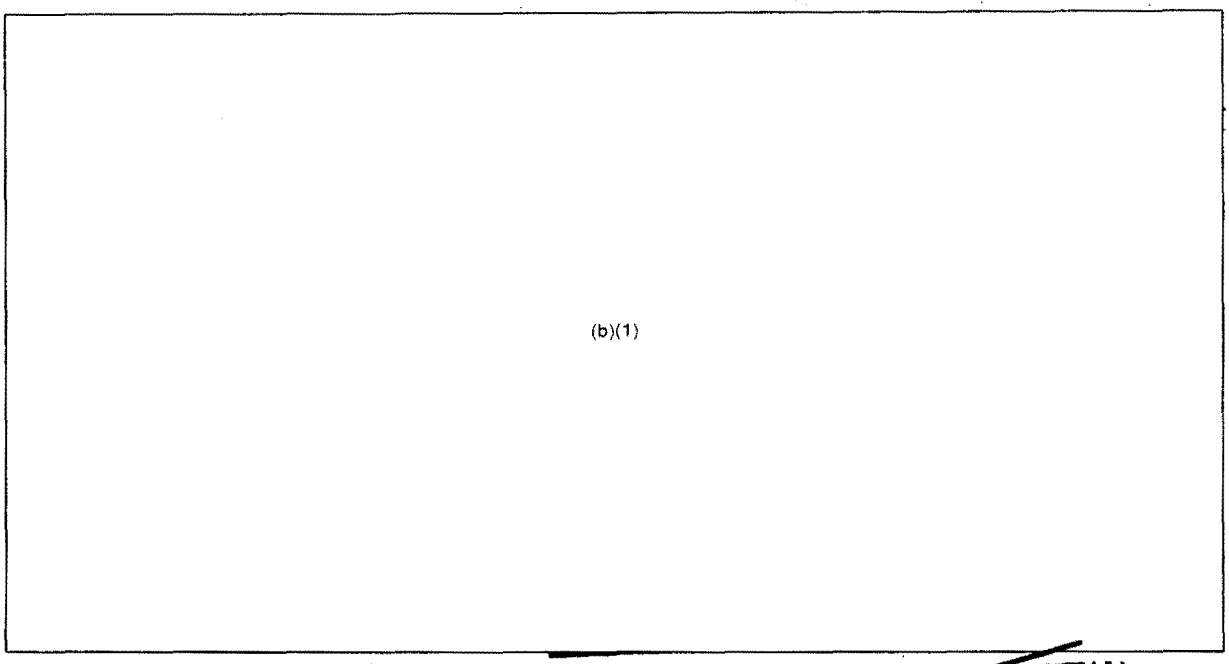
(b)(1)

B. ORDER OF BATTLE

4. (C) Military Personnel and Organizations

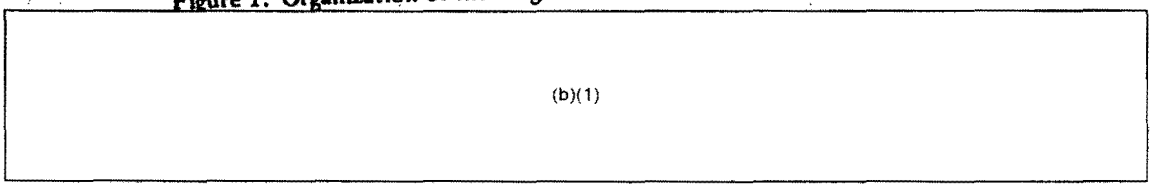
(b)(1)

(b)(1)

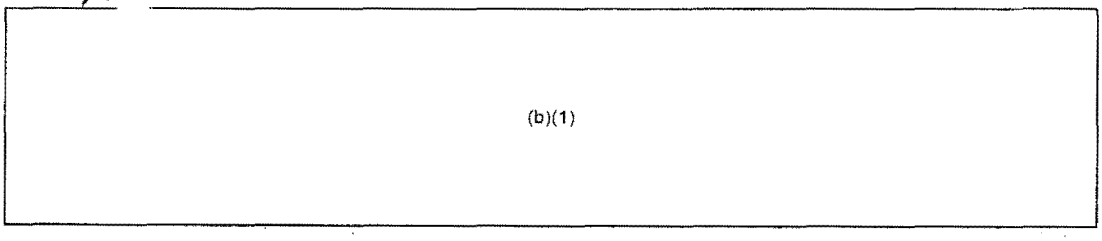


(CONFIDENTIAL)

Figure 1. Organization of the Belgian Ministry of National Defense (U).



5. (C) CBR Training



(b)(1)

6. (C) Civil Defense

(b)(1)

(b)(1)

(b)(1)

7. (C) Military Equipment

(b)(1)

(b)(1)

C. DOCTRINE AND PROCEDURES

8. (C) Offensive

(b)(1)

9. (C) Defensive

(b)(1)

(b)(1)

D. BW MATERIEL, PRODUCTION, AND STOCKPILING

10. (C) Materiel

(b)(1)

(b)(1)

11. (C) Agent Production

(b)(1)

(b)(1)

(b)(1)

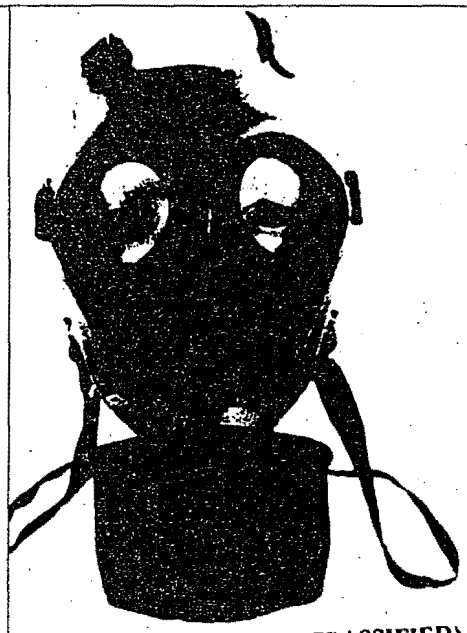
12. (S-NFD) Stockpiles and Storage Facilities

(b)(1)

a. (S)

(b)(1)

(b)(1)



(UNCLASSIFIED)

Figure 2. Belgian Model M-51 protective mask (U).

(b)(1)

(b)(1)

(b)(1)

(b)(1)

Table 1. Major Belgian Pharmaceutical Production Companies (U)

Company	Location	Products
Parke-Davis	Bornem	Biologicals
Abbott Laboratories	Brussels	Antibiotics
Belge-Canadienne Continental Pharma	Brussels	Biologicals
Belgo-Pharma	Brussels	Biologicals, Antibiotics
Christiaens, A.	Brussels	Biologicals
Ciba	Brussels	Biologicals
Coutelier, Freres	Brussels	Biologicals, Antibiotics
Roche Products	Brussels	Biologicals
Sidsa	Brussels	Biologicals
U.C.B.	Forest	Biologicals
Therapeutic Research and Industry—R.I.T.	Genval	Biologicals, Antibiotics
Pfizer Corporation	Jette	Biologicals, Antibiotics
Coutelier Brothers Bio-Products	Schaerbeek	Biologicals
Louis Sanders	Saint Gilles	Biologicals
Tuypens Laboratories	Saint Niklaas	Biologicals, Antibiotics

(UNCLASSIFIED)

NO FOREIGN DISSEM

c. (C) (b)(1)

(b)(1)

d. (S-NFD) (b)(1)

(b)(1)

E. RESEARCH, DEVELOPMENT, AND TESTING

13. (U) Military Facilities

(b)(1)

(b)(1)

14. (C) Civilian Institutes and Facilities

(b)(1)

c. Other Facilities.

(b)(1)

(b)(1)

F. CONCLUSIONS

15. (C) Policy and Procedures

(b)(1)

(b)(1)

(b)(1)

16. (C) Capability

(b)(1)

(b)(1)

G. TRENDS AND FORECASTS

17. (C) Trends

(b)(1)

18. (C) Forecasts

(b)(1)

(b)(1)

Section II.

CANADA

A. INTRODUCTION

1. (U) Historical Background and Competence in Microbiology and Public Health

a. The North American territory now known as Canada was partially colonized by the French and the English in the 16th and 17th centuries. Ownership of these colonies, primarily located in the St. Lawrence Valley, changed several times as a result of successive wars between the two nations. The territory was finally ceded to England under the terms of the 1763 Treaty of Paris. Expansion of Canada to its present size was the result of exploration and the movement of populations from east to west. The Dominion of Canada came into being July 1, 1867 when the colonies were united in a federation; it is now the largest self-governing country in the Commonwealth of Nations. Until the beginning of the twentieth century, Canada was largely a pioneer country, and research was related to the primary industries. World War II drove industrial development forward at a rapid pace. Today Canada plays an increasing role in international affairs. She cooperates closely with the US in the defense of North America, sends forces to NATO's Atlantic and European sectors, and plays an active role in Commonwealth and United Nations affairs. In 1969 a planned and phased reduction in Canada's NATO forces in Central Europe was announced which was to be completed in 1973. This would cut Canada's military contribution by more than half and eliminate nuclear strike weapons. Increased emphasis is to be given to the defense of sovereignty, to internal security, and to national development.[1-3]

b. Canada does not have a long history of basic research in the sciences. In 1916 the government set up the National Research Council as a government agency to promote research. The council immediately began to encourage and to stimulate research in the universities which had until then fostered little activity of this sort. A few years later the Council established its own laboratory system, and during World War II, it took on the responsibility of research for the armed services. After the war, the Defense Research Board (DRB) was established and given the responsibility for military research.[2] Many Canadian universities offer graduate studies in microbiology, and the research programs are of high quality. The pharmaceutical industry, both domestically and foreign-owned, has developmental research programs for vaccines and antibiotics. There are enough microbiologists in Canada to support a national professional society, the Canadian Society of Microbiologists, and a large number of Canadian microbiologists are members of US

professional societies. Ten Canadian Journals of Research, including the Canadian Journal of Microbiology, are published under the guidance of a standing committee of the National Research Council.

c. Public health is primarily the responsibility of the provincial governments. The federal government has jurisdiction over health matters of a national character and provides financial assistance to provincial health services. The Department of National Health and Welfare controls food and drugs, quarantine and immigration medical services, and provides health services to Indians and Eskimos. Most provincial governments operate public health laboratories which are responsible for the prevention, diagnosis, and treatment of communicable diseases; for providing public health nursing; and for child and maternal health programs. Municipalities provide sanitation and some of the larger cities have an active program in other aspects of the public health within the provinces. All levels of government are aided and supported by a network of voluntary agencies working in different health fields.[1 /2]

2. (U) **Geographical and Political Factors**

a. Canada covers an area of almost 4,000,000 square miles and is the second largest country in the World. Ninety percent of the population is located along the southern border in about one-fifth of the total area. Most of the arable land, as well as the major cities and industrial centers, is located here.[1]

b. Canada is a federation of 10 provinces and administers two territories. The Constitution reserves certain rights to the provincial governments, the remainder being vested in the Federal Government at Ottawa. The Federal Government of Canada is patterned on the British parliamentary system, and the ultimate administrative authority is the Cabinet which is selected by the Prime Minister. Queen Elizabeth II, Queen of Canada, is Head of State and is represented at Ottawa by a Governor General. Parliament consists of the Queen, the Senate, and the House of Commons. Senators are appointed on a regional basis, and members of Parliament are elected by universal suffrage.[2 /4]

c. Canada takes an active part in exchange of defense science information with her allies through bi-, tri-, and quadripartite agreements, in addition to participation on various NATO committees. Bipartite agreements exist separately with the Netherlands, the Federal Republic of Germany, Norway, France, and Greece. Cooperation with the Netherlands is limited entirely to research on chemical and biological warfare.[3 6] Tripartite agreements have been negotiated between Canada, the United Kingdom, and the United States, while

the quadripartite agreements include the above three plus Australia. Information and assistance on biological warfare research is a portion of agenda topics.

B. ASSESSMENT

3. (S) Order of Battle

a. (S) (b)(1)

(b)(1)

(b)(1)

(b)(1)

(b)(1) (b)(1)

c. (S) (b)(1)

(b)(1)

d. (S) CBR Training Schools.

(b)(1)

(b)(1)

c. (U) Civil Defense. Civil Defense planning is integrated with the overall plan for national defense, with the aim of survival in event of direct attack. Canadian civil defense is organized at all levels of government. The federal government is responsible for planning, policy, and financial assistance; provincial governments, for organization and implementation; the municipal governments, for execution of plans and policy. Training has been carried out at all levels.[1]

4. (U) Doctrine

Canada has ratified the BW Disarmament Convention and is a signatory of the 1925 Protocol. Canada has no BW weapons systems. Organization, training, and equipment for BW is directed completely toward defense. Canada does monitor CBR capabilities of other countries. Its CBR program is integrated with that of the United States, UK, and Australia.

5. (S) BW Materiel

(b)(1)

(b)(1)

(b)(1)

6. (S-NFD) Production Facilities and Capabilities

(b)(1)

(b)(1)

(b)(1)

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(UNCLASSIFIED)

Figure 3. Canadian MK2 protective mask (U).

7. (S-NFD) Stockpiling and Storage Facilities

(b)(1)

(b)(1)

Item	Quantity
Protective Mask, M8 (Headwound)	20
Protective Mask, Cdn No. 2, Mk2	63,000
Protective Mask, M14 (C1A1)	1,200
Protective Coveralls	14,680
Protective Hood	13,130
Protective Gloves	28,000

(UNCLASSIFIED)

Figure 4. Canadian CBR protective clothing (U).

~~8. (U)~~ Research and Development

a. ~~(U)~~ Administration and Areas of Interest

(1) (U) Biological warfare research and development is administered by the Defence Research Board (DRB), an agency in the Department of National Defence, and is concerned only with defensive aspects. In addition to an in-house research effort, grants are made to universities to work on unclassified problems, and aid in the form of matching grants is given to industry to encourage defense-related research. In 1970, six grants totaling $39,900 were made to universities for research on defense against biological agents.[3]

(C) (b)(1)

(b)(1)

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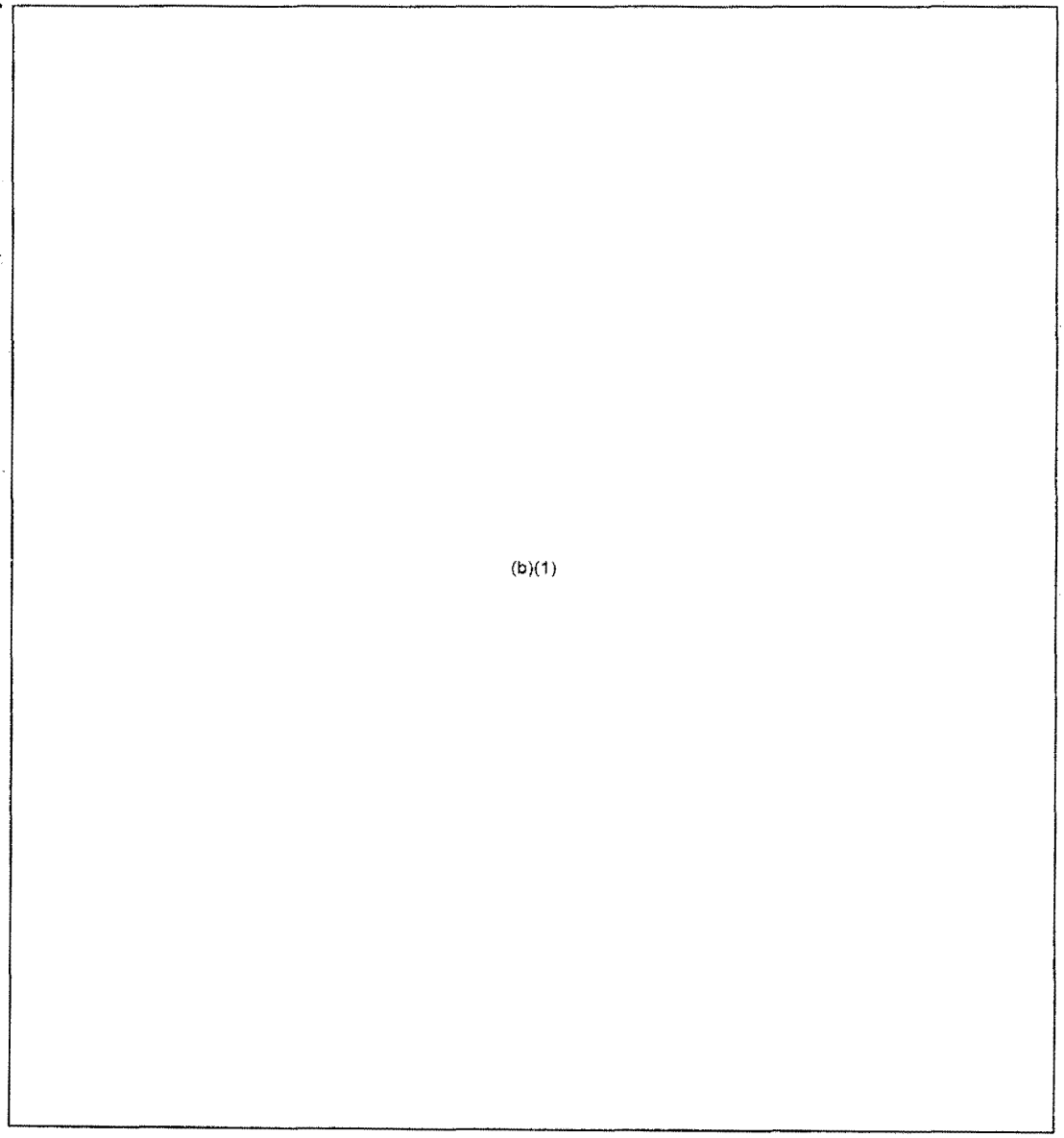

(2) (U) A biological warfare field sampling training kit was developed in the mid-sixties. The kit contains components with which one man can secure surface, air, solid, and water samples in the field and transport them to a laboratory.[35] No information was available as to whether this kit is still used for training purposes, or whether a different type of sampling device is being used by the Canadians in the field.

(C)

(b)(1)

(b)(1)

9. (C) Naval Aspects of BW

(b)(1)

10. (S) Conclusions

(b)(1)

C. TRENDS AND FORECASTS

(C) ~~11. (C)~~ Trends (b)(1)

(b)(1)

(C) ~~12. (C)~~ Forecasts (b)(1)

(b)(1)

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Section III.

DENMARK

A. INTRODUCTION

1. ~~(C)~~ Historical Background and Competence in Microbiology and Public Health

(b)(1)

(b)(1)

(b)(1)

(b)(1)

(b)(1)

2. (U) Geographical and Political Factors

a. Denmark is situated on the access route from the Baltic Sea to the Atlantic Ocean. Military forces stationed there could control movement through the three narrow straits of the Danish Archipelago. Its territory includes the Jutland Peninsula which borders on the Federal Republic of Germany, the large islands of Sjaelland and Fyn plus a number of smaller islands nearby, and the island of Bornholm 88 miles distant in the Baltic.[4]

b. Denmark is a constitutional monarchy with a multiparty system headed by a prime minister, and is politically stable. Social concerns as well as defense are emphasized in national spending. As with security, it looks to regional and international organizations to bolster its economic well being.[4]

B. ASSESSMENT

3. ~~(C NFD)~~ Order of Battle (b)(1)

a. ~~(C NFD)~~ (b)(1)

(b)(1)

(b)(1)

b. (U) In the wartime structure of the Royal Danish Army, each brigade will have one engineer company among its component units. In every unit of battalion size, up to 20 men are appointed and trained as atomic, biological, and chemical (ABC) specialists to aid in forming survey and decontamination teams. Approximately 70 hours of training are required for these specialists. There are no BW troops in the Danish Army; however, any ABC mission would, in all probability, be carried out by the engineer company.[8]

(b)(1)

c. (C-NFD)

(b)(1)

(b)(1)

d. (U) The joint ABC school was established in 1953 and comes under the jurisdiction of the Inspector General of the Corps of Engineers. Training at the Defense ABC school is provided for personnel from all branches of the Danish armed forces. There are nine different courses offered, ranging in duration from 3 days to 6 months; these are mainly for officers and NCO's. Enlisted men receive a few hours of ABC training during their basic training. The school is currently located at Copenhagen but is expected to be moved near Farum and colocated with the Sjaelland Engineer Regiment. Personnel are sent to other NATO countries to attend ABC courses, and school instructors attend other NATO-country schools so that they can maintain and up-date, as required, the content and standards of their course.[8]

e. (U) Personnel of the Civil Defense Organization receive the same training in BW defense as do the military. In addition special civil defense courses are offered as needed.[8]

4. (C-NFD) Doctrine and Procedures.

a. (C-NFD)

(b)(1)

(b)(1)

b. (U) Defense. Although the use of BW agents is rejected by Danish forces, emphasis is placed on maintaining a defensive capability. Civil defense and military protective measures against a BW attack are no different than those employed in peacetime for epidemics. The Danes would be unlikely to object to the use of biological weapons by NATO forces defending Danish soil against an enemy employing such weapons.

5. (C NFD) BW Materiel

a. (U) No development or stockpiling of BW weapons has been reported.

(UNCLASSIFIED)

Figure 6.
M-56 protective suit (U).

(b)(1)

(b)(1)

b. (C NFD)

(b)(1)

(b)(1)

(b)(1)

(b)(1)

(UNCLASSIFIED)

Figure 7. Danish M-49/53 protective mask (U).

(b)(1)

(b)(1)

Table II. Major Danish Pharmaceutical Production Companies (U)

Company	Location	Products
Leo Pharmaceutical Products Trading Ltd.	Copenhagen	Antibiotics
Novo Industri	Copenhagen	Antibiotics
Ferrosan	Copenhagen	Antibiotics
Dumex	Copenhagen	Antibiotics
Pharmacia	Copenhagen	Biologicals
Gea	Copenhagen	Biologicals
Alfred Benzon	Copenhagen	Biologicals
H. Lundbeck	Copenhagen	Biologicals

(UNCLASSIFIED)

7. (C-NFD) Stockpiling and Storage Facilities

(b)(1)

(b)(1)

Table III. Known Stockpiled Materiel, Denmark (U)

(b)(1)

(CONFIDENTIAL)

(b)(1)

8. (C-NFD) Research and Development (b)(1)

(b)(1)

b. (U) The National Veterinary Institute for Virus Research is located on the island of Lindholm (0° 21'E-55°02'N), and its primary task is production and distribution within Denmark of vaccines and sera to combat Foot and Mouth Disease (FMD). Dr. Michelson, the Director of the laboratory, stated that fairly extensive precautions are taken to prevent the escape of this infectious agent. The personnel change into laboratory clothing for work, and shower when they leave contaminated areas.[26] This is the only laboratory in Denmark where personnel are known to work with a highly infectious agent and where physical facilities are available for the safe handling of microorganisms in large quantity.

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(b)(1)

(b)(1)

NO FOREIGN DISSEM

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C. TRENDS AND FORECASTS

11. (~~C~~) Trends

(b)(1)

12. (~~C~~) Forecasts

(b)(1)

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Section IV.

FRANCE

A. INTRODUCTION

1. (S) Historical Background

(S)

(b)(1)

(b)(1)

(S) [redacted] (b)(1)

2. (U) Competence in Microbiology and Public Health

a. (U) France has a long tradition of excellence in scientific research, with some research institutes dating back as far as the Renaissance. Public organizations also exist which can be traced back to the sixteenth century. Louis Pasteur, recognized as the "Father of Microbiology," is noted for his work between 1857 and 1885 on fermentation and *pasteurization* of wine, beer, and dairy products and on the prevention of anthrax and rabies. France's competency in microbiology is exemplified by the internationally renowned *Pasteur Institute* which was founded in the 1880's as a private establishment concerned with fundamental studies in microbiology, its theory and applications, and with public health. One of its special concerns remains the non-commercial production of sera and vaccines. It holds large reserves of sera in case of an epidemic emergency. In 1964 its facilities included seventy services and laboratories with a staff of 230 scientific personnel. Today, there are twenty-one Pasteur Institutes throughout the world—Paris, Lille, Lyon, Tunis, Casablanca, Hanoi, Saigon, Dakar, etc. Programs in progress involve many fields of scientific research in microbiology, virology, and their biological and industrial applications.[1,2]

b. (U) France has other private, government, and military laboratories which support excellent research in microbiology and immunology. In recent years significant contributions have been made in molecular biology, biochemistry, microbiology, virology, parasitology, and radiobiology. The 1965 Nobel Prize in Medicine and Physiology was awarded to three French scientists for their research in molecular biology concerned with regulatory activities of the body cells.

(S) [redacted] (b)(1) (S) [redacted] (b)(1) (b)(1)

(b)(1)

3. (~~C~~) Geographical Factors

a. (U) France is the largest of the European countries in area, located at the western end of the historic avenue of military movement across Northern Europe. The coast is only 19 nautical miles from the UK and the borders of France are within 1000 nautical miles of the greater part of Europe, including Western USSR. It has an area of about 213,000 square miles inhabited by a population of about 50,131,000 (1966). Two-thirds of the land is flat, rolling lowlands or hills, and about one-third is mountainous in topography.

b. (U) The climate of France varies. Migratory pressure systems and associated weather fronts contribute greatly to the day-to-day changes throughout France and Corsica. In most of France, the winters are mild and rainy with occasional outbreaks of cold and freezing temperatures. Militarily, there are three main geographic regions—the Lowlands and Hills, the Eastern and Southern Mountain Rim, and Corsica. In the first region, the terrain is generally favorable for ground operations. The climate is relatively mild, and snow falls infrequently. A dense network of roads affords facilities for rapid movement throughout the region. Conditions for airmobile and airborne operations generally are favorable.

c. (U) The region of the Eastern and Southern Rim is an almost unbroken area of rugged country, ranging from the very high, jagged peaks of the Alps and Pyrenees to the high rolling surfaces and deep gorges of the Mossif Central. This region would present great difficulties for ground operations, and most of the region is unfavorable for air operations. Fog, turbulence, and extensive cloud cover are common to the area particularly from November through January.

d. (U) The small, rugged island of Corsica is dominated by a rocky or forest-and-scrub-covered backbone that is compartmented into many steep-sided valleys by mountain spurs; conditions are generally unfavorable for ground or air operations.[11]

(b)(1)

4. (~~S NFD~~) Political Factors

a. (U) France has had a republican form of government for nearly a century, but chronic governmental instability has had an impact on the manner in which Premiers have

fulfilled their tasks. They have had a tendency to concentrate on immediate problems rather than on long-range questions of domestic and foreign policy.[13] This has had some effect on France's program of research on biological warfare caused by a cyclical pattern of public expression regarding their effort. In the main, and most recently, public statements have present.[14] In September 1971 the French Council of Ministers completed a bill for submission to Parliament that prohibits the use of biological weapons in time of war.[89] The French seem to feel that this enacted French law is sufficient and therefore have not signed the 1972 BW Disarmament Convention.

b. (S-NFD) (b)(1)

(b)(1)

B. ORDER OF BATTLE

5. (S-NFD) Military Personnel and Organizations Responsible for BW

a. (S-NFD) Organizations Within or Under MOD.

(1) (S-NFD) (b)(1)

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(S)

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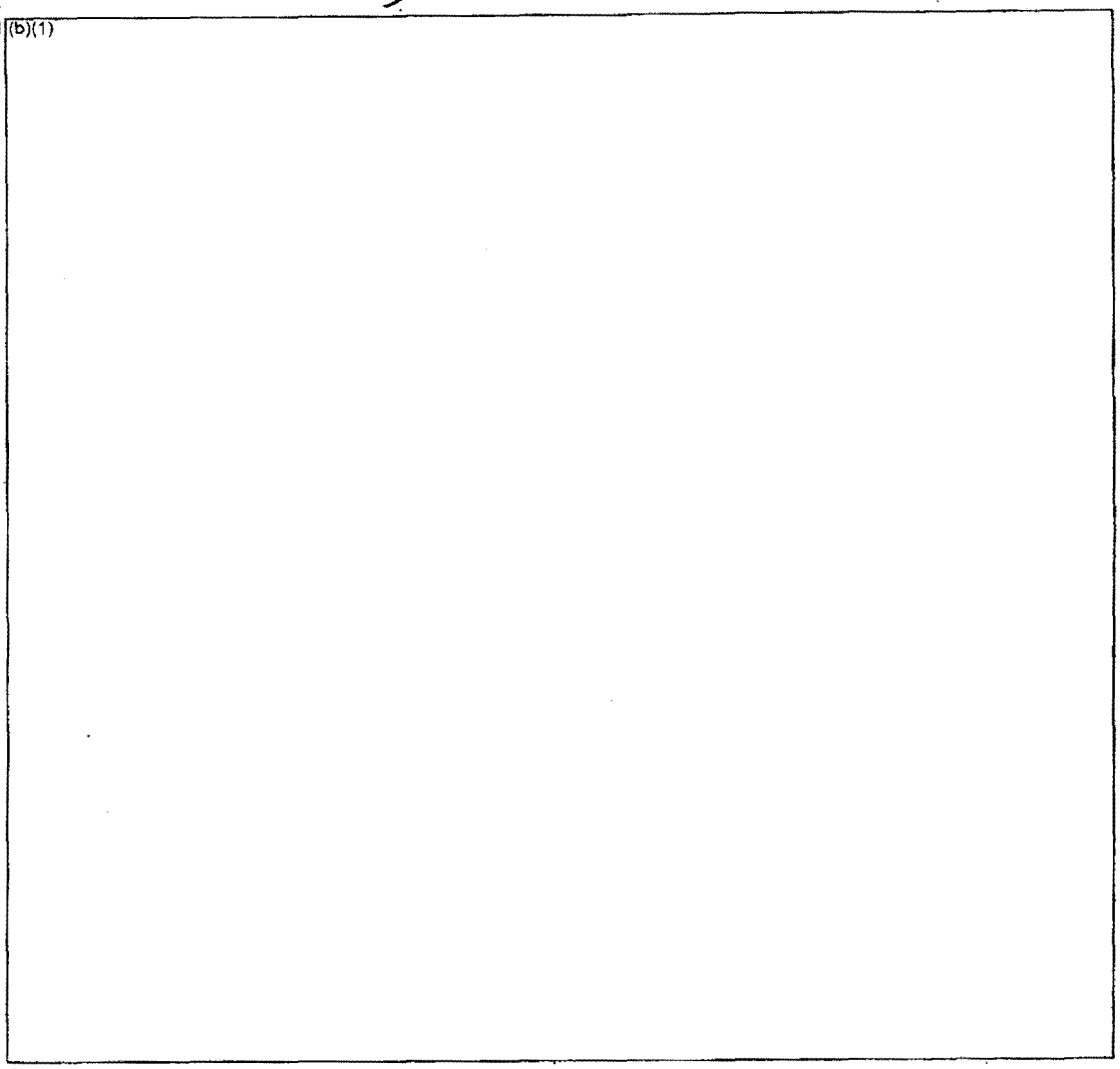

6. (C) Military Equipment

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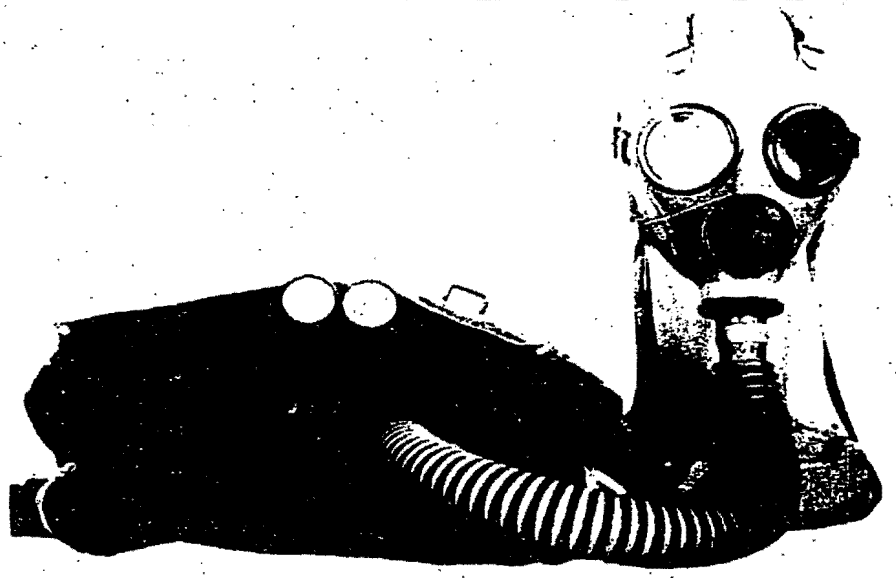

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Figure 8. French Model ANP 51 protective mask (U).

(C)

(b)(1)

C. DOCTRINE AND PROCEDURES

7. (S/NFD) Offensive

(S)

(b)(1)

D. BW MATERIEL

9. (S/NFD) Offensive

(S)

(b)(1)

(S) (b)(1)

b. (U) Agents Developed. There is no identification of any specific biological agent as being available for biological operations.

10. (S-NFD) Defensive

(S) (b)(1)

(b)(1)

d. (U) Vaccines, Sera, and Chemotherapeutics. The French pharmaceutical industry is well developed and is capable of producing BW defense-related antibiotics, sera, and vaccines in sufficient quantities for domestic needs and to permit stockpiling. Producers of BW defense-related pharmaceuticals are cited in Table IV. A number of military medical depots are utilized for the storage of BW defense-related materiel; however, details on types standardized and quantities in storage are not available. Two of the depots are located in the Paris area; they are the Armed Forces Central Pharmacy and the Central Stores Depot. The Central Pharmacy Depot is located in Lunel. In addition, general logistical facilities are located at Bordeaux, Caen, Chartres, Lyon, Marseille, Saint-Cyr, and Sainte Menehould.[13]

Table IV. French Producers of BW Defense-Related Pharmaceuticals (U)

Company	Location	Products
Laboratoires des Carmes	Besancon	Antibiotics
Sarget-Ambrine Laboratoires	Bordeaux	Biologicals
Laboratoires Sarbach	Chatillon-Sur-Chalaronne	Biologicals Veterinary Products
Merieux Institute	Lyon	Biologicals Veterinary Products
Lipha Society	Lyon	Veterinary Products
Unipol	Marseille	Veterinary Biologicals
Chardonnier Etablissements	Moullins	Veterinary Biologicals
Laboratoire Roger Bellon	Neuilly-Sur-Seine	Biologicals Veterinary Products
Laboratoires Servier	Neuilly-Sur-Seine	Antibiotics
Fevrier, Decoisy, Champion	Paris	Biologicals
Pasteur Institute	Paris	Biologicals
Laboratoire Lyocentre	Paris	Biologicals
Laboratoires Delagrange	Paris	Biologicals Veterinary Products
Laboratoires Fournier	Paris	Biologicals
Laboratoires Le Brun	Paris	Antibiotics
Laboratoires Toraude	Paris	Biologicals

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~~NO FOREIGN~~ DISSEM

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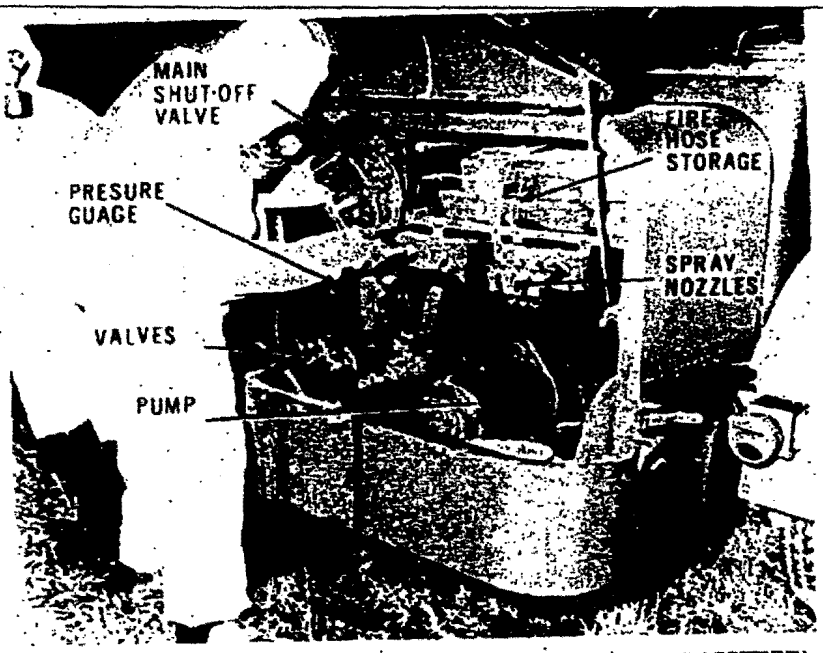

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Figure 9. French 600-liter decontamination apparatus (U).

E. BW PRODUCTION FACILITIES AND CAPABILITIES

11. (S-NFD) Military

(b)(1)

12. (S) Civilian

(S) (b)(1)

F. STOCKPILING AND STORAGE FACILITIES

13. (S-NPD) Military Capabilities (b)(1)

(S) (b)(1)

(S) (b)(1)

(S) (b)(1)

14. (U) (S/NFD) Civilian Facilities

a. (U) The Pasteur Institute, Paris, is France's largest manufacturer of biologicals and has quantities of unidentified sera and vaccines stored for use in the event of epidemic emergencies.[12]

(S) (b)(1)

c. (U) Other civilian institutes capable of producing and storing a variety of biologicals useful for the prevention or treatment of biological warfare casualties are listed in Table I (paragraph 10).

G. BW RESEARCH AND DEVELOPMENT

15. (U) (S/NFD) Institutes, Facilities, Test Sites

a. (S/NFD) Military Installations.

(S) (b)(1)

(S)

(b)(1)

b. (C-NFD) Selected "Civilian" Institutes Funded in Whole or in Part by the Military.

(C)

(b)(1)

(2) (U) The Pasteur Institute has a history of productive investigation in microbiology from the time of Pasteur, to the discovery of lysogeny by Lwoff, and the premier efforts in molecular biology by a school of investigators headed by Jacob and Monod. There are five main divisions: Microbiology (which includes Bacteriology): Viral

Diseases; Ecology of Pathogenic Agents and their Vectors (which includes Mycology and Parasitology); Molecular Biology; and Immunology. Microbiology is being pursued more vigorously at the Pasteur Institute today than every before. A rabies vaccine inactivated with beta propiolactone is now being prepared from infected young sheep and infected suckling mice.

(b)(1)

(3) (U) The Merieux Institute, *Institut Merieux*, in Lyon is one of the largest, most modern biological and pharmaceutical houses in France. The institute also does work under contract to the Microbiology Division of the Research Center of the Health Services of the Armed Forces. The institute claims to be a world leader in producing a vaccine effective against foot-and-mouth disease. It sells this vaccine world-wide, and procures raw materials from all of western Europe, and the USSR, Bulgaria, East Germany, Hungary, and Rumania. Numerous research grants are given by the institute to universities throughout France. Elaborate and extensive freeze-drying equipment is available to support operations on a commercial scale. The expertise, and laboratory and production facilities available would be of immediate usefulness for stockpiling defensive materiel in anticipation of biological warfare. These same assets are probably readily adaptable for offensive applications if the need should arise.[50]

(4) (U) Station Centrale de Pathologie Vegetale, Institut National de la Recherche Agronomique, Paris, does extensive research in the field of agriculture, including work on yellow rust (stripe rust) of cereal plants. Such studies clearly have potential biological warfare applications.

(5) (U) Personnel at Ecole Nationale Veterinaire d'Alfort teach and conduct extensive research on various animal diseases. Published work on brucellosis contains results of research potentially applicable to biological warfare R&D programs.

(6) (U) Universite de Strasbourg, Institut de Researches Nucleaires, Strasbourg-Cronenbourg, Laboratoire des Virus des Plantes does research on turnip yellows virus and the molecular biology of other plant viruses applicable to anti-plant biological warfare.

16. (C-NFD) Biological Agent Development

(b)(1)

(C)

(b)(1)

b. (C-NFD) Genetics.

(1) (U) The genetic manipulation of microorganisms to yield biological warfare agents with improved characteristics is usually a long term research process which exploits techniques generally available to competent investigators. Dr. Andre Lwoff and his associates, Jacob and Monod, have done outstanding research in cell genetics for which they have been made Nobel Laureates. New construction is underway to provide a modern laboratory for these people and their associates adjacent to the Pasteur Institute. It can be anticipated that this group will continue with their research in genetics and molecular biology which could be exploited by a French BW effort.

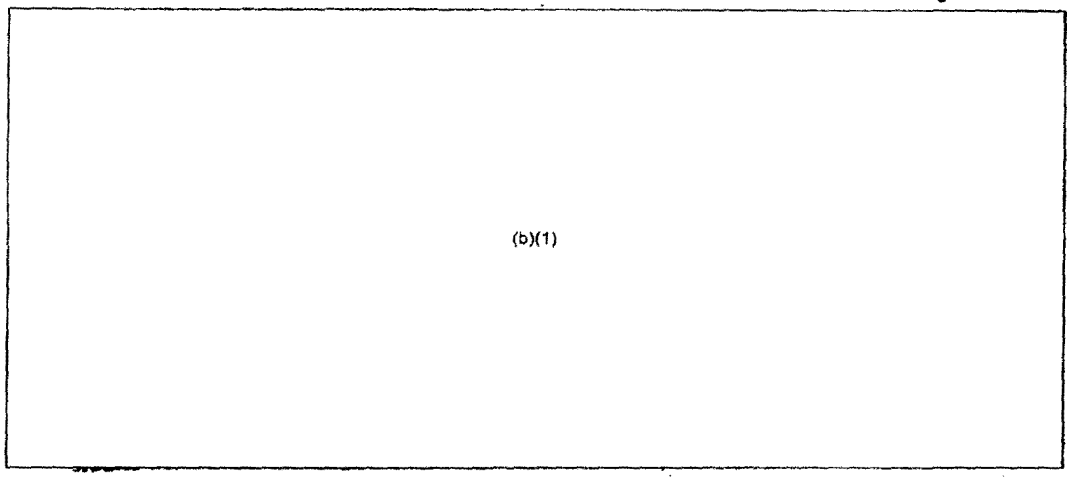
(b)(1)

c. (NFD) Acrobiology.

(b)

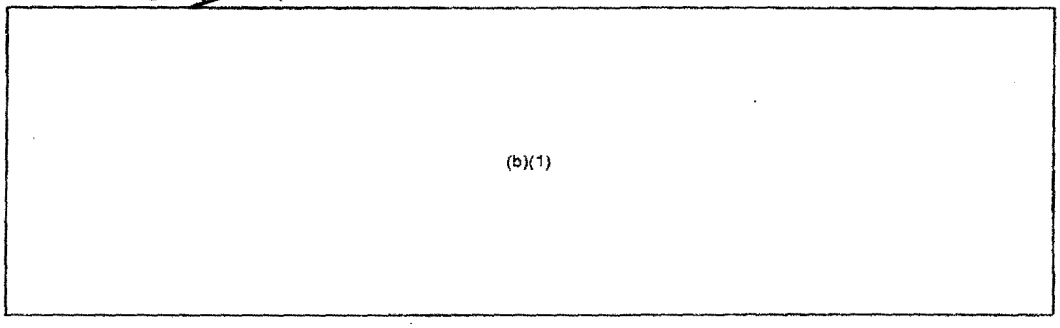
(b)(1)

(S)



d. (C-NFD) Production and Process Research

(S)



(2) (U) Process Research.

(a) (U) Capabilities. A new freeze-drying system has been developed by the French at the Center for Cryogenic Studies, Grenoble. Rapid freezing of suspensions is achieved, followed by extremely rapid removal of water at rates which may rival those achieved by the R.J.N. Greaves method. In contrast to the loss of microorganisms during the latter freezing process, the French appear to obtain excellent recoveries. In 1969 the unit was composed of two parts: a cylindrical freezing unit, and a drying apparatus. In that configuration, the freezing of the biological specimen was done in the open, and the sterility of the product could not be assured. However, a prototype unit under development was

observed which was entirely self-contained. It was effective in operation, but like most prototypes needed some refining. The advantage provided by this modification is that sterility of the product being freeze-dried can be maintained: moreover, handling of the product during the process will be obviated. The new system has been used to rapidly freeze-dry bacteria, viruses, vaccines, toxins and anti-toxins. The optimal parameters of materiel and methods for each of these separate preparations have been experimentally established.[83,84]

(b) (U) Equipment. French food processors claim to have the largest freeze-drying plant in the world, the SICALY, installed at Saint-Cyr in Bourgh, which can process at the rate of 2.4 metric tons per 17 hour cycle. This industrial competency and high capacity indicates that France would have no difficulty, technologically, in freeze-drying large quantities of biological warfare agents if it became necessary.[84]

(S) (b)(1)

17. (S-NFD) Dissemination Research

(S)

(b)(1)

(S)

(b)(1)

18. (C/NFD) Detection and Identification Concepts and Studies

(S)

(b)(1)

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19. (U-NFD) Vaccines, Sera, and Chemotherapeutic Agents

(C)

(b)(1)

(b)(1)

20. (C-NFD) Aerosol Immunization

(C)

(b)(1)

(b)(1)

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(b)(1)

(C)

(b)(1)

21. (C) Toxin Laboratory Accident

(C)

(b)(1)

(b)(1)

22. (C NF D) Wind-Water Channel and Wind Tunnel for BW/CW Research

(C)

(b)(1)

H. NAVAL ASPECTS OF BW

23. (C-NFD) Protection (b)(1)

(b)(1)

24. (C-NFD) Offensive (b)(1)

(b)(1)

25. (C) Training (b)(1)

(b)(1)

I. CONCLUSIONS

26. (S) Technology and Research (b)(1)

(b)(1)

(b)(1)

(b)(1)

27. (S) Materiel and Personnel, Army

(b)(1)

(b)(1)

28. (C-NFD) Naval Protection

(b)(1)

(b)(1)

K. TRENDS AND FORECASTS

29. (C) Trends

(b)(1)

(b)(1)

30. (C) Forecasts

(b)(1)

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(b)(1)

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Section V.

GREECE

A. INTRODUCTION

1. (U) Competence in Microbiology and Public Health

There has been very little research on non-nuclear aspects of CBR warfare; there is no base to support BW studies. Responsibility for military research lies with the medical corps of the Hellenic Army, but Army medical research includes only epidemiological studies, the examination of food and drugs for microbial contamination, and limited studies concerned with the production and control of biologicals. There is little veterinary research of any kind, although the Army Veterinary Research Laboratory investigates animal disease problems and assigned personnel collaborate closely with their counterparts at the Hellenic Pasteur Institute in Athens who are concerned with the epizootiology of animal diseases. The quality of medical care is low in Greece.[1] The Greeks are hard pressed to cope with indigenous problems affecting the nation's public health, and have shown little interest in initiating BW programs.

2. (U) Geographic and Political Factors

Greece can support only a modest R&D effort, and its scientific and technical capabilities lag far behind those of Western Europe. The quality of Greek research is suffering from the increasing isolation of Greek scientists from the international community of scientists due to, in part, Western boycotts of Greece and the difficulty that Greek scientists have in obtaining passports.

B. ASSESSMENT

3. (S-NFD) Order of Battle

a. (S-NFD) Military Personnel and Organizations

(b)(1)

(b)(1)

(b)(1)

4. (C-NFD) Doctrine and Procedures

(b)(1)

5. (S-NFD) BW Materiel (b)(1)

(b)(1)

b. (S) Defensive (b)(1)

(b)(1)

(S)

(b)(1)

(b)(1)

Table V. Greek Producers of BW Defense Related Pharmaceuticals (U)

Company	Location	Products
Cooperation Pharmaceutique Industrielle, S. A. "Cooper"	Athens	Antibiotics
Foot-&-Mouth Disease Institute	Athens	Foot-and-Mouth Disease Vaccine
Hellenic Pasteur Institute	Athens	Combined diptheria & tetanus toxoids; BCG, typhoid, rabies, & staphylococcus vaccines
State Laboratories	Athens	Smallpox, rabies, typhoid, paratyphoid, cholera & plague vaccines
Veterinary Microbiological Institute	Athens	Veterinary biologicals
Economides & Company, S. A. ("Chropi")	Piraievs	Biologicals
Microbiological Institute	Thessaloniki	Veterinary biologicals[7]

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6. (U) Research and Development

Although the Greeks have an adequate administrative organization for military research and development, lack of qualified personnel, facilities, and financing has kept research at a low level. Such as it is, the research base consists of the Hellenic National Defense Research Center, the Greek Atomic Energy Commission, the Academy of Athens, and the Hellenic Research Foundation. Additional research is carried out in universities. Because of political difficulties and economic priorities, research is not well organized, and the Greeks, though a NATO member, rely on the USIS for technical information of all kinds. There is no indication in either the open or classified literature that biomedical research in progress would support a BW program.

7. (C) Conclusions

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C. TRENDS AND FORECASTS

8. (C) Trends

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9. (C) Forecasts

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Section VI.

ICELAND

1. (U) Introduction

Iceland's standards of medical care are among the world's best. Hospital and health care support facilities are entirely adequate for the population. In spite of the Civil Defense Law of 1962, little has been done to prepare for war disaster, and the population would have to rely on sea and mountain rescue services and the Red Cross for disaster relief. Medical training at the University of Iceland's Faculty of Medicine meets high standards.[1]

2. (U) Assessment

a. The Institute of Pathology, a general medical oriented facility, does support viral studies in tissue culture systems.[2] Although laboratories are well-equipped, and investigators are deemed competent, there are no known R&D programs applicable to biological warfare.

b. No data are available concerning Iceland's policy, doctrine, training or Order of Battle for biological defense. Iceland is a signatory of the 1972 BW Disarmament Convention.

c. Iceland neither produces nor stores either offensive or defensive materiel for biological warfare. The country would have to rely upon imports to satisfy any military requirement.

3. (U) Conclusions

Iceland has no BW programs or capabilities. There are no indications that either will be developed.

4. (U) Trends and Forecasts

Iceland's military importance to NATO will continue to be only its geographic location. Icelanders will continue to receive good medical care but will not divert funds to military programs other than required by the Coast Guard. R&D will be limited to that needed for medical purposes and as part of teaching activities. No change is expected through the next 15 year period.

Section VII.

ITALY

A. INTRODUCTION

1. (S-NFD) Historical Background

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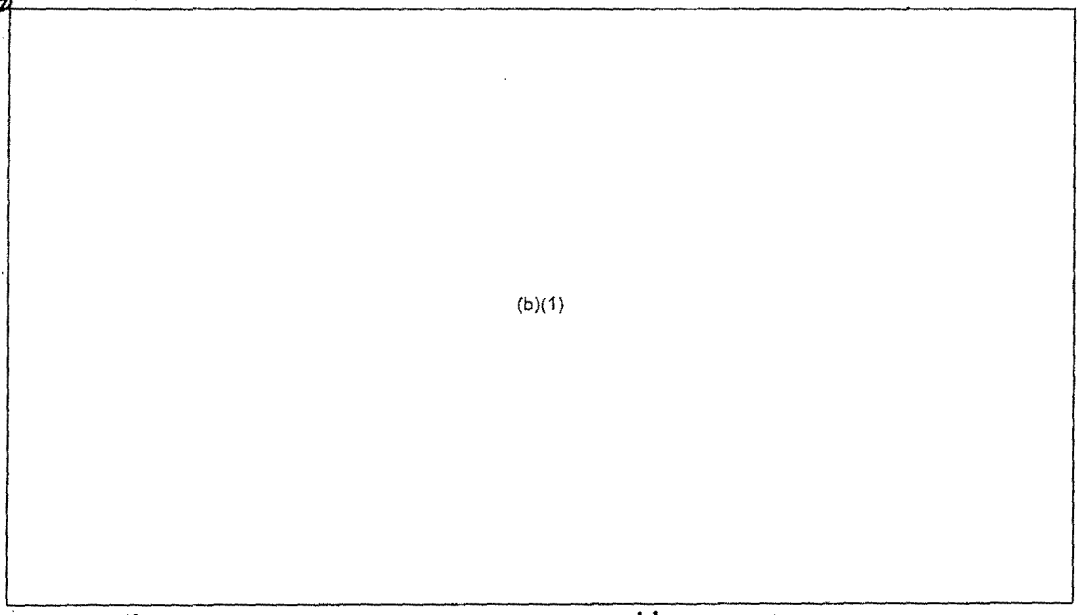

2. (U) Competence in Microbiology and Public Health

a. (U) Italian scientific tradition predates the Renaissance and includes the beginnings of modern experimental science. Outstanding scientific achievements by Italians during the 16th through 18th centuries include the experimental research of Redi and Spallanzini who refuted the theory of spontaneous generation of life.[28] Italy has a large number of universities, institutes, academies, and professional societies that are concerned actively with the advancement of scientific research. The Ministry of Health and Sanitation operates the Higher Institute of Health in Rome where research is performed in biochemistry, biophysics, microbiology, parasitology, as well as on air and water pollution. Italian scientists and engineers are generally as capable as those in the United States but are often deficient in laboratory experience or specialized training. Despite this fact, they have made important contributions over several decades to many disciplines, including microbiology, genetics, and fermentation.[25] Italy's competency in microbiology and in allied sciences is adequate to sustain defensive biological warfare programs. If adequate funding was provided and the country's policy demanded it, an offensive program could also be managed with the talent presently available.

(b)(1)

3. (U) Geographical and Political Factors

a. Italy is located in southern Europe, in the Mediterranean basin. The long, peninsular mainland and the island of Sicily almost bisect the Mediterranean Sea. All of western and central Europe, including western USSR are within 1,000 nautical miles of Italy. The Strait of Otranto, about 40 nautical miles wide, separates Italy from Communist Albania, and the USSR is about 360 nautical miles from the northeastern border of Italy. Mainland Italy has an area of about 97,000 square miles, about 1 3/4 times that of Florida. No part of the country is more than 150 miles from surrounding seas.[25] Italy is vulnerable to biological warfare attack from the land, the air, and particularly, the sea.

b. Italy is constitutionally a republic governed by a cabinet responsible to both houses of parliment; the chief of state is a President chosen by the parliment. Institutions of local government date essentially from pre-Fascist days, with important powers wielded

from Rome through a system of prefects. Regional governments, foreshadowed in the 1948 constitution, have not yet been introduced generally throughout the peninsula.[25] An unstable political atmosphere resulted in constraints on military spending which, in part, prohibited the development of a long-range BW program.[42]

B. ASSESSMENT

4. ~~(U)~~ Order of Battle

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(b)(1)

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5. (C) Doctrine and Procedures

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Italy is a signatory of the 1972 BW Disarmament Convention.

6. (C) BW Materiel

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7. (C-NFD) Production Facilities and Capabilities

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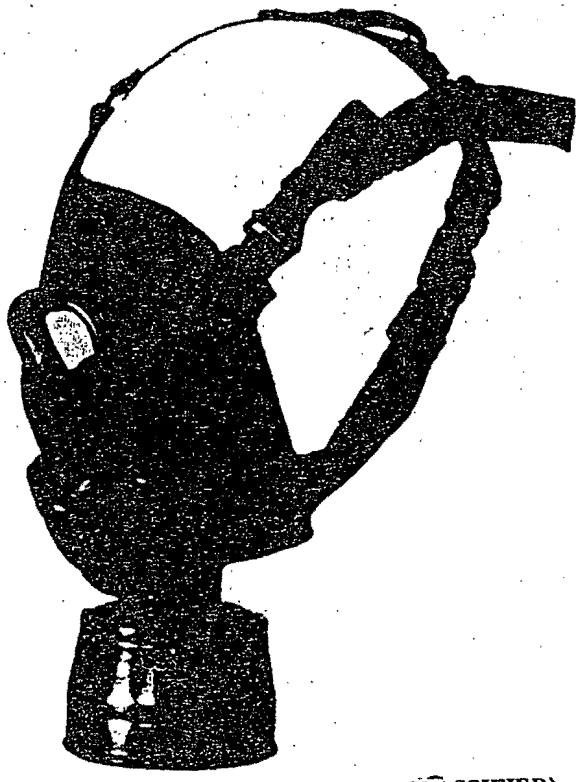

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Figure 10. Italian Model M-59 protective mask (U).

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8. (S) Stockpiling and Storage Facilities

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There is no more recent information available.[12]

9. (S-NFD) Research and Development

a. (S) General

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(b)(1)

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b. (C-NFD) Institutes and Facilities

(1) (C-NFD) Military

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(2) (C-NFD) Selected civilian institutes. a

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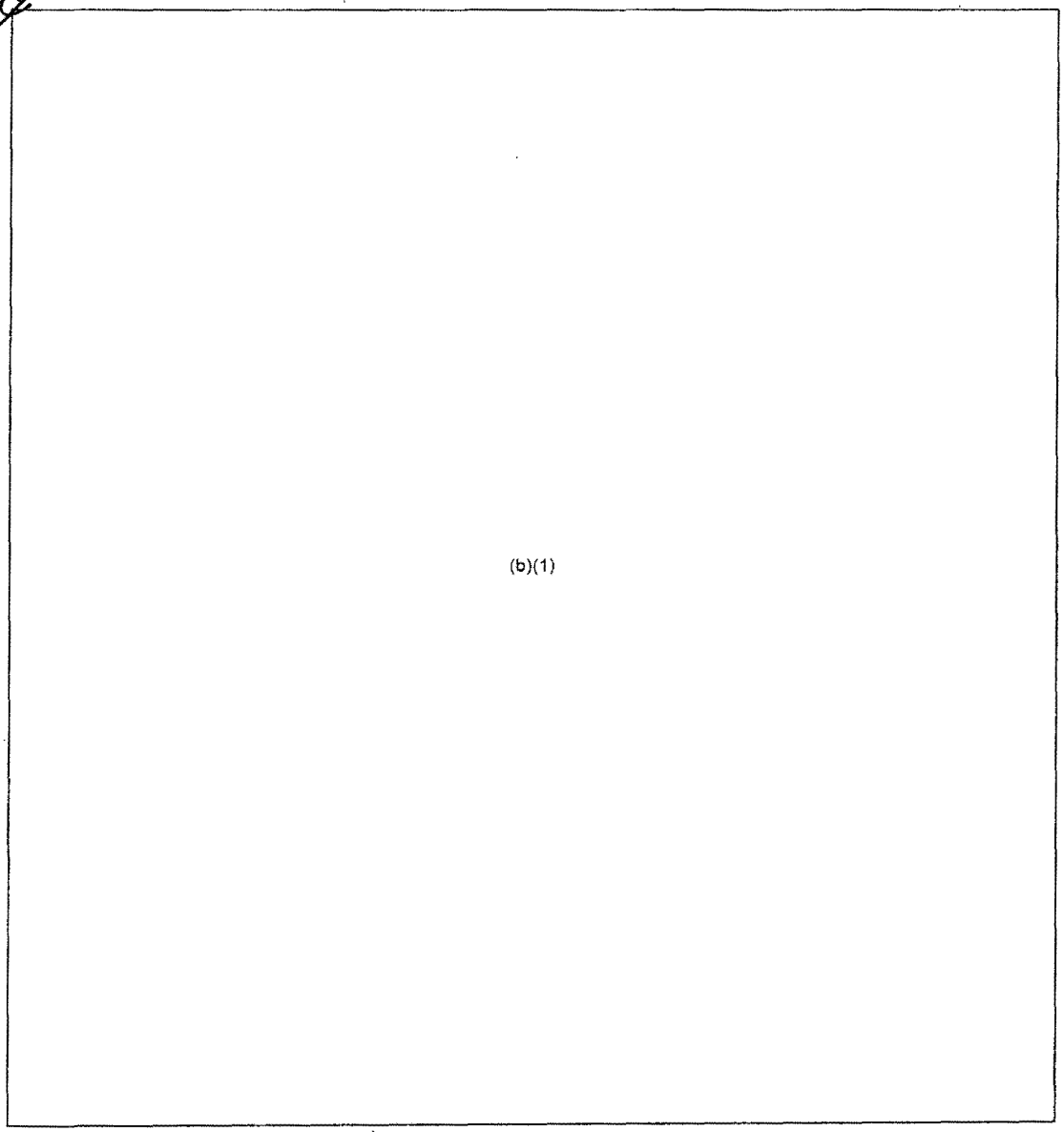

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NO FOREIGN DISSEM

C. TRENDS AND FORECASTS

12. (C) a. Trends

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1 (C) Forecasts

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Section VIII.

LUXEMBOURG

A. INTRODUCTION

1. (U) Competence in Microbiology and Public Health

a. The medical services and standards of public health and sanitation in Luxembourg compare favorably with those of other West European countries. There is no medical school in Luxembourg, and medical students are trained in other European or non-European countries. Medical facilities are generally controlled by the government.[4]

b. Most serious diseases occurring in Luxembourg are under control, and progress is being made in reducing the incidence of disease. The damp climate is responsible for the prevalence of respiratory infections with epidemics of influenza occurring periodically.

2. (U) Geographical and Political Factors

a. Luxembourg is centrally located in Western Europe, surrounded by Belgium, France, and the Federal Republic of Germany (FRG). It is the hub of several international transportation lines. The country has no natural barriers to afford protection, and the armed forces consist of a small, all volunteer army. A National Gendarmerie could, if required, assist the army in territorial defense. Luxembourg has sought security from its neighbors when a traditional policy of neutrality proved to be no safeguard through two world wars.

b. The boundaries of Luxembourg enclose an area of 1,000 square miles inhabited by nearly 350,000 persons. Compact and roughly triangular in shape, the country has a maximum north-south dimension of 55 miles and a maximum east-west dimension of about 35 miles. Of her boundaries, 92 miles adjoin Belgium, 45 miles with France, and 84 miles with the FRG. No fortifications exist on the Luxembourg side of the border. Because its geographical location has given Luxembourg a greater role in international affairs than her size warrants, neighboring countries are concerned lest other countries control this Grand Duchy.

c. Politically, Luxembourg abandoned its traditional posture of neutrality when it joined the UN in 1945. The Duchy has consistently sided with the West and given full support to the European collective security and integration programs. The political structure

is based on a constitutional, 1868, monarchy, a popularly elected unicameral parliament responsive to the will of the electorate, and political parties representing diverse religious and socioeconomic elements of the population. The constitution guarantees a wide range of civil and religious rights, protected by legal and judicial processes. Ultimate political power resides in the parliament, known as the Chamber of Deputies. The head of the state is the Grand Duke or Grand Duchess in whose name executive power is exercised.

d. Luxembourg's defense policy is based on cooperation in mutual security programs and active participation in NATO commensurate with the size and resources of the nation. Responsibility for the formulation of defense policy is vested in the cabinet with the concurrence of the Chamber of Deputies. Military service in Luxembourg has, since 1967, been entirely voluntary. The Army would be powerless to resist any determined aggressor and is capable of maintaining internal security only. The force has no strength other than the quality of its manpower.

B. ASSESSMENT

3. (S-NFD) Order of Battle

a. (U) Staff Structure. The Minister of Public Force is responsible to the Prime Minister who reports directly to the Commander in Chief, currently the Grand Duke. Subordinate to the Minister of Public Force is the Commandant who exercises authority over major components of the Army, as shown in Figure 11.

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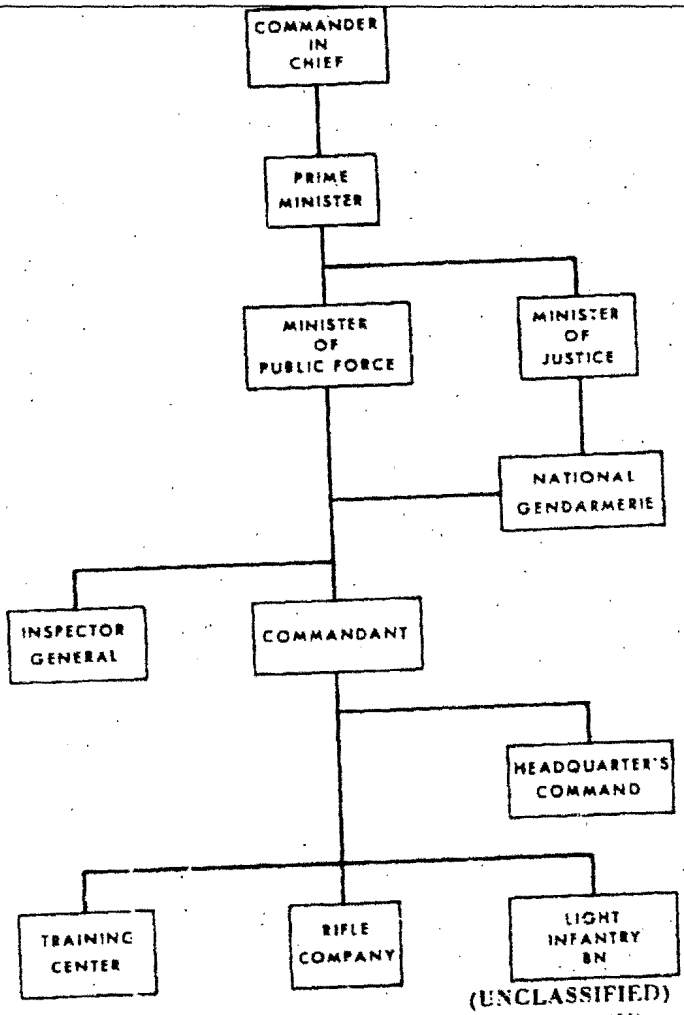

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Figure 11. Luxembourg Army Command Structure (U).

5. (C NFD) BW Materiel

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6. (C NFD) Conclusion

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C. TRENDS AND FORECASTS

7. (U) Trends

The status of public health and medicine will continue to reflect conditions in other West European countries as a result of Luxembourg's integration into European affairs. Although Luxembourg will fully support NATO, it will not develop offensive military programs nor initiate research in BW related areas.

8. (C) Forecast

(b)(1)

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Section IX.

THE NETHERLANDS

A. INTRODUCTION

1. (C) Historical Background and Competence in Microbiology and Public Health

a. (C) Historical Background

(b)(1)

(b)(1)

b. (U) (C) Competence in Microbiology and Public Health

(1) (U) Science and technology have maintained a position of importance in the Netherlands for many generations. Dutch scientists are highly skilled in the fields of microbiology and the medical sciences, and the public health system in the Netherlands is

equivalent to, and in some respects better, than that of the US. The Netherlands' technological goal has been to maintain a recognized position in international scientific affairs.

(b)(1)

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2. (U) Geographical and Political Factors

a. The Netherlands is located on the North European Plain between the North Sea, West Germany, and Belgium. The land area is about 13,000 square miles or about one-fifth the size of the State of Maine. The terrain is predominantly low, flat plains with about one-third lying below sea level. Cross-country movement in much of the country would be severely hindered by the dense network of canals and drainage ditches. The maritime climate is dominated by prevailing onshore winds from the west or southwest, which result in high humidity and abundant cloudiness. Air operations are most favorable from May through September.

b. The Dutch are a moral, industrious, and self-contained people. National stability is manifested in a long established constitutional monarchy, a popularly elected parliament,

and working coalition governments drawn from the major political groups. Government established agencies define the national scientific and technological (S&T) goals for which funds are provided by government and industry; however, the bulk of funds are contributed by private industry. Research is carried out in university institutes, semi-governmental cooperative facilities, and large research laboratories of Dutch-based international industries. The government's policy has been to provide maximum encouragement and support with a minimum of direction to S&T efforts. Its influence functions indirectly through the institutes, committees in which it participates with provincial and municipal governments, through quasi-governmental bodies, and with private industry. This places emphasis on cooperative decisions in cooperative institutions with joint channels of responsibility. The TNO is the country's largest semi-private cooperative through which the government exercises its influence. The strong scientific tradition coupled with the carefully organized program of participation by government, semi-private, and industrial research organizations has favorably affected the advancement of science in the Netherlands.[4]

B. ASSESSMENT

3. (U) (S-NFD) Order of Battle

a. (S-NFD) Military Personnel and Organizations.

(1) (S-NFD) Responsible Organizations.

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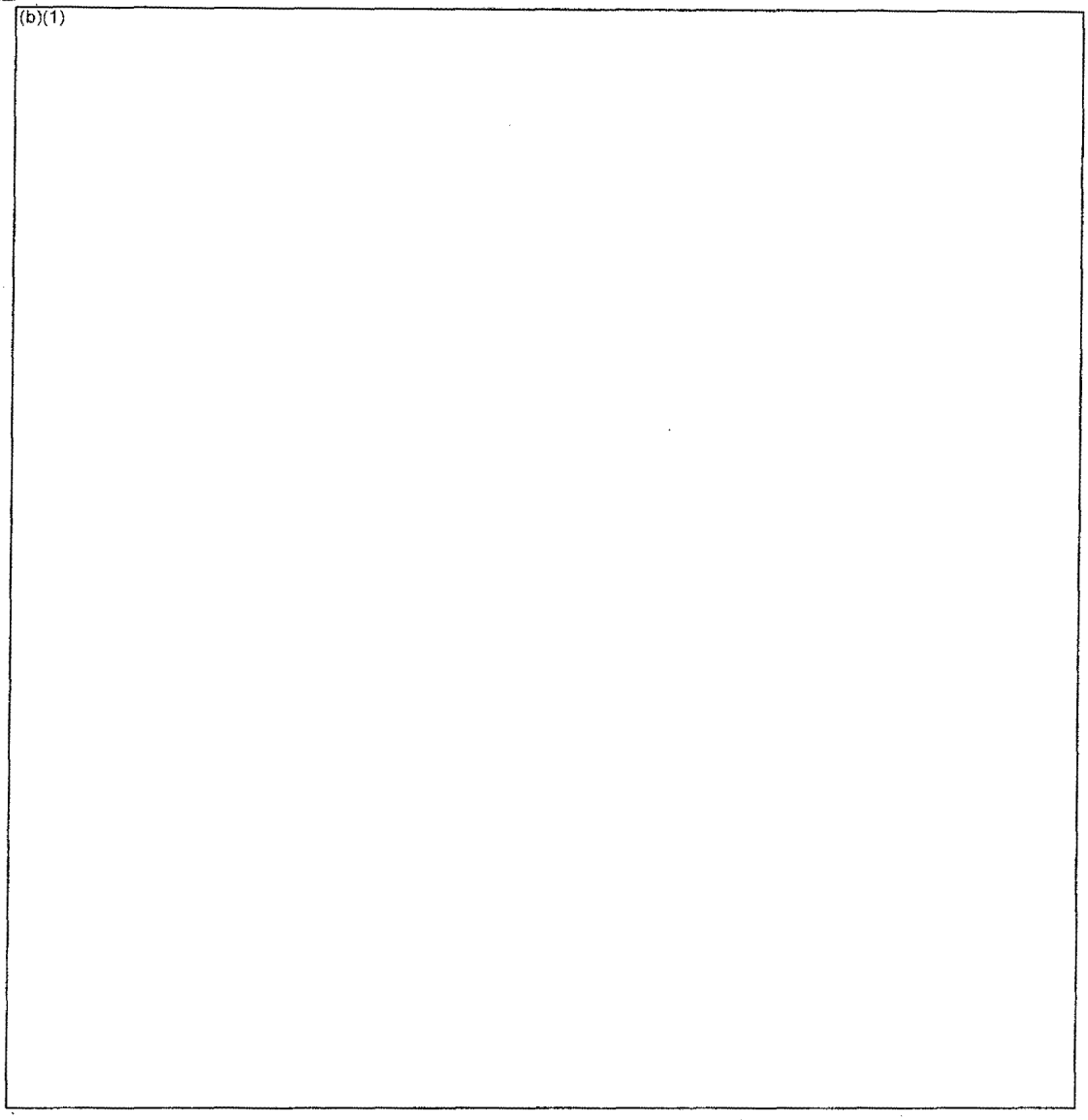

(4) (S/NFD) CBR training schools

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4. (C) Doctrine and Procedures Governing the Use of BW Weapons

(b)(1)

(b)(1)

6. (C) BW Materiel

(b)(1)

(4) (U) Although no standard collective protectors for field use are known to be available, the US M113 armored personnel carriers and the German Leopard tanks in the RNA are equipped with collective protection systems.[6 7] (b)(1)

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Figure 12. Netherlands protective cape (U).

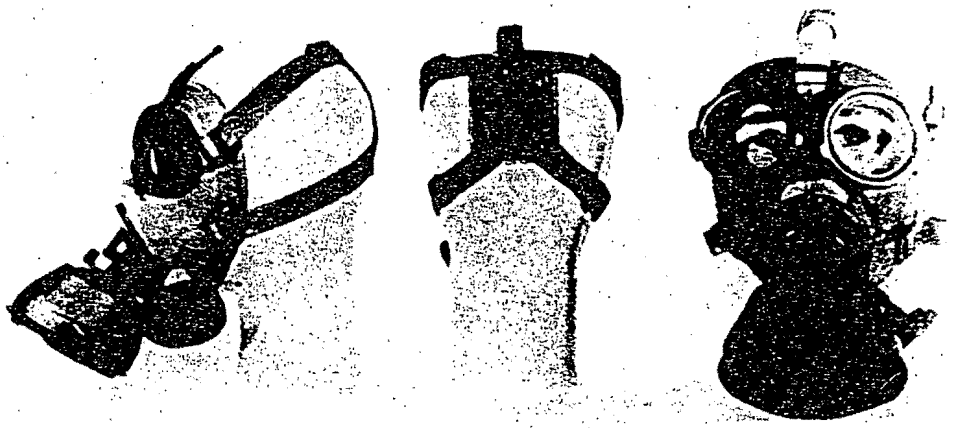

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Figure 13. Netherlands Model K protective mask (U).

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d. (S-NFD) Production Sites.

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(b)(1)

8. (S) BW Research, Development, and Testing

(b)(1)

b. (U) The Central Organization for Applied Natural Scientific Research (TNO), The Hague.

(1) (U) This organization, created by an Act of the Netherlands Parliament in 1932, is an impartial, non-profit, establishment with a mission to stimulate applied research throughout the scientific community. Organizations under the TNO are decentralized and consist of special organizations, each dealing with scientific research for a specific range of objectives. The government contributes about 70 percent of available funds with the remaining 30 percent accruing from contributions by industry and from third party research projects.

Table VI. Major Dutch Pharmaceutical Producers (U)

Company	Location	Products
Amsterdamsche Chininefabriek N.V.	Amsterdam	Biologicals
Central Institute for Veterinary Research	Amsterdam	Biologicals for human and animal use
Nederlandsche Combinatie voor Chemische Industrie N.V.	Amsterdam	Antibiotics & Biologicals
Phillips-Duphar	Amsterdam	Antibiotics & Biologicals
Royal Tropical Institute	Amsterdam	Yellow Fever Vaccine
Koninklijke Nederlandsche Gist-en Spiritus Fabriek N.V.	Delft	Biologicals & Drugs
Merck, Sharp & Dohme	Haarlem	Biologicals & Drugs
Organon	Oss	Biologicals & Drugs
Central Serum Institute	Rotterdam	Biologicals (human and animals)
N.V. Chefarc Maatschappij (Chemische Fabrief Rotterdam)	Rotterdam	Biologicals & Drugs
Franken Donders N.V. United Aniline Works	Tilburg	Biologicals
Cooperative Apothekers Vereniging De Onderlinge Pharmaceutische	Utrecht	Biologicals & Drugs
National Institute for Public Health	Utrecht	Serums & Vaccines

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(2) (U) The TNO staff numbers about 4000 and includes 700 with Ph. D. degrees, 600 with B. Sc. degrees, and 600 technicians. Organizations subordinate to TNO are: The Organization for Industrial Research, The Organization for Nutrition and Food Research; The National Defense Research Organization; and The Organization for Health Research (Figure 14). These research disciplines combine into one organization a variety of expertise which can be directed to research of a complex nature when desired. Through sponsored research and cooperative research with industrial firms, the TNO maintains excellent contacts and working relationships with the scientific community.[3]

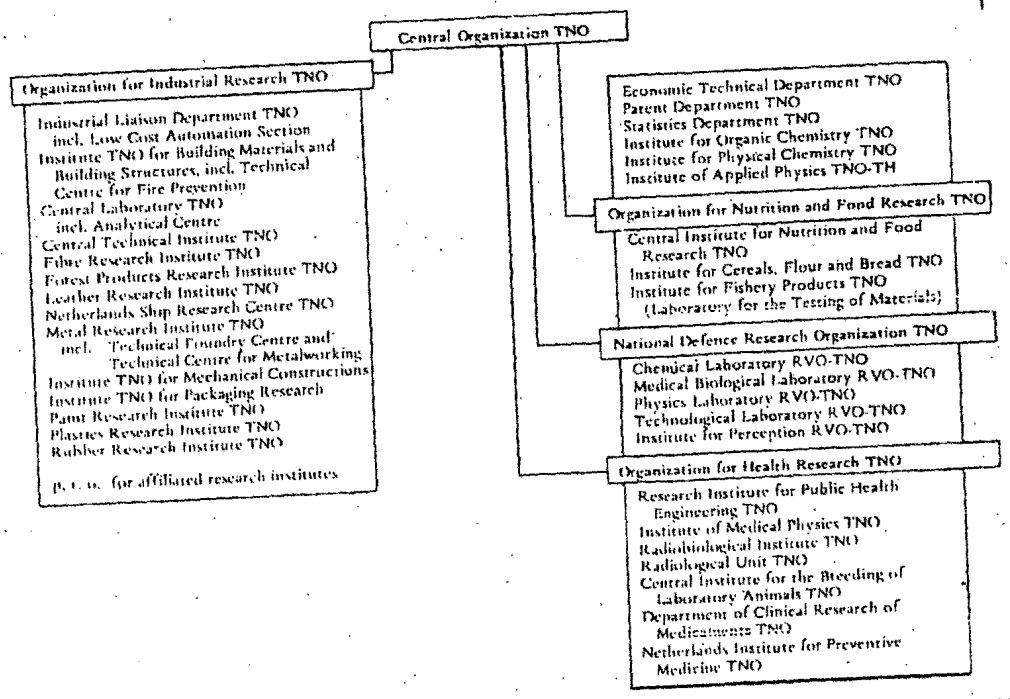

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Figure 14. The Organization for Applied Scientific Research (TNO) (U).

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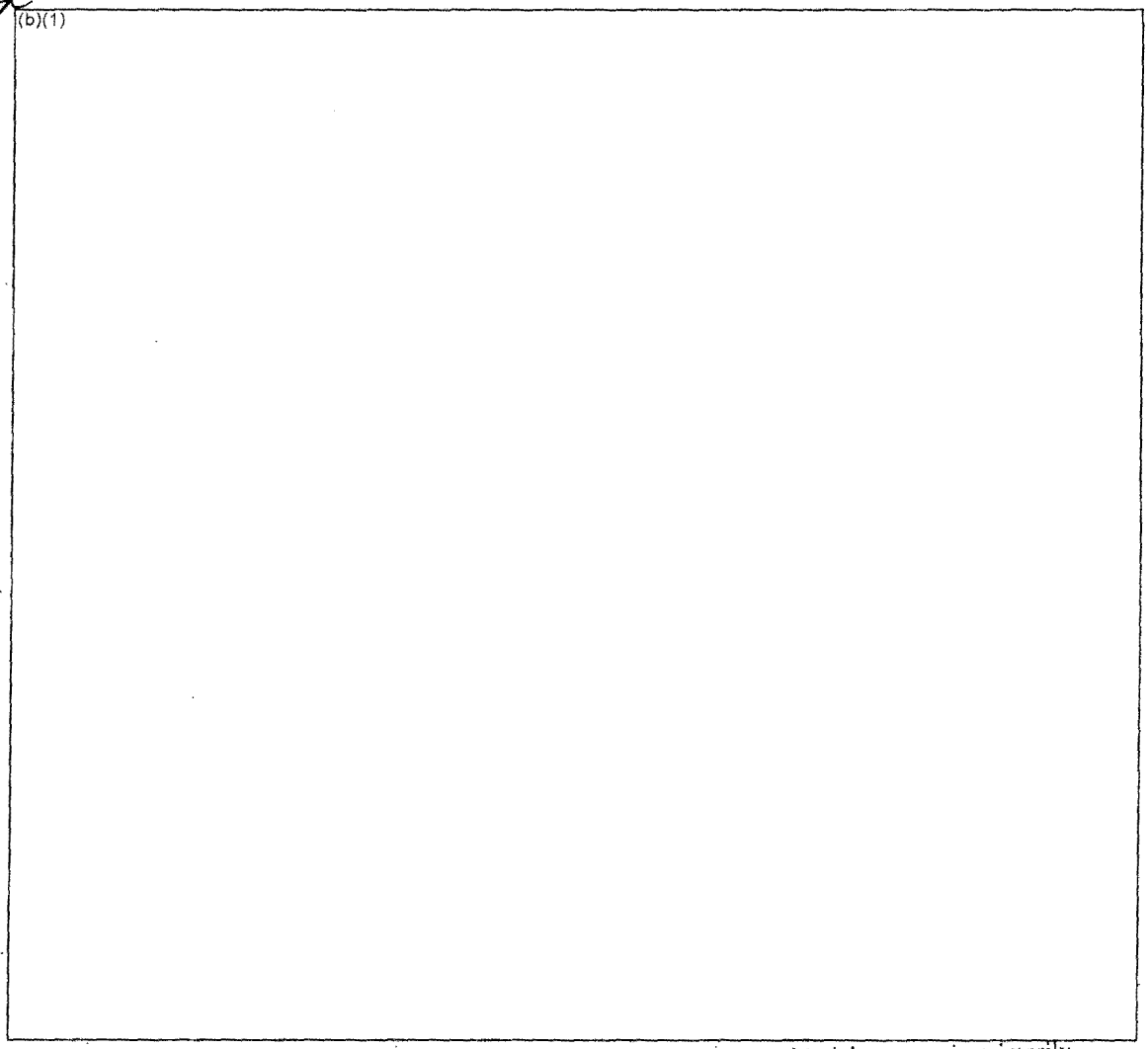

(2) (U) The Technological Laboratory, Rijswijk. This laboratory is primarily concerned with explosives and rockets, but also develops NBC protective equipment.

(3) (U) The Physics Laboratory, The Hague. Primary research efforts concern communications and electronics.

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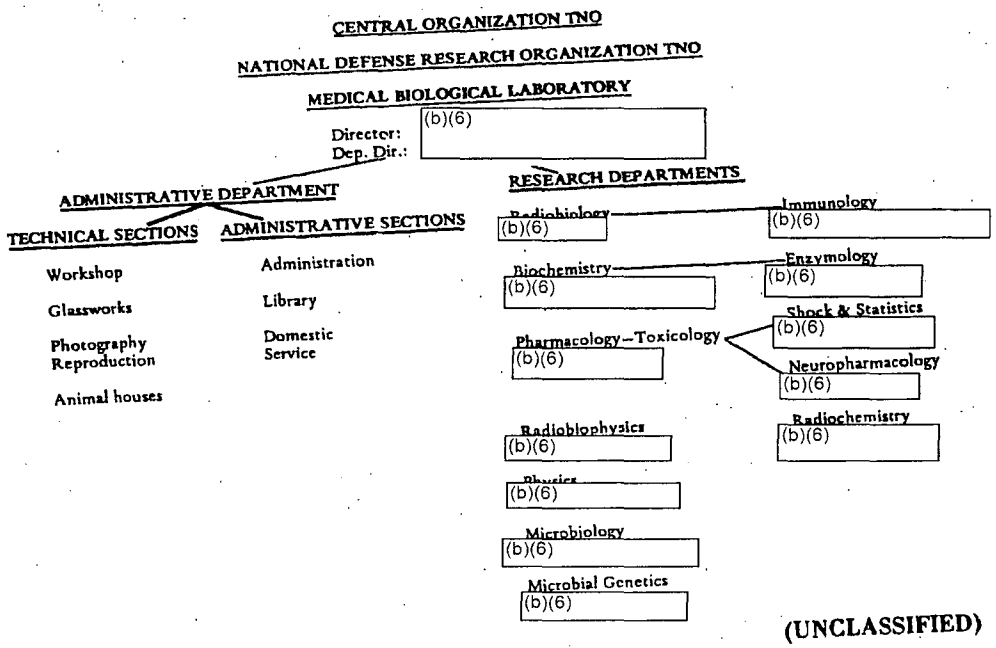

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Figure 15. Organization of the Medical Biological Laboratory (U).

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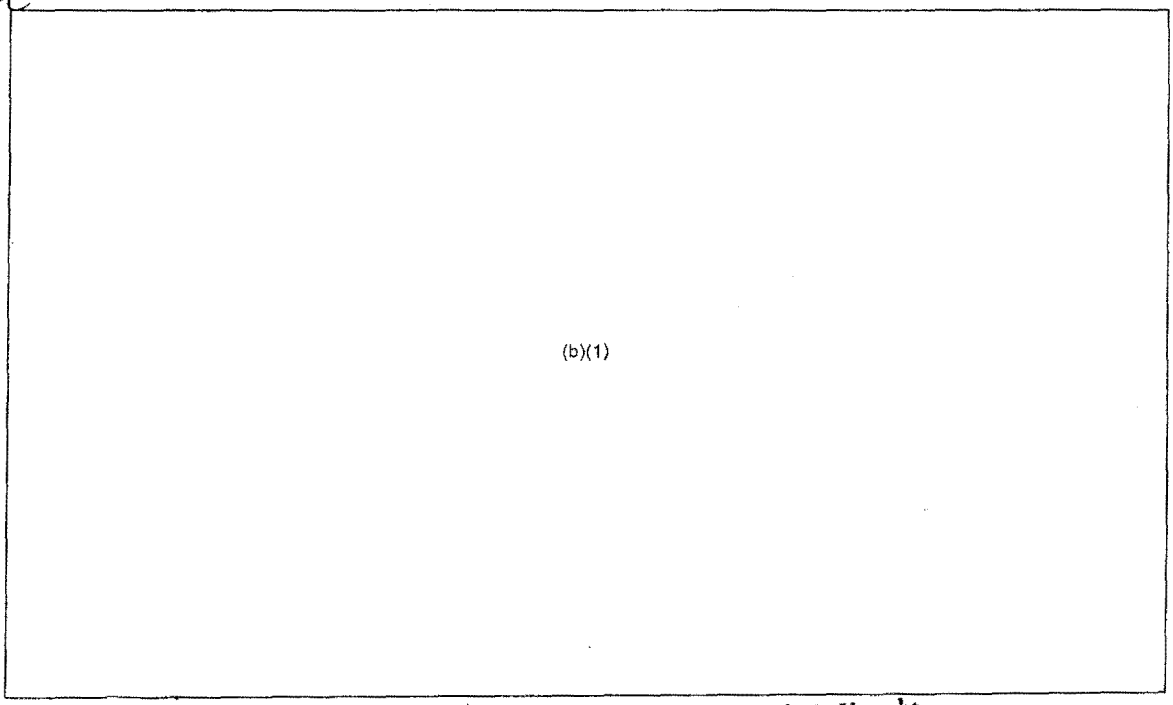
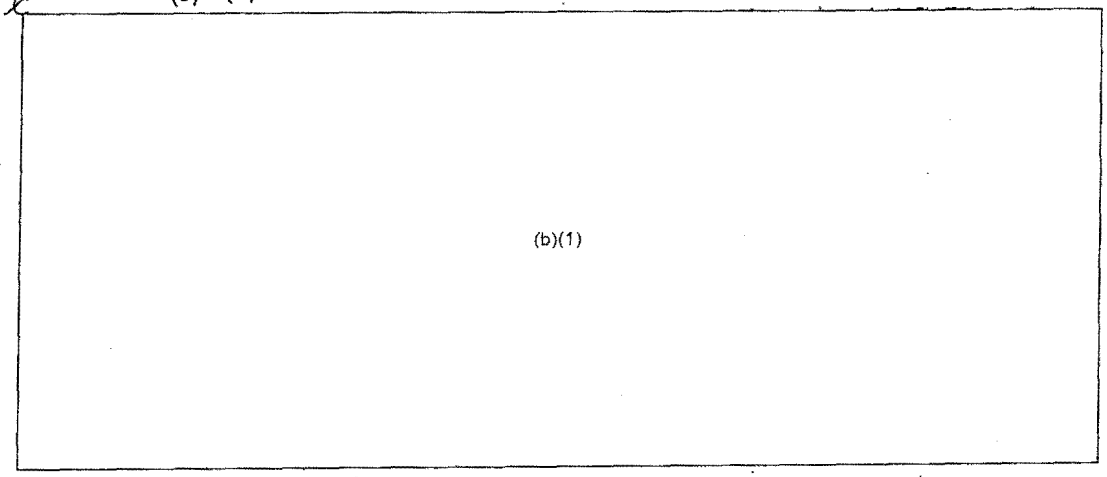


(5) ~~(C)~~ State University of Utrecht, Catharynlsengel 59, Utrecht.



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d. (U) Other Institutes of Interest.

(b)(1)

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(2) (U) Van Hemert of the Apparatenfabriek von Doarn, Utrechtseiveg 364—De Bilt described problems associated with the growth of tissue cells and production of viruses in 1968. The inability to control environmental conditions was cited as a serious propagation weakness. This was particularly true for oxygen tension since high oxygen concentration inhibited cell division but favored viral propagation. Recently, this company circulated brochures which described fermentors of 5, 10, and 50 liter capacities which were completely instrumented and which included a steam-sterilizable oxygen electrode. Reportedly, the oxygen tension can be controlled under a variety of conditions by automatic regulation of oxygen, nitrogen, air, and carbon dioxide concentrations. The oxygen tension probe can be sterilized repeatedly at 120°C. The inclusion of these electrodes in a fully instrumented fermentor provides an excellent system for producing tissue culture cells for subsequent viral infection.[59]

(b)(1)

(b)(1)

(4) (U) The Phillips-Duphar Company is engaged in the development of special drugs, medical equipment, vaccines, and anti-viral compounds. Brucella vaccine is manufactured by fermentation, then inactivated by heating at 50-75°C.[60] Other vaccines are under development.

e. (~~C~~) Anti-Crop Research (b)(1)

(b)(1)

(2) (U) Research on plant viruses has included studies of the mechanism of infection, isolation and purification of plant viruses, characterization and synthesis of protein and nucleic acids isolated from plant viruses, and from insect vectors.[63] Interest has also been evident in controlling insects by infecting them with specific viruses.[64]

(b)(1)

9. (C-NFD) Naval BW Capabilities (b)(1)

(b)(1)

(b)(1)

10. (S-NFD) Conclusions

(b)(1)

(b)(1)

C. TRENDS AND FORECASTS

11. (C) Trends

(b)(1)

12. (C) Forecasts

a. Short-Range (1972-1977).

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(b)(1)

Section X.

NORWAY

A. INTRODUCTION

1. (U) Historical Background

As a signator of the Geneva Protocol of 1925, Norway has renounced the use of chemical and biological agents and research to develop offensive weapon systems. Norway has also signed the 1972 BW Disarmament Convention.

2. (C) Competence in Microbiology and Public Health

(b)(1)

(b)(1)

B. ASSESSMENT

3. (U) ~~(S)~~ Order of Battle

a. (C) Military Personnel and Organizations

(b)(1)

(b)(1)

(b)(1)

4. (S) Doctrine and Procedures

(b)(1)

5. (S-NFD) BW Materiel

a. (U) Offensive. No agents and/or other offensive materiel has been acquired. It is deemed unlikely that Norway will develop such a capability. In the event of an all-out war, and if the Norwegian Ministry of Defense deemed it militarily advantageous to use a biological weapon, they would at this time have to obtain the weapon system from another NATO country. However, unilateral national decisions made by the United States have stripped NATO countries of offensive biological warfare capability.

(b)(1)

(b)(1)

6. (S-NFD) Production Facilities and Capabilities

(b)(1)

Table VII. Principal Norwegian Producers of BW Defense-Related Antibiotics and Biologicals (U)

(b)(1)

7. (S-NFD) Stockpiling and Storage Facilities

(b)(1)

8. (S-NFD) BW Research and Development

a. (U) Prior to World War II, the scope of research in Norway was very limited, and the economic resources too small to facilitate a strong development of research activities. Since 1945 there has been an expansion of research capacity. A significant feature of Norway's post-war development was the establishment of three research councils: The Royal Norwegian Council for Scientific and Industrial Research (NTNF), founded in 1946; The Norwegian Research Council for Science and the Humanities, founded in 1949; and The Agricultural Research Council of Norway (NLVF), also founded in 1949. Large proportions of funds have been devoted to planning or encouraging scientific and scholarly activity at the state colleges and universities. The work of the research councils has also been of great

Table VIII. Norwegian Military Medical Depots (U)

(b)(1)

significance in strengthening and expanding research activities outside the universities and state colleges.

b. (U) The Norwegian Science Advisory Council was established by Royal Decree in 1965, and is responsible to the Prime Minister. Its fifteen members are appointed by the Government for a period of 4 years. The main task of the Council is to provide advice on matters related to scientific and technological research in all fields to the Government and in particular to the Ministerial Science Committee, which is an interdepartmental body of the Government established to coordinate science activities at government level. The Research Councils play a very important part in policy making. For example, apart from grants to atomic energy research, earmarked by Parliament, the Councils have a free hand in the distribution of funds, regardless of whether they are derived from the State, from the State-owned football pool, or from other sources. The Councils have the right to grant funds to governmental institutions and higher institutions of learning run entirely by the State, and can accordingly influence the activities of the institutions. The Councils also influence science policy by direct representation on the boards of the various institutes, through direct influence on their own institutes, and finally through active work for the recruitment of scientific personnel.

c. (U) Norwegian research institutes include universities and colleges (all of which are controlled and administered by the Government), Government institutes connected with various Ministries, institutes connected with the Royal Norwegian Council for Scientific and Industrial Research, and finally private non-profit institutes connected with research associations.

d. (U) Despite considerable expansion over the past years, the universities have been unable to satisfy the demand for scientists and engineers. At least 40-50% of Norway's graduate engineers take their degrees abroad. This is also true in medicine and dentistry. Several of the important universities are cited here. The University of Oslo, which was established in 1811, enrolled 13,000 students in 1966. Of this number, 2,800 were studying mathematics and the natural sciences, while 750 were matriculated in the department of medicine. The Industrial Research Center, Blindera, together with the Research Center at Trondheim can be regarded as main institutes for industrial research in Norway. The University of Bergen is also a major center of learning, as is The Technical University of Norway at Trondheim where emphasis is placed on architecture, mining, and metallurgy, civil, chemical, mechanical and electrical engineering, and on the general sciences. Two other universities of lesser importance are the Agricultural College of Norway and the Veterinary College of Norway.

e. (U) The Norwegian Defense Research Establishment (NDRE) at Kjeller was established in 1946 under the Ministry of Defense and was built up around a nucleus of scientists experienced in wartime defense research. Personnel at NDRE conduct fundamental and applied research in fields important to the defense of Norway. They particularly evaluate progress in military science and technology. For example, they conduct research on Norwegian geophysical peculiarities which could be of importance for both the national and NATO defense, and facilitate national production of weapons and materiel by encouraging the development of weapons and equipment particularly suitable for use in the Norwegian environment. The NDRE acts in an advisory capacity to the Ministry of Defense, the Defense Staff, and the three services in all matters of fundamental importance covered by its field of activity. Within the NDRE there are divisions of physics, chemistry, electronics, underwater warfare, explosives, and toxicology. A Defense Research Board of 10 members formulates the general research policy of the Establishment and approves major new research projects within the framework of funds and personnel made available by the Ministry of Defense. The staff at NDRE numbers about 400, of which nearly 130 are scientists and graduate engineers. For 1966, it had a budget of 20,000,000 NK ($3,000,000). The Establishment receives its financial support for some of its projects from other national organizations and from sources in the United States; the Mutual Weapons Development Program (MWDP) has been one of the principal contributors.[5]

(b)(1)

(b)(1)

C. TRENDS AND FORECASTS

10. (U) Trends

(b)(1)

(b)(1)

11. (C) Forecasts

(b)(1)

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Section XI.

PORTUGAL

A. INTRODUCTION

1. (U) Competence in Microbiology and Public Health

a. The Ministry of Corporations, Social Welfare, Health and Public Assistance is the responsible agency for matters concerning the health of the country. In addition, there are regional health offices in Lisbon, Porto, and Coimbra. Supporting these regional offices are 22 political district health offices.

b. Common animal diseases indigenous to Portugal are brucellosis, anthrax, rabies, and African swine fever.

- There are few highly qualified scientists available to conduct necessary research.

2. ~~(C)~~ Political Factors &

(b)(1)

(b)(1)

B. ASSESSMENT

3. ~~(C)~~ Order of Battle &

(b)(1)

(b)(1)

(b)(1)

5. (C) BW Materiel (b)(1)

(b)(1)

6. (C) Production and Stockpiling

(b)(1)

7. (S-NFD) Research and Development

a. (U) Institutes and Facilities.

(1) (U) Research programs in biology and medicine are chiefly concerned with problems related to public health and preventive medicine. This quality of work is considered to be relatively unsophisticated. Portugal is a signatory of the 1972 BW Disarmament Convention

(2) (U) Investigators in the Plant Genetics and Rice Breeding Section of the Plant Breeding Department at The National Agronomy Station in Oeiras have been developing disease resistant strains of rice, wheat, barley, and rye. The development of strains yielding more grain per acre has also been given some priority. These investigations have been at least partially successful.[6 /1 2] This work was under the direction of Engineer C. G. de Melo e Mota, Chief of the Genetic Department, and Engineer M. A. da Cunha Vianna e Silva, Chief of the Rice Breeding Section, Department of Plant Pathology. Dr. Manuel Bravo Lima, the only plant nematologist in the country, also works at the National Agronomy Station.

(3) (U) The Institute of Tropical Medicine supports programs related not only to diseases and public health problems indigenous to Portugal, but also those affecting the overseas provinces in Africa, Portuguese Timor, and Macao.[8]

(4) (U) At best, the biological research in Portugal is considered to be of a low level.

b. (U) Biological Agent Development.

(1) (U) There are no known facilities or institutes specifically directed toward the development of biological warfare agents.

(2) (U) The only work in biological genetics has been referenced previously, and is concerned solely with the improvement of crop resistance to disease and with enhancing higher yields of specific crops.[6]

c. (S NFD) Methods of Dissemination.

(b)(1)

(b)(1)

d. (C) Detection and Identification.

(b)(1)

(b)(1)

(2) (U) As a NATO member, Portugal does have access through NATO sponsored scientific meetings to information relating to the latest developments for the detection and identification of biological warfare agents.

e. (U) Vaccines, Sera, and Chemotherapeutic Agents.

(1) (U) Although small quantities of various vaccines, sera, and other therapeutic and prophylactic biologicals are produced in Portugal, such supplies must be augmented from sources outside the country.

(2) (U) There is no known research being carried out in Portugal to develop procedures for aerogenic immunization.

8. (C) Naval Aspects of Biological Warfare

(b)(1)

(b)(1)

9. (S-NFD) Conclusions

(b)(1)

(b)(1)

C. TRENDS AND FORECASTS

10. (C) Trends

(b)(1)

(b)(1)

11. (C) Forecasts

(b)(1)

(b)(1)

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Section XII.

TURKEY

A. INTRODUCTION

1. (U) Historical Development

a. Since the establishment of the Republic, the government has established modern disease control practices, health services, and facilities. Preventive campaigns have eliminated severe epidemics which once took heavy tolls in rural areas, and education and public works have raised the standard of rural hygiene, although facilities and personnel were few in number. By 1968, the cities and larger towns had access to good health care. However, as in the country, total medical resources are spread rather thin.

b. Inadequate public sanitation and a harsh climate are two of the principal factors affecting the health level in Turkey. However, public attitudes, especially in rural areas, contribute to lower standards of sanitation.[1]

2. (U) Public Health Competence

a. Since World War II, there have been many advancements in health facilities due largely to the efforts of the Ministry of Health and Social Welfare and its planning and operating agency, the General Directorate of Health. A Director of Health Services has been assigned to each province; otherwise, the Directorate's functions are highly centralized. It plans preventive programs, supervises existing facilities, establishes standards and fees for the medical profession, conducts sanitation inspections, and promotes research and education. It supervises the School of Hygiene where health officers and physicians are given special training, and the Refik Saydam Institute of Hygiene, a laboratory that engages in research, diagnosis, and manufacture of vaccines and sera.[1]

b. The limiting factor in Turkish public health competence is lack of both trained personnel and adequate facilities. Research standards are also limited by these same inadequacies, which in turn, affects training in secondary schools. Competent scientists and mathematicians are in short supply despite a government drive to improve and foster scientific education and employment. However, low pay and lack of facilities will continue to frustrate this goal for some time to come.

Turkey has no rapid warning and detection devices. Decontamination equipment is scarce. Turkey possesses no known BW weapons system.

4. (C/NFD) Doctrine and Procedures

(b)(1)

5. (S-NFD) BW Materiel

a. (U) Offensive Materiel. Turkey is not known to possess either biological agents or munitions or to be engaged in research to develop offensive materiel of any kind. Guidance from the US has been requested in establishing CBR programs, but the emphasis was to be on defense aspects.[3]

b. (S-NFD) Defensive Materiel

(b)(1)

6. (S-NFD) Production Facilities and Capabilities

(b)(1)

b. (C) Capabilities.

(b)(1)

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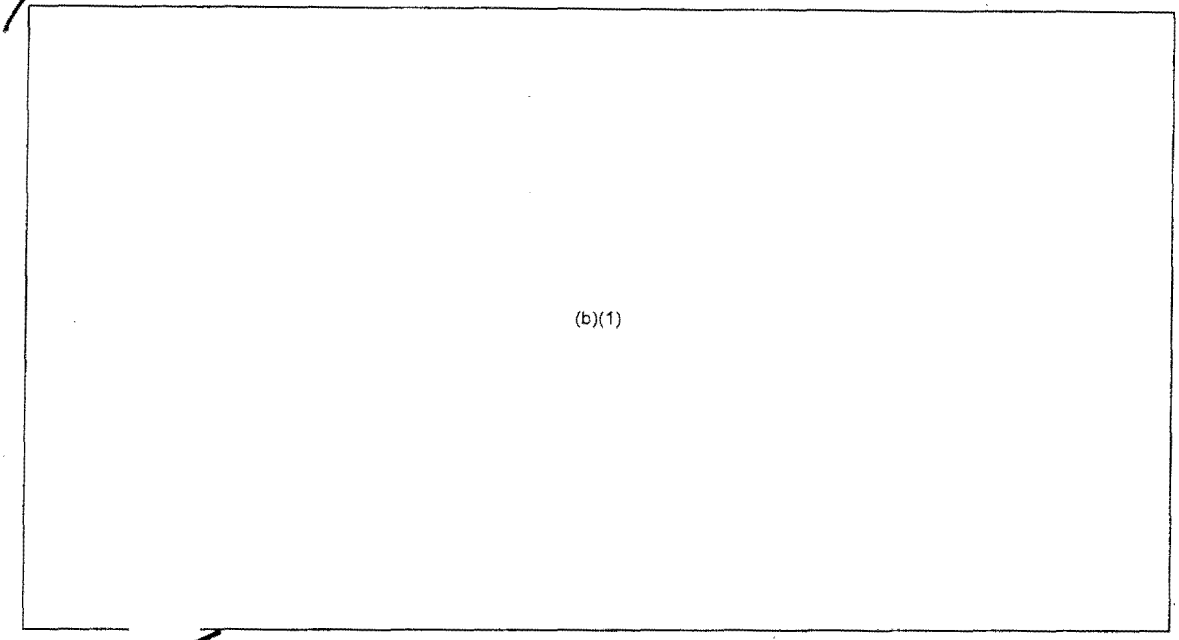
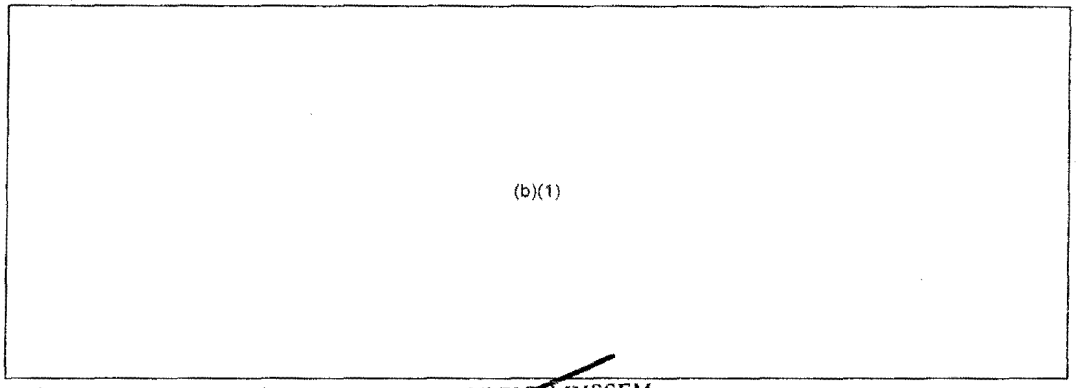


7. (S) Stockpiles and Storage

a. (U) No stockpiling or storage is known to exist. It is unlikely that in the event of need more than a token amount of defensive equipment would be available. In view of the prevailing low technological level, it is unlikely that storage of BW materiel would be either safe or reliable.



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9. (U) Naval Aspects of BW

No information is currently available which relates to specific or special offensive or defensive capabilities of the Turkish Navy. No citadel type construction or modification has been reported.

10. (U) Conclusions

(b)(1)

Section XIII.

UNITED KINGDOM

A. INTRODUCTION

1. (U) Historical Background

British strategy for the defense of the United Kingdom and its oversea interests was for centuries based largely on control of the seas and the maintenance of alliances with strong and friendly European powers. In the post World War II period, however, the relative decline of the United Kingdom as a world power, the diminution of its colonial empire, and the vulnerability of the home base to nuclear attack have contributed substantially toward the development of a national posture of defense.

2. (U) Public Health

The United Kingdom has a wide ranging public health program. Established in 1948, this program, known as the National Health Service (NHS), makes comprehensive health services available--for the most part without charge--to everyone in the United Kingdom in accordance with medical need and without regard to nationality, residence, or insurance qualification. Available under this program are such services as hospitalization, medical and dental care, provisions of medicines and drugs, maternity and infant care, home nursing and vaccination. Providing these services by participating in the program are the vast majority of general practitioners, specialists, dentists, pharmacists and hospitals in the United Kingdom. About 97 percent of the population make use of the NHS.[4]

3. (U) Political Factors

(b)(1)

(b)(1)

B. ASSESSMENT

4. (U) (S) Order of Battle

NFD

a. (S) Military Personnel and Organizations (b)(1)

(b)(1)

(2) (S) CBR units. (b)(1)

(b)(1)

(b) (U) The Royal Navy has a NBC Protection Officer aboard each combat ship, but this is not believed to be a full-time assignment. The responsibilities of the NBC Protection Officer include: Advising the ships command as to implication of present or impending biological, chemical, or radiation hazards, and recommending appropriate countermeasures; keeping records of "total dose" absorbed by the ship's company; monitoring, and subsequently initiating decontamination and cleaning procedures to deal

with NBC agents; training teams to accomplish these tasks; and, distributing and maintaining CBR protective devices, decontamination equipment, detection and measuring devices.[3]

(b)(1)

(4) ~~(C NF D)~~ CBR training schools.

(b)(1)

(5) (U) Civil defense.

(a) (U) The Civil Defense Corps (CDC) is organized in local divisions recruited and trained by CDC agencies—usually the county and county borough authorities. Each division contains five sections. The Headquarters section is responsible for CD operations, communications, and reconnaissance. The Rescue section undertakes rescue of people who are trapped in damaged buildings and gives them first aid. The Ambulance and First Aid section administers first aid, organizes stretcher bearers, and transports casualties to Forward Medical Aid Units and hospitals. The Wardens are the general guardians within a district, helping to guide and control the public, reporting damage and radioactive fall-out, organizing self-help measures, etc. The Welfare sections look after the homeless, help with billeting, establish rest centers, implement emergency cooking and feeding procedures, and provide for public information centers.

(b) (U) There are three scientific advisors for the director of each CD district. These scientific advisors take extensive course work both within the CD organization and at appropriate universities to update their knowledge of CBR warfare, its effects, and countermeasures. In addition, volunteer CD workers must undergo during their first two years with the organization at least 50 hours of training, part of which is devoted to CBR. Refresher courses and exercises are continually held.

(b)(1)

b. (U) Military Equipment.

(b)(1)

(b)(1)

5. Doctrine and Procedures

(b)(1)

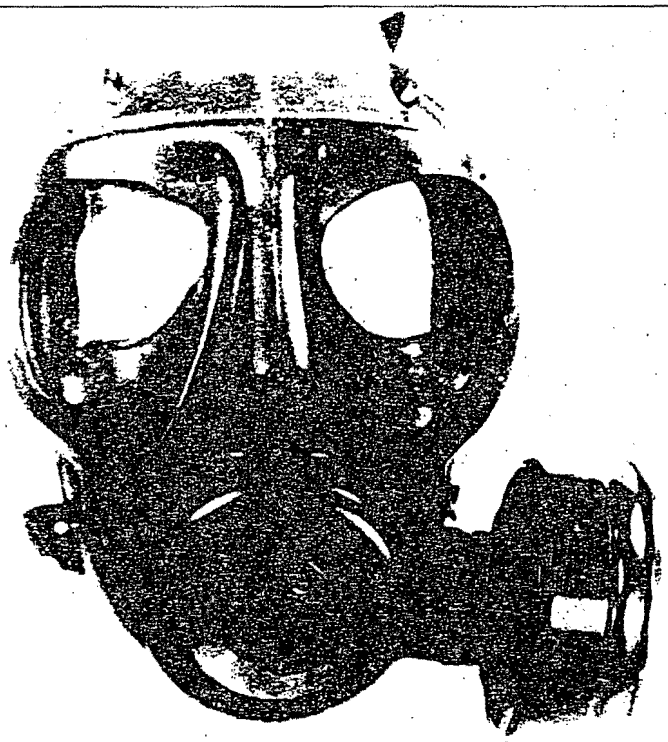

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Figure 16. British Model S-6 protective mask (U).

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6. (S) BW Materiel

(b)(1)

b. (S) Defensive.

(1) (S) Military.

(b)(1)

(b)(1)

(2) (S) Civilian

(b)(1)

(b)(1)

7. (S) Production Facilities and Capabilities

a. (S) Biologicals.

(b)(1)

(2) (U) A virus production facility has recently been formed at MRE and will soon be able to produce viruses on a substantial scale if the requirement exists. Production of chick embryo cells, used in the culture of certain types of viruses, is now semi-automated and highly efficient.[8]

b. (S) Equipment

(b)(1)

c. (U) Pharmaceuticals. The pharmaceutical industry in the United Kingdom is large and comprises several hundred independent firms. Approximately 72 companies are major producers. In 1965 the industry produced goods valued at $600 million, and employed a labor force of approximately 72,000. Large quantities of drugs and other pharmaceuticals are exported. There is no known production of pharmaceuticals and biologicals specifically designed for defense against BW, however, some types of materiel being produced do have BW defense application.[2]

8. (C) Stockpiling and Storage Facilities. (b)(1)

(b)(1)

9. (S-NFD) Research and Development (b)(1)

(b)(1)

a. (C) Research Facilities. (b)(1)

(b)(1)

(b)(1)

(b)(1)

(3) (U) In addition to in-house research, MRE administers several extramural contracts. Currently these have been let to:

(a) (U) University of Birmingham. Studies here are concerned with the Semliki Forest Virus, vaccinia extra-viral antigens, and improvements in immunochemical technique.

(b) (U) London School of Hygiene and Tropical Medicine. Work emphasizes the effects of measles virus, yellow fever virus, and human adenovirus (type 5) on cultures of nervous tissue.

(c) (U) Queen Elizabeth College, University of London. Program is designed to investigate bacterial leaching of uranium and copper from their oxide and sulfide ores.

(d) (U) University of Bristol. Because equipment suitable for microscopy and the micromanipulation of *Staphyloccoccus* is not yet available, preliminary studies have been carried out on the comparatively large cells of a sewage organism. Improved instrumentation is being developed to permit near-ultraviolet illumination, with versatile phase-contrast facilities and photographic recording of observations.

(e) (U) University of Oxford. Investigations emphasize aspects of biochemical research.

(f) (U) Oxford Polytechnic. Hydroxyapatite columns have been used for the chromatographic separation of strains of Semliki Forest virus.

(4) (U) There has been considerable collaboration with the Medical Research Council (MRC), the Public Health Laboratory Service, and the Ministry of Health that is of an applied nature. These investigations include evaluations of disinfectants, studies of bacterial permeability through surgical wrapping paper and bags, analyses of bacterial infections which spread in hospitals, and characterizations of air filters and filter materials.[1/8]

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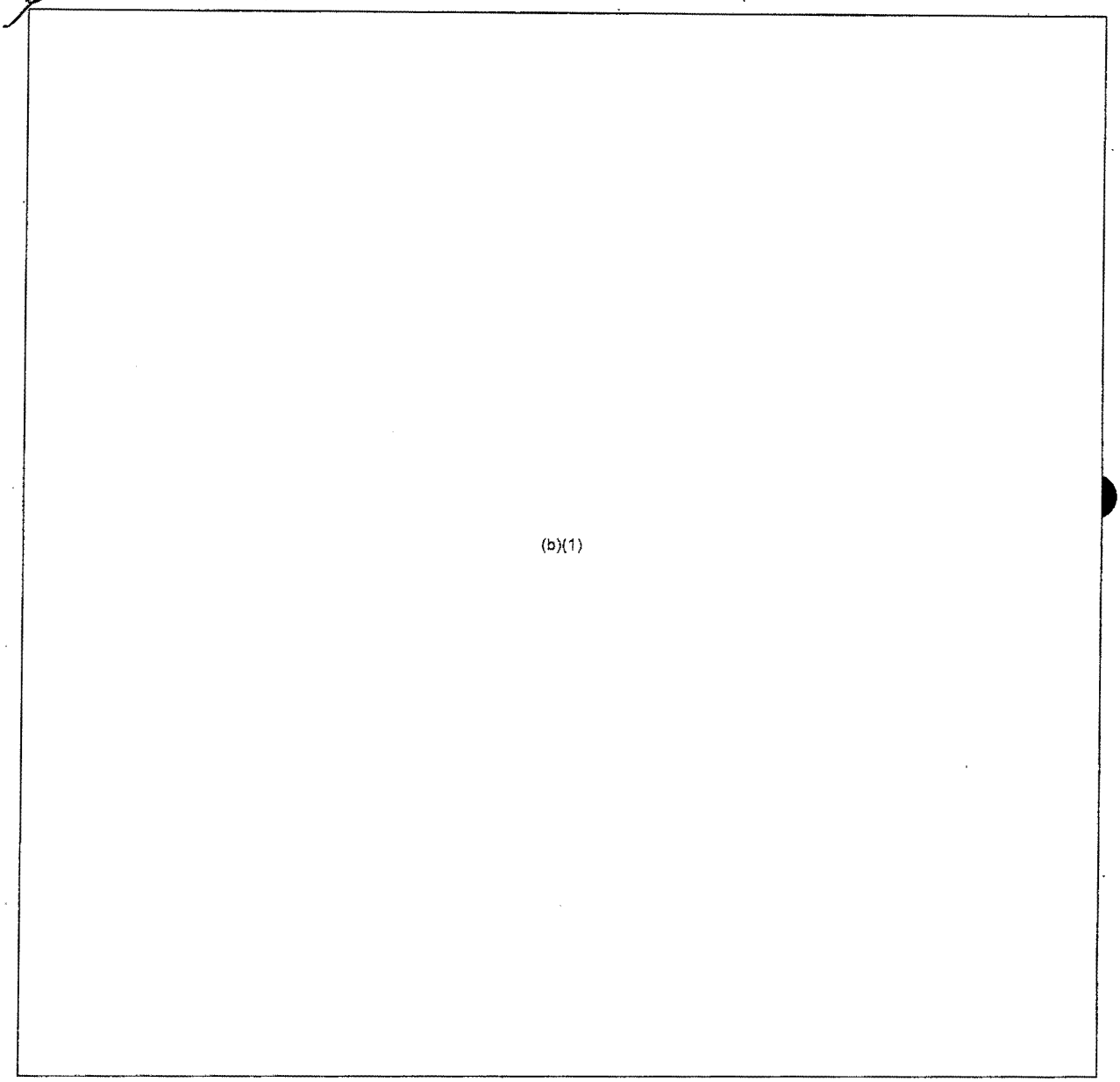
(b)(1)



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(b)(1)

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c. (S) Detection and Identification.

(b)(1)

(b)(1)

10. (S) Naval Aspects of BW

(b)(1)

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(b)(1)

11. (S) Conclusions

(b)(1)

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11. (S) Conclusions

(b)(1)

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C. TRENDS AND FORECASTS

12. ~~(C)~~ Trends

(b)(1)

13. ~~(C)~~ Forecasts

a. Short-Range (1972-1977).

(b)(1)

(b)(1)

b. Mid-Range (1977-1982).

(b)(1)

(b)(1)

(b)(1)

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Section XIV.

WEST GERMANY

A. INTRODUCTION

1. (S-NFD) Historical Background

a. (U) West Germany's activities in the field of biological warfare are restricted by the Brussels Treaty of 1948 which forbids the production of toxic CW munitions, and the London and Paris agreements of 1954 which prohibit research and development leading to the manufacture of weapons of mass destruction. These later agreements were further enforced by the Federal Republic of Germany Ministry of Defense (MOD) in accordance with the Brussels Declaration of 1955, in which the MOD stated that it had not exceeded and would continue to abide by these restrictions. In 1972 West Germany signed the BW Disarmament Convention.

(b)(1)

(b)(1)

h. (U) The Federal Republic of Germany was founded in 1949 by uniting the three western zones of occupation of the former German Third Reich. At the end of World War II, the structure of scientific research throughout Germany had been completely shattered. It has been estimated that more than 60% of all research establishments which predated 1939 had been destroyed, and that scientific research was at a virtual standstill. Universities and other academic and scientific institutions had also suffered so severely that only 6 of 30 institutes of higher learning were able to open when hostilities ceased.

i. (U) One of the first important steps towards reorganization was taken by the British in 1946 when they brought several important German scientists to Göttingen and provided housing, laboratory accommodations, and equipment. From this small nucleus grew one of West Germany's most significant non-industrial and independent organizations for the promotion of research, The Max Planck Society for the Advancement of Science. This group was officially recognized in both the American and British zones in February, 1948, and by the French in October, 1949.

2. (U) Research Base

a. The Federal Republic of Germany (FRG) is comprised of eight States and the free cities of Hamburg and Bremen. This is an important factor in understanding educational and scientific policy. The FRG is a polycentric country, and the science policy is primarily the responsibility of the States, not of the FRG. There is no federal authority for science and research. Consequently, each state provides the main support for scientific research in all academic institutions, and each state has its own educational practices. However, to achieve some unity, there is the Permanent Conference of Ministers for Cultural Affairs, a body politic made up of representatives from the offices of each State Ministry for Cultural Affairs. In 1951, the German Research Association was formed which has become the central organization within the Federal Republic dealing with all fields of scientific research.

b. Today the FRG has one of the best scientific and technological bases to support research in almost any field, including both offensive or defensive aspects of biological warfare if it so desires. In all likelihood, it has the largest group of scientifically trained personnel in all of Europe, and it is perhaps second only to the United States in having a large corps of young, enthusiastic, energetic, and dedicated scientific personnel. It is interesting to note that while prior to World War II young German men found their greatest rewards in military service, today in West Germany this age group is finding its greatest financial and personal satisfaction in research, industry, and business administration. It is of the utmost importance that the intelligence community of the United States keep abreast of all phases of research and development within the FRG.

B. ORDER OF BATTLE

3. (U) (S) Military Personnel and Organizations Responsible for BW

a. (U) Responsible Organizations within MOD.

(b)(1)

(b)(1)

Military Technology

(2) (U) The BWB is responsible for the procurement and testing of all equipment and materiel for the armed forces. One of its twelve subunits, the Engineer and Field-equipment Division, *Pionier und Truppengerate* (PT), is responsible for the procurement, testing, and quality control of CBR equipment. Of the two testing facilities maintained by the BWB, the Testing Laboratory No. 53 at Munsterlager deals with the technical evaluation of CBR defense gear.

(b)(1)

b. ~~(C)~~ CBR Units.

(b)(1)

(b)(1)

d. ~~(S)~~ Organization and Strengths

(b)(1)

(b)(1)

TOTAL WARTIME TOE STRENGTH - 711

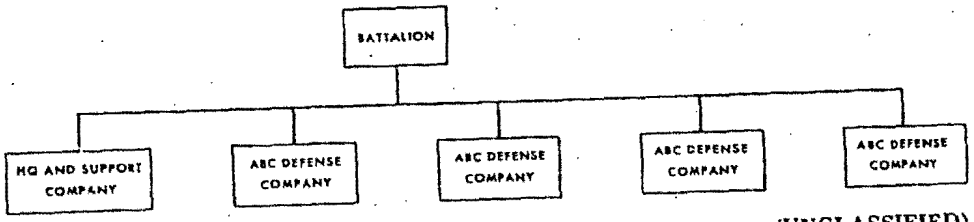

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Figure 17. Corps ABC Defense Battalion (U).

(b)(1)

f. (C-NFD) CBR Training Schools.

(b)(1)

(2) (U) The CBR school in Sonthofen is an all-service school, although the Army is most strongly represented. An ambitious program of instruction is carried out,

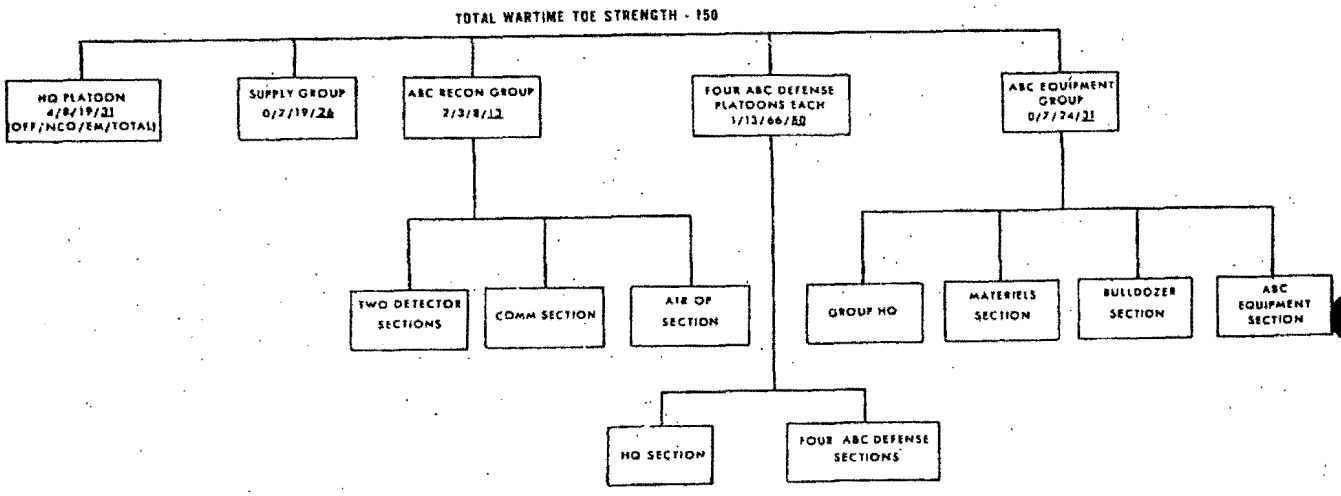

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Figure 18. Divisional ABC Defense Company (U).

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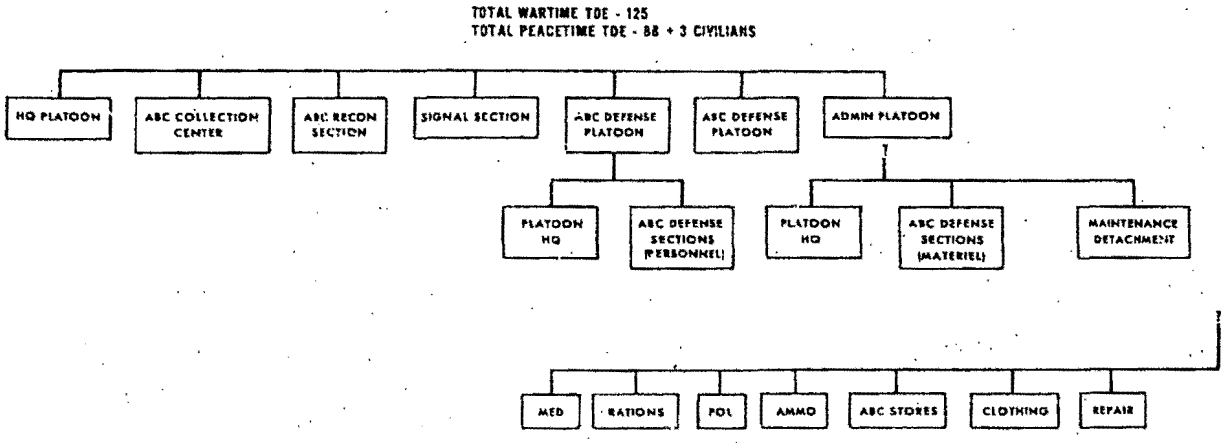

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Figure 19. ABC Defense Company—Armored Infantry, Infantry Brigade and Armored Brigade (U).

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(b)(1)

(b)(1)

4. (U) Civil Defense

The Federal Republic of Germany is aware of its responsibility to take all possible measures to safeguard the civilian population against CBR attacks. Defense measures are taken within the framework of Civil Defense in close cooperation with the armed forces. In 1965 the Bundestag passed Civil Defense laws covering various aspects of civil response to natural disaster and war. One of the requirements is that each citizen is to protect himself against the effects of radioactive fallout, and biological and chemical weapons.[99] There is no current information on the implementation of these laws.

C. DOCTRINE AND POLICY GOVERNING THE USE OF BW WEAPONS

5. (C) Doctrine

(b)(1)

(b)(1)

6. (C-NFD) Policy

(b)(1)

(b)(1)

D. DOCTRINE AND PROCEDURES FOR DEFENSE AGAINST BW

7. ~~(C)~~ Military

(b)(1)

(b)(1)

8. ~~(C)~~ Civilian

(b)(1)

E. BW MATERIEL (OFFENSIVE)

9. ~~(C)~~ Weapon Systems

(b)(1)

10. ~~(C)~~ Offensive Equipment

(b)(1)

(b)(1)

(b)(1)

F. BW MATERIEL (DEFENSIVE)

11. (C) Military --

a. Protective Masks.

(b)(1)

(b)(1)

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Figure 20. West German Model M-65 protective mask (U).

(b)(1)

(b)(1)

d. Decontamination.

(b)(1)

(b)(1)

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(b)(1)

12. (U) Civilian

(b)(1)

(b)(1)

(b)(1)

G. PRODUCTION FACILITIES AND STOCKPILING

13. (C-NFD) General

(b)(1)

(b)(1)

14. (C-NFD) Production Sites

(b)(1)

15. (S-NFD) Defensive Equipment Produced and Stockpiled

(b)(1)

Table IX. West German Military Medical Depots (U)

(b)(1)

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(b)(1)

(b)(1)

Table X. Major West German Pharmaceutical Producers (U)

Company	Location	Products
Asta Works Chemical Factory, Inc.	Brackwede	biologicals
E. Merck Chemical Factory, Inc.	Darmstadt	drugs
Cassella Mainkur Dye Works, Inc.	Frankfurt	antibiotics
Hoechst Dye Works, Inc.	Frankfurt	antibiotics
Dauelsberg Penicillin Company	Göttingen	antibiotics
Pfizer, Inc.	Karlsruhe	drugs
Bayer Dye Works, Inc.	Leverkusen	antibiotics
C. F. Boehringer and Sons Co.	Mannheim	antibiotics biologicals
Behring Works, Inc.	Marburg	antibiotics biologicals
CIBA, Inc.	Wehr	drugs

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H. BW RESEARCH AND DEVELOPMENT

16. (U) Civilian Research Institutes and Facilities

a. General Science Policy. Scientific investigators in the Federal Republic of Germany enjoy today a high degree of freedom, due primarily to the cultural autonomy of the States. There is no government pressure to compel, either directly or indirectly, scientists, research workers, or teachers to adopt certain methods or views. The Donor's Association for Promoting Arts and Sciences in Germany, The Max Planck Society, and the German Research Asociation are completely autonomous and independent of any government department.

b. Academic Institutions. Universities of historic significance include:

(1) Ruprecht Karl University of Heidelberg (founded in 1386);

(2) The University of Cologne (1388);

(3) Gottingen University (1757);

(4) The University of Wurzburg (1402);

(5) University of Munster (1780);

(6) University of Freiburg (15th century);

(7) Justus Liebeg University, Giessen (1607);

(8) University of Tubingen (1472);

(9) University of Marberg (1527).

c. Scientific Societies. The FRG has many scientific societies which have earned international recognition. Some of these are:

(1) Association of West German Academies of Sciences and Arts;

(2) The Gottingen Academy of Sciences;

(3) The Bavarian Academy of Sciences and Arts in Munich;

(4) The Heidelberg Academy of Sciences and Arts;

(5) The Academy of Sciences and Arts of Mainz.

d. The Max Planck Society.

(1) One of the outstanding scientific organizations in Germany, and indeed in all Europe, is the Max Planck Society for the Advancement of Science. The fundamental principle of the Max Planck Society is to maintain institutes, especially those concerned with the natural sciences and medicine, where scientists can carry out research without being involved in teaching or administrative duties. Students are normally excluded from institutes of the Society. Its founders provided considerable initial capital and made regular annual donations to ensure its freedom from governmental control. The Society is led by its President, who is Chairman of the Board of Management, a Senate, and a General Assembly of Members. The membership of the Society is divided into scientific and supporting members, and the Society is administered as a registered society by private law. The General Assembly elects the members of the Senate who hold office for a period of six years. The Senate is responsible for all important decisions affecting the life of the Society. It makes all the appointments, has the power to dissolve or establish an institute, and draws up budgets both for each separate institute and for the Society as a whole. In addition, the Senate elects the President and members of the Board of Management, who all serve for a period of six years.

(2) The following is a partial listing of Max Planck Institutes that are directly concerned with biological research or related disciplines:

(a) Institute for Experimental Medicine–Gottingen;

(b) Institute for Virus Research–Tubingen;

(c) Institute of Biology–Tubingen;

(d) Institute of Biophysics–Tubingen;

(e) Institute of Inorganic Chemistry and Allied Fields–Frankfort/Main;

(f) Institute of Plant Genetics–Heidelberg;

(g) Institute of Medical Research—Heidelberg:

(h) Institute of Molecular Genetics—Berlin:

(i) Institute of Cell Physiology—Berlin.

c. German Research Association. Another non-government scientific society that functions on a national scale is the German Research Association. There is hardly any field of scientific endeavor in the Federal Republic with which the German Research Association is not concerned. Special attention is given to problems relating to the national economy and to questions of public health and welfare. The principal functions of the German Research Association are: To provide financial aid for research projects: to advise governmental and administrative authorities on matters of scientific policy; to encourage cooperation between scientific workers and, when possible, to coordinate their research activities; and to establish and maintain relationships between the Federal Republic and other countries in all branches of scientific research.

17. (U) Government-sponsored Research Facilities

The Federal Government, the State Governments, and to a lesser extent the local authorities sponsor and maintain a very large number of research institutes. Coordinating the efforts of these various institutes is the Science Council which in turn is divided into the Scientific and Administrative Commissions. The Council as a whole is responsible to the Federal Government through the Ministry for Scientific Research, and to the State Governments through their Education Ministries. Although the Scientific Commission is completely independent of any government control, the Administrative Commission is responsible through its members to both Federal and State Governments as appropriate. The Council receives its funds from the Federal Ministry of Scientific Research. This Ministry, established in 1962, supports research in all branches of science and the arts. About three-quarters of its annual budget is earmarked for applied research. The remainder is devoted to the programs of the General Promotion of Science. The Ministry for Scientific Research not only supports institutes within the Federal Republic of Germany, but also a number of institutes outside the country. In addition, it supports promising young Germans who wish to study and conduct research outside the FRG.

(b)(1)

(b)(1)

(b)(1)

18. (U) The Fraunhofer Society for the Promotion of Applied Research

a. This society has its headquarters in Munich. Though a private, non-profit institution, it receives the majority of its funds from the FRG. It has been reported that this Society is an agency of the MOD.[21] Its principal aim is the promotion of research in all branches of applied science and technology. In 1964 research funds available to the Society amounted to 31,000,000 DM ($10 million). Although this is the most current figure available, it is assumed that the sum has substantially increased in the intervening years. The Fraunhofer Society has eight research institutes of its own and administers the work of three others. These support research programs in a wide range of disciplines, at such diverse facilities as:

(1) Institute for Applied Microscopy, Photography, and Cinematography—Mannheim;

(2) Institute for Public Health and Bacteriological Techniques—Munich;

(3) Institute for Technical Physics—Stuttgart;

(4) Institute for Electrical Materiels—Freiberg;

(5) Institute for Aerobiology—Grafschaft;

(6) Institute for the Chemistry of Propellants;

(7) Documentation Center for Building Information;

(8) Spectrochemistry and Radiochemistry Information Center.

NO FOREIGN DISSEM

In 1955, the Fraunhofer Society was given the responsibility for maintaining the Patents Service for German Research. Accordingly, it provides advice and assistance to research workers and inventors with regard to the patenting and marketing of discoveries and inventions.

b. In addition to all the facilities listed in preceeding paragraphs, industrial firms of the FRG maintain large research staff and/or sponsor research institutes or foundations. A number of these would include the:

(1) Volkswagen Foundation;

(2) Farbenfabriken Bayer, AG;

(3) Badische Anilin und Soda Fabrik AG–BASF;

(4) Farbwerke Hoechst AG;

(5) Metallgesellschaft AG;

(6) Zeiss of Oberkochen annually spends about 14% of its income in research and development. About 12% of the employees are engaged in research and another 8% are employed on testing and inspection.[1]

20 (C) Institute for Aerobiology, Grafschaft

(b)(1)

(4) (U) Today the Institute has been opened to qualified and reputable academic personnel who are invited to work at the Institute for extended periods of time.

Many of the potential CW antidotes currently under test at the Institute are obtained from university and commercial laboratories, and scientists at the Institute are now encouraged to publish their test results in the open literature.

(5) (U) During the reorganization, Dr. Karl Bisa was relieved as Director of the Institute. He took this opportunity to retire from government service and is no longer connected with the Institute in any capacity.

(6) (U) Dr. Oldiges (Biologist) has been Acting Director since Dr. Bisa's departure. Prior to this appointment, he had been on the staff of the Institute doing research related to toxic antidotes and their effect upon mice, guinea pigs, and rabbits. He has continued his interest in this area.[88]

b. ~~(C)~~ Research Program of the Institute

(b)(1)

(b)(1)

c. (C) Facilities.

(b)(1)

(b)(1)

(4) (U) Other buildings house additional chemical laboratories, all of which contain modern, sophisticated equipment; for example, a 1 MEV neutron generator built by the Philips Corporation of Holland.

(b)(1)

(b)(1)

(b)(1)

d. (U) Scientists at the Institute and Their Areas of Research. A brief review of the current research conducted at the Institute is presented below.[88]

(1) (U) (b)(6) (Biologist), Acting Head of the Institute, is responsible for the following projects: Pharmacological investigations with antidotes against alcylphosphate intoxications; experiments to measure the dose responses in animals treated

with antidotes against organophospheric esters: and physiological testing of animals treated with various antidotes.

(2) (U) (b)(6) (Biologist) is investigating the permeability of organophosphorous compounds through the skin of pigs. It is his opinion that pig skin most nearly matches that of the human skin.

(3) (U) (b)(6) (Biologist) is conducting pharmacological investigations on isolated mouse ileum.

(4) (U) (b)(6) (Chemist), husband of (b)(6) is doing *in vitro* research on the inhibition and reactivation of enzymes.

(5) (U) (b)(6) (Electrical Engineer) continues his work related to the measurement of aerosolized latex particles using the principle of light scattering. He has also fabricated and studied the effectiveness of a rotary filter for air filtration. Preliminary tests showed that axial rotation of filter discs provided a separation efficiency against micron size particles equal to that obtained using 11 times the thickness of such filters held in stationary frames. Results also indicated that with design modifications and with greater rotational speeds, the filter could probably reach an efficiency achieved only by stationary filters twenty times more thick in construction. These filters may have excellent application in NBC protective systems.[92]

(6) (U) (b)(6) (Chemist) is conducting studies related to: the preparation of toxic solutions for the other divisions; he is also involved in synthesis and analytical work, i.e., measurement of acetyl cholinesterase activity in reticulo-endothelial tissues of laboratory animals poisoned with parathion (E605); and he is attempting to characterize chemical reactions between toxic phosphoric acid esters and selected antidotes.

(7) (U) (b)(6) (Biologist) is investigating the biological effects of fast neutrons. He is studying mortality rates of mice after neutron irradiation, and damage caused to the hematopoietic system (bone marrow, spleen, and lymphatic system). He is also studying the relative biological activity of fast neutrons when these effects are compared to those caused by gamma rays.

(8) (U) (b)(6) (Chemist)[89] is doing research on the reactivation of diethylphosphoryl-acetylcholinesterase by pyridinium oximes. The results of kinetic studies indicate a complex is formed between phosphoryl-enzyme and the reactivator as a preliminary step in the reactivation process. Based on this assumption, the

concentration-dependence of the observed rate-constants were used to interpret the affinities and reactivities of 30 different pyridinium-oximes. The pKa values of mono- and bisoximes were determined by means of potentiometric titration. (b)(6) has also prepared possible intermediates in the reactivation chain and has tested some of these compounds in pharmacological tests.

(9) (U) (b)(6) (Physicist) is doing research in dosimetry of fast neutrons, 1-6 MEV. He has also prepared an Einzel lens system to enhance the focal properties of the 1 MEV accelerator. He has conducted radiation experiments using white mice, and has devised a quartz target to determine the focal properties of the accelerator.

(10) (U) (b)(6) (Zoologist) joined the staff in October of 1968. His research interests include microspectrography using ultraviolet light, microdensitometry, isolation of DNA and RNA, and the influence of alcylphosphates on phosphates.

(11) (U) (b)(6) (Physicist) is conducting research using differential centrifugation to establish particle size distribution in aerosols. He has been able to separate latex particles of various sizes in a centrifugal field of force. The centrigues used were designed by Prof. Stober (see below).

(12) (U) (b)(6) (Physicist) is a US citizen who has been with the Institute for about one and a half years. He has a two-year contract with the Fraunhofer Society to conduct research on the detection of aerosolized particulates. He is attempting to measure particles by their rate of deceleration in a vacuum.

(13) (U) (b)(6) (Veterinarian) is engaged in research related to general toxicology, veterinary pharmacology, concentration of pesticides, such as E605, in animal tissue, the storage of toxic organophosphorous compounds in the animal body, and the absorption of organophosphorous compounds through the skin.

(14) (U) (b)(6) (Chemist) came to the Institute in November 1969 through the efforts of Prof. Stober. His main area of research deals with studying Ribonuclease T_1 using Proton Magnetic Resonance (PMR). The chemical shifts of the C-2 protons of the histidine residues of ribonuclease T_1 have been studied as a function of pH in the presence of deuterium oxide. His results are interpreted in terms of interactions between the histidine residues and the carboxylate anions of acidic amino acid residues. In addition, he has studied the chemical shift of the C-2 imidazole protons of the histidine residues contained in pancreatic ribonuclease. Upon protionation of the imidazole ring, the C-2 proton magnetic resonance signal shifts about 1.0 ppm to a lower level. Thus, titration

curves and approximate pka values of the histidine residues can be developed. From an analysis of the titration curves of histidine 119 and histidine 12, the existence of an enzyme species has been derived in which both imidazoles are connected by a hydrogen bond.

(15) (U) Neutron magnetic resonance (NMR) studies have been carried out with a Varian Associates HA 100 NMR spectrometer having an internal lock system. A Varian C 1024 Computor of average transients was used. Also available to (b)(6) is a recently installed proton spectrometer linked to a computor manufactured by FABRI-TEK and BRUKER.[89]

(16) (U) (b)(6) continues his studies to measure residual concentrations of parathion in the brains of treated mice. He has been doing this work since 1968. He appears to be interested only in total brain concentration and has made no attempt to find areas of the brain (i.e., thymus, cerebrum, cerebellum, medulla, cortex, etc.) where maximum concentration might accumulate.

(17) (U) (b)(6) (physicist) specializes in radiobiology. He has taken a position with the Institute of Aerobiology as Chief of the Physics Branch. It is mainly through his efforts that young, new investigators have joined the staff. He has also been responsible for obtaining the necessary funds to procure expensive and highly sophisticated equipment. In addition to his position at the Institute for Aerobiology, Prof. Stober is a member of the faculty at the University of Munster, Munster, West Germany, and concomitantly holds a position at the University of Rochester, Rochester, N. Y., USA, in the Department of Radiobiology. Prior to accepting his present positions, (b)(6) spent two years teaching in the Physics Department at the University of California, Berkley. (b)(6) speaks flawless English.

e. (C) Research Applications.

(b)(1)

(b)(1)

(b)(1)

21 (C) Institut Fur Electrowerkstoffe, Freiburg

a. (U) An effort has been under way at the Institut fur Elektrowerkstoffe, Freiburg, Germany, to detect airborne particulate matter. The prototype instrument that has been fabricated for this purpose uses a high-volume air sampler (100-1,000 liters of air/minute), a pre-impinger to screen out all particles above 3-5 microns, a lightscanning system, a particle-size discriminator, and a manual visual readout. The only novel feature of the system appears to be the light source. This component has been built into the system so that there is a guaranteed light source with no flickering or wavering of the illumination (i.e., there is a constant level of light emission). This feature involves very exotic automatic controls, but the Germans appear to feel that the uniform light feature is very important to the overall success of the detector.

(b)(1)

(b)(1)

(b)(1)

21. (U) The Borstel Institute

a. An example of the type of research facility operated on a state level is the Borstel Institute. One of a number of institutes under the jurisdiction of the *Forschungsgeselschaft*, it is located about 40 km north of Hamburg. The entrance to this institute is about a mile east of the main highway running between Hamburg and Kiel.

b. At present, the main laboratory facilities are located in very old single story brick buildings. The laboratories are very well equipped, and safety cabinets are available in which all culture transfers, dilutions, etc., are made prior to animal inoculations.

c. The major research conducted at the Borstel Institute concerns studies with *Pasturella pestis* which are directed towards the development of new cultural techniques, the study of variant strains of this pathogen, and the production of new and more effective vaccines. The comparative biochemistry of different strains of *P. Pestis* is also studied.

d. During the past two years, a very modern lecture hall has been built. Under construction in the summer of 1970 was a five-story laboratory building, possibly planned to replace the existing laboratories, or perhaps to supplement them. In addition, individual homes and apartments were also under construction. This is being done both to keep present employees and also to attract others. Many of the present employees commute between the Institute and Hamburg or Kiel and the turnover of employees at Borstel has been quite high.

e. There is no evidence that personnel at the Borstel Institute are currently engaged in any type of offensive BW research, nor is there any indication that they receive funds or guidance from the military. However, the Institute is a state operated facility although it does receive some operational funds from the Federal Republic of Germany. Such a laboratory could readily be concerted to participate in offensive programs if such were to be undertaken.

22. (C) Military Research Institutes and Facilities (b)(1)

(b)(1)

(b)(1)

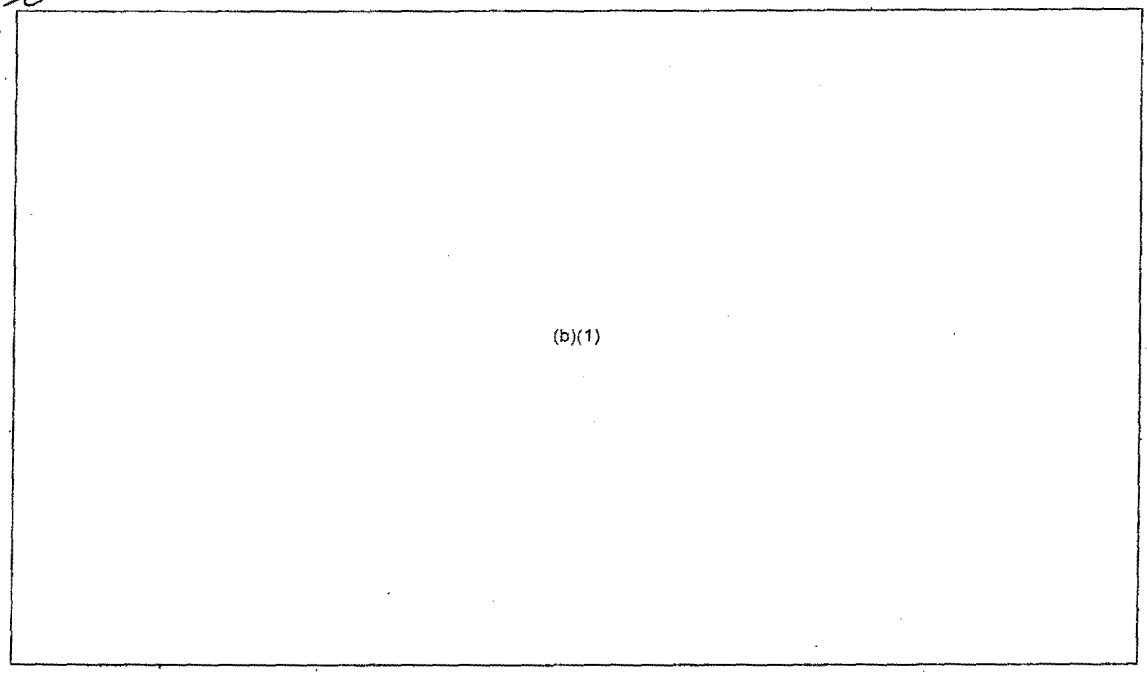
(b)(1)

h. (U) A self-contained, pressurized, protective suit has been developed at E-Stelle 53. It is currently under test and evaluation. It is constructed of two pieces of materiel which is basically nylon impregnated with a plastic. The exact plastic used is not known. The most unique feature of this suit is that it affords protection to the wearer by maintaining a positive pressure head within the suit. This positive pressure is derived from a small (6"x12") battery-operated blower, fitted with absolute filters. Operation time with the batteries presently available is three hours. The blower package weighs approximately ten pounds and is worn at waist level on the back of the suit. This affords the wearer complete freedom of movement and action.

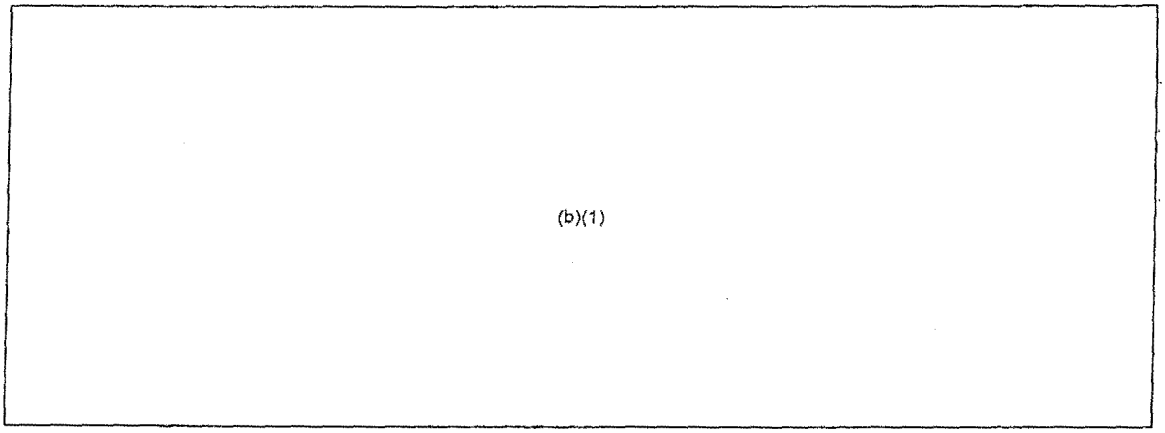
I. NAVAL BW CAPABILITY

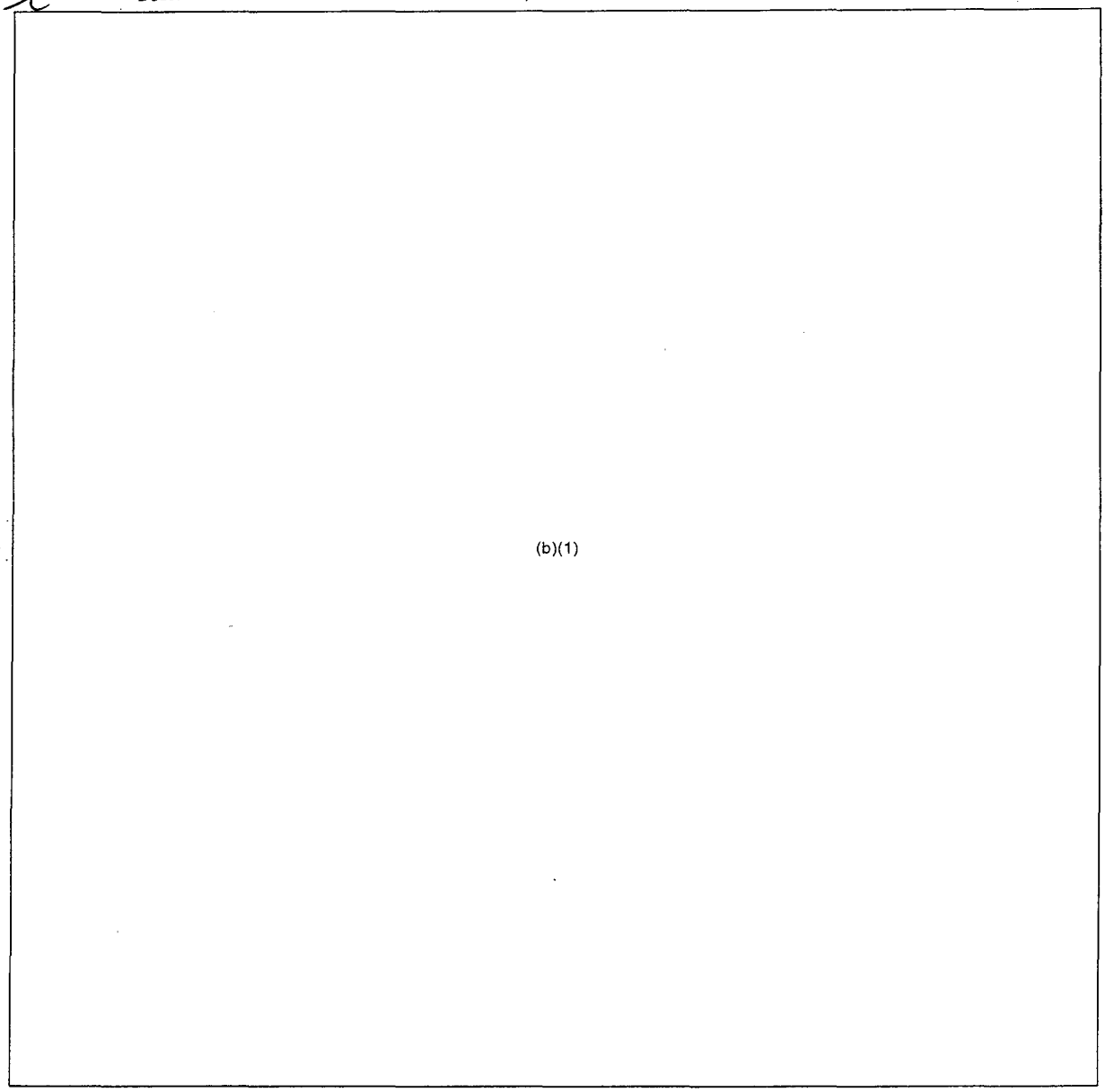
24. (C) General

(b)(1)



25. (U) CBR Protective System on the Destroyer BAYERN




(b)(1)

(b)(1)

25.1. (S NFD) Washdown System on the Frigate LUBECK

(b)(1)

26. (S-NFD) Naval Research

(b)(1)

(b)(1)

NO FOREIGN DISSEM

(b)(1)

J. CONCLUSIONS

27. (C-NFD) Summation

(b)(1)

28. (C-NFD) Projection

(b)(1)

K. TRENDS AND FORECASTS

29. (C) Trends

(b)(1)

30. (C) Forecasts

(b)(1)

(b)(1)

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LIST OF ABBREVIATIONS

A/ARMA	Assistant Army Attaché
ABC	atomic, biological, chemical
AMA	Danish Army Ammunition Arsenal
AMX	*Atelier de Moulineaux*, the name of the company producing the French light tank or *char*.
AMZ	CBR Warning and Coordinating Center, *ABC Meldezentrale* (West Germany)
ANP	*L'appareil Normal de Protection*
ATC	Army Technical Center (Italy)
BCG	*Bacillus calmettee - guerien*
BG	*Bacillus subtilis var niger (B. globigii)*
BHK	baby hamster kidney cells
BW	biological warfare
BWB	Federal Office for Military Technology and Procurement, *Bundesamt fur Wehrtechnik und Beschaffung* (West Germany)
B weapon	biological weapon
CB	chemical, biological
CBR	chemical, biological, radiological
CCAS	Committee for Coordination of Scientific Activities, *Comite de Coordination des Activities Scientifiques*, (Belgium)
CD	Civil Defense
CDC	Civil Defense Corps (United Kingdom)
CDE	Chemical Defense Establishment (United Kingdom)
CEB	Center of Studies, Le Bouchet, *Centre d'Estudes des Bouchet* (France)
CFNBCS	Canadian Forces Nuclear Biological, and Chemical School
CIAS	Interservice Special Weapons Command, *Commandement Interarmees des Armes Speciales* (France)
CIC	Communications information center
CIETAS	Interservice Special Weapons Tactical Study Group, *Cemite Interarmee d'Estudes tactiques des Armes Speciales* (France)
CIEECB	Interservice Chemical and Biological Experimental and Study Commission, *Commission interarmee Experimentation et Etudes Chimique et Biologique* (France)
CRD	Defense Research Center, *Centre de Recherche pour la Defense* (Belgium)

CW	chemical warfare
C weapon	chemical weapon
DCBRL	Defense Chemical, Biological and Radiation Laboratories, now is the DREO (Canada)
DM	Deutsch mark
DMA	Ministerial Delegate for Armament. *Delegation Ministerielle pour l'Armament* (France)
DNA	deoxyribonucleic acid
DP	Powder Directorate. *Direction des poudres* (France)
DRB	Defense Research Board (Canada)
DREO	Defense Research Establishment Ottawa (Canada)
DRES	Defense Research Establishment Suffield (Canada)
DRME	Directorate of Research and Experimental Methods. *Direction des Researches et Moyens D'Essais* (France)
DSK	Dauer - Schutzluft - Klimasystem (West Germany)
DTAT	Technical Directorate for Ground Armaments. *Direction Technique des Armaments Terrestres* (France)
EETB	Bourges Technical Test Center. *Etablissement d'Experiences Techniques de Bourges* (France)
EM	enlisted man/men
EMA	Headquarters Armed Forces. *Etat-Mayor des Armees* (France)
EMC	encephalomyocarditis
E-Stelle	Testing Station. *Erprobungsstelle*
FAO	Food and Agricultural Organization of the United Nations
FAST	fluorescent antibody staining technique
FFI	*Forsvarets forskuings institutt*, now is NDRE (Norway)
FINABEL	An alliance of France, Italy, the Netherlands, and Belgium, plus West Germany
FMD	foot-and-mouth disease
FRG	Federal Republic of Germany
GAC	Chemical Arms Group. *Groupement Armes Chimique* (France
G-3	operations and training section of a general staff
HMCS	Her Majesty's Canadian Ship
INSAN 1-3	Inspectorate of Sanitation and Health Matters. *Inspektion des Sanitats-und Gesundheitswesens* West Germany
km	kilometer
kw	kilowatt
LAC	large area coverage

LIDAR	light detection and ranging
m	meter
MeV	million electron volts
Mk	mark - designation of a model
Mle	model
mm	millimeter
MOD	Ministry of Defense
MOS	military occupational specialty
MRC	Medical Research Council (United Kingdom)
MRE	Microbiological Research Establishment (United Kingdom)
MWDDEA	Mutual Weapons Defense Development Exchange Agreements
MWDP	Mutual Weapons Development Program
NATO	North Atlantic Treaty Organization
NBC	nuclear, biological, chemical
NCO	noncommissioned officer
NDRE	Norwegian Defense Research Establishment
NGSF	Royal Netherlands Fermentation Industry
NHS	National Health Service (Denmark, United Kingdom)
NLVF	Agricultural Research Council of Norway
NMR	neutron magnetic resonance
NTNF	Royal Norwegian Council for Scientific and Industrial Research
OAF	open air factor
PMR	proton magnetic resonance
PT	Engineer and Field Equipment Division, *Pionier und Truppengerrate* (West Germany)
R&D	research and development
RH	relative humidity
RNA	Royal Netherlands Army, ribonucleic acid
RVO	National Defense Research Organization, *Rijksverdedigingsorganisatie* (Netherlands)
RVO-TNO	See RVO
SEBC	*Section d'Etudes Biologiques et Chimiques*; part of CEB (France)
SFV	Semliki Forest virus
SGB	subgroup of CIEECB
SGC	subgroup of CIEECB
SID	Defense Intelligence Service (Italy)
S&T	scientific and technical

STA	Army Technical Section, *Section Technique de l'Armee* (France)
STITEUR	Army Scientific and Technical Intelligence Team, Europe (United States)
TEP	troop decontamination center, *Truppen Engiftungs Platz* (West Germany)
TOE	Table of Organization and Equipment
TNO	Central Organization for Applied Natural Scientific Research, *Toegepast Natuurwetenschappelijk Onderzoek* (Netherlands)
T-II-2	The "*Referat*" (2) dealing with CBR matters within the Defense Research Section (II) of the Military Technology Division (West Germany)
T-III-7	The "*Referat*" (7) dealing with CBR matters within the Defense Technology Division (III) of the Military Technology Division (West Germany)
UN	United Nations
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNICEF	United Nations Children's Fund
UK	United Kingdom
US	United States
USIS	United States Information Service
USSR	Union of Soviet Socialist Republics
WHO	World Health Organization
ZWO	Organization for Pure Scientific Research (Netherlands)

SECRET-NFD

(b)(1)

SECRET-NFD
Security Classification

DD FORM 1 NOV 68 1473 REPLACES DD FORM 1473, 1 JAN 64, WHICH IS OBSOLETE FOR ARMY USE.

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UNCLASSIFIED

Security Classification

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10. DISTRIBUTION STATEMENT

In addition to security requirements which apply to this document and must be met, each transmittal outside the Department of Defense must have prior approval of the Defense Intelligence Agency.

11. SUPPLEMENTARY NOTES This product is an amendment to ST-CS-03-139-72 bearing the same title, published February 1972	12. SPONSORING MILITARY ACTIVITY Foreign Science and Technology Center US Army Materiel Command Department of the Army

13. ABSTRACT

This amendment brings up to date the available information concerning biological warfare preparations and capabilities of the NATO countries and France. (U)

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Note:	This report is one of 16 reports released under Mandatory Declassification Review by the US Army Intelligence & Security Command. All of these reports may be accessed here: http://www/governmentattic.org/inscomBWCW.html

DEPARTMENT OF THE ARMY
UNITED STATES ARMY INTELLIGENCE AND SECURITY COMMAND
FREEDOM OF INFORMATION/PRIVACY OFFICE
FORT GEORGE G. MEADE, MARYLAND 20755-5995

REPLY TO
ATTENTION OF:

Freedom of Information/
Privacy Office

10 JUN 2013

This is in further response to your Freedom of Information Act (FOIA) request of October 23, 2008, and supplements our electronic message of May 12, 2010.

Coordination has been completed with another element of our command and other government agencies and records returned to this office for our review and direct response to you. We have reviewed the records and determined the records are partially releaseable to you. A copy of the records are enclosed for your use.

We have completed a mandatory declassification review in accordance with Executive Order (EO) 13526. As a result of our review information has been sanitized and 4 pages have been withheld in their entirety as the information is currently and properly classified TOP SECRET, SECRET and CONFIDENTIAL according to Sections 1.2(a)(1), 1.2(a)(2), 1.2(a)(3) and 1.4(c) of EO 13526. This information is exempt from the public disclosure provisions of the FOIA pursuant to Title 5 U.S. Code 552 (b)(1). It is not possible to reasonably segregate meaningful portions of the withheld pages for release. The records are enclosed for your use. A brief explanation of the applicable sections follows:

Section 1.2(a)(1) of EO 13526, provides that information shall be classified TOP SECRET if its unauthorized disclosure reasonably could be expected to cause exceptionally grave damage to the national security.

Section 1.2(a)(2) of EO 13526, provides that information shall be classified SECRET if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

Section 1.2(a)(3) of EO 13526, provides that information shall be classified CONFIDENTIAL if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

Section 1.4(c) of EO 13526, provides that information pertaining to intelligence activities, intelligence sources or methods, and cryptologic information shall be considered for classification protection.

In addition, information has been sanitized from the records and 4 pages have been withheld in their entirety as the release of the information would reveal sensitive intelligence methods. This information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(7)(E) of the FOIA. The significant and legitimate governmental purpose to be served by withholding is that a viable and effective intelligence investigative capability is dependent upon protection of sensitive investigative methodologies. It is not possible to reasonably segregate meaningful portions of the withheld pages for release.

The withholding of the information described above is a partial denial of your request. This denial is made on behalf of Major General Stephen G. Fogarty, the Commanding General, U.S. Army Intelligence and Security Command, who is the Initial Denial Authority for Army intelligence investigative and security records under the FOIA. You have the right to appeal this decision to the Secretary of the Army. Your appeal must be postmarked no later than 60 calendar days from the date of this letter. After the 60-day period, the case may be considered closed; however, such closure does not preclude you from filing litigation in the courts. You should state the basis of your disagreement with the response and provide justification for a reconsideration of the denial. An appeal may not serve as a request for additional or new information. An appeal may only address information denied in this response. Your appeal is to be made to this office, for forwarding, as appropriate to the Secretary of the Army, Office of the General Counsel.

Coordination has been completed and we have been informed by the Central Intelligence Agency (CIA) that information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(1) and (b)(3) of the FOIA.

The withholding of the information by the CIA constitutes a denial of your request and you have the right to appeal this decision to the Agency Release Panel within 45 days from the date of this letter. If you decide to file an appeal, it should be forwarded to this office and we will coordinate with the CIA on your behalf. Please cite CIA #F-2010-01292/Army #57F-09 assigned to your request so that it may be easily identified.

Coordination has been completed and we have been informed by the Defense Intelligence Agency (DIA) that their information is exempt from public disclosure pursuant to Title 5 U.S. Code § 552 (b)(1), (b)(2) (b)(3) and (b)(4) of the Freedom of Information Act and Executive Order (EO) 13,526 § 1.4 (c) (d) and (h). The statute invoked under Title 5 U.S. Code 552 (b)(3) is 10 U.S.C. §424, which allows for the protection of organizational and personnel information for DIA.

The withholding of the information by the DIA constitutes a partial denial of your request and you have the right to appeal this decision directly to the DIA. If you decide to file an appeal, it should be forwarded to the Director, Defense Intelligence Agency, ATTN: DAN-1A-FOIA, Washington, DC 20340-5100. Please cite MDR #0155-2010 assigned to your request so that it may be easily identified.

You have received all Army intelligence investigative records pertaining to this request.

There are no assessable FOIA fees.

If you have any questions regarding this action, feel free to contact this office at 1-866-548-5651, or email the INSCOM FOIA office at: INSCOM_FOIA_ServiceCenter@mi.army.mil and refer to case #57F-09.

Sincerely,

Brad S. Dorris
Director
Freedom of Information/Privacy Office
Investigative Records Repository

Enclosure

TOP SECRET

Copy 2 of 134

SAO/ST-SS-03-148-72

DEFENSE INTELLIGENCE AGENCY

BIOLOGICAL WARFARE CAPABILITY -- ASIAN COMMUNIST COUNTRIES (U)

WARNING

This document contains information affecting the national security of the United States within the meaning of the espionage laws U. S. Code Title 18, Sections 793, 794 and 798. The law prohibits its transmission or the revelation of its contents in any manner to an unauthorized person, as well as its use in any manner prejudicial to the safety or interest of the United States or for the benefit of any foreign government to the detriment of the United States. It is to be seen only by personnel especially indoctrinated and authorized to receive information in the designated control channels. Its security must be maintained in accordance with regulations pertaining to the TALENT-KEYHOLE and (b)(1) Controls. No action is to be taken on any (b)(1) which may be contained herein, regardless of the advantage to be gained, if such action might have the effect of revealing the existence and nature of the source, unless such action is first approved by the appropriate authority.

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BIOLOGICAL WARFARE CAPABILITY-- ASIAN COMMUNIST COUNTRIES (U)

(b)(6)

SAO/ST-SS-03-148-72

DIA Task No. T70-03-11

May 1972

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PREFACE (U)

(U) The purpose of this publication is to bring together all available information concerning the many facets of biological warfare preparation in the Asian Communist Countries. Included is information on: order of battle for biological warfare; identification and description of Asian Communist biological warfare materiel characterized for either offensive or defensive use; production facilities and capabilities; stockpiles and storage facilities; doctrine and procedures governing use of biological warfare weapons; defensive measures to be taken in the event of biological warfare attack; and applicable research, development, and testing programs now ongoing within the Asian Communist Countries.

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(U) The data base and analyst experience which must be committed in support of this effort are not available at any single office within the intelligence community. Accordingly, inputs for this report have been solicited from various groups. The US Army Foreign Science and Technology Center was responsible for basic coverage by area and subject matter. The US Naval Scientific and Technical Intelligence Center was tasked to develop a section of this report dealing with the naval offensive and defensive biological warfare capabilities of the Asian Communist Countries. The US Air Force Foreign Technology Division was queried for inputs covering aerospace offensive and defensive applications. Finally, appropriate elements of the Defense Intelligence Agency were responsible for information concerning order of battle, training, doctrine, policy, production, and stockpiles.

(U) As the prime producer of this study, the Foreign Science and Technology Center was charged with the final collation, preparation, and editing of copy material.

(U) Constructive criticisms and suggestions for changes are solicited. Critical evaluations from readers of this report will provide

direct guidance to insure that future updatings of this study will result in a product that is most responsive to the varied needs of the users.

(U) Although the cutoff date for information in this document is November 1971, major updatings have been made up to the date of final approval for printing.

(U) Comments, questions, and requests for additional information concerning this study may be addressed to the Defense Intelligence Agency, Washington, D. C. 20315, ATIN: DT-1A.

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SUMMARY (U)

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Section I.

COMMUNIST CHINA

A. INTRODUCTION (U)

1. (C) Historical Background (U)

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2. (C) Competence in Microbiology and Public Health (U)

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3. ~~(C)~~ Geographical and Political Factors (U)

a. (U) Communist China is the third largest country in the world, occupying about 3.7 million square miles, and the population comprises about one-fifth that of the world. To the North and West an extensive boundary is shared with the Soviet Union, a boundary which separates the two most powerful communist countries. To the South, China borders on several weak, unstable countries, one being North Vietnam. She has used North Vietnam as a base for Communist operations against neighboring countries. China also shares common borders with North Korea, Mongolia, Afghanistan, India, Nepal, Bhutan, Burma, and Laos. The mainland is within 2500 nautical miles of every major target in Asia as well as European USSR. Two-thirds of China's area is mountainous or desert-like, and ninety percent of the population live in one-sixth of the country, primarily in the fertile plains and deltas of the east.[9]

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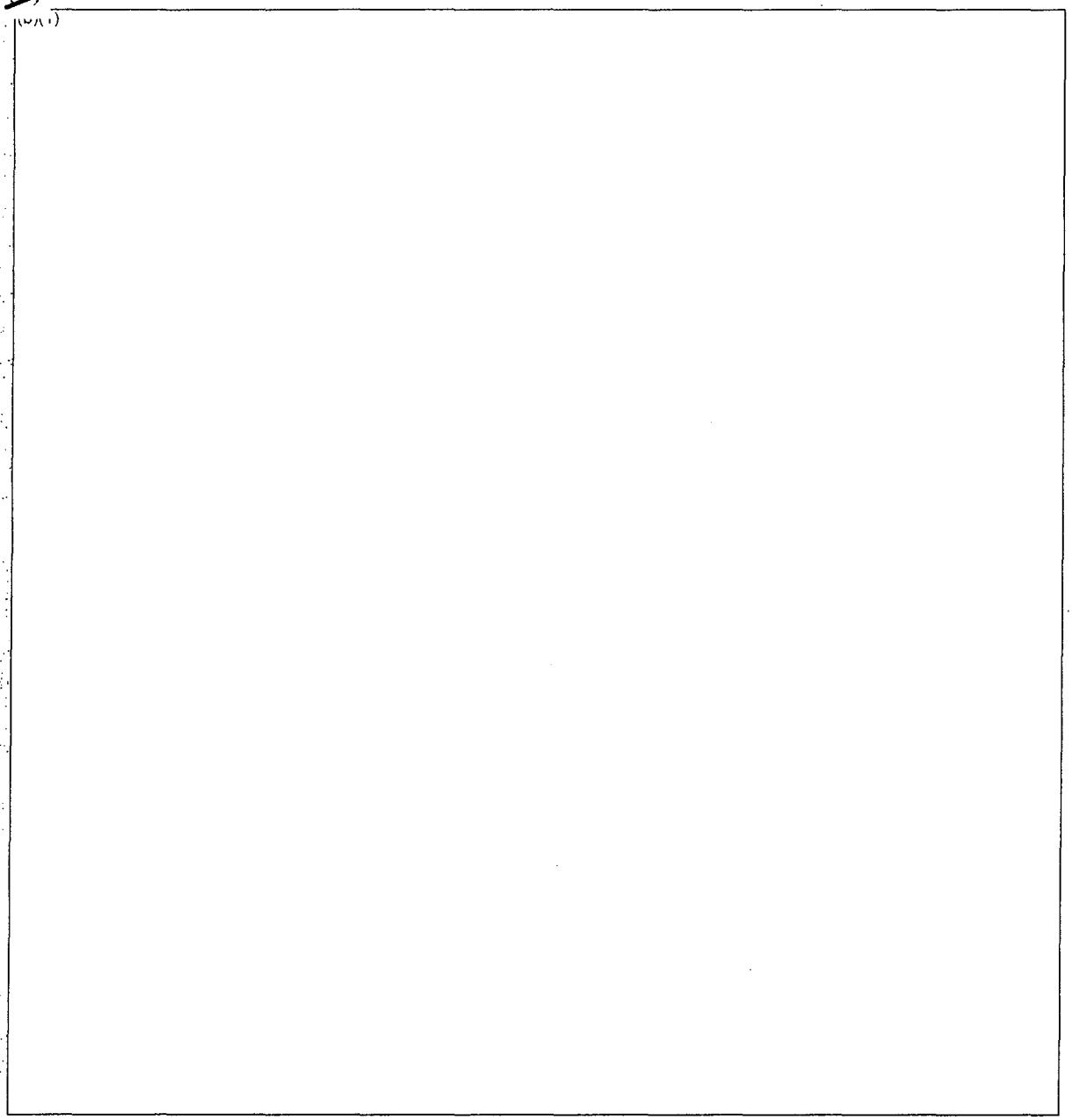

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B. ORDER OF BATTLE (U)

4. (S) Military Organization (U)

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5. (C) Military Equipment (U)

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6. (TS (b) Military Training (U)

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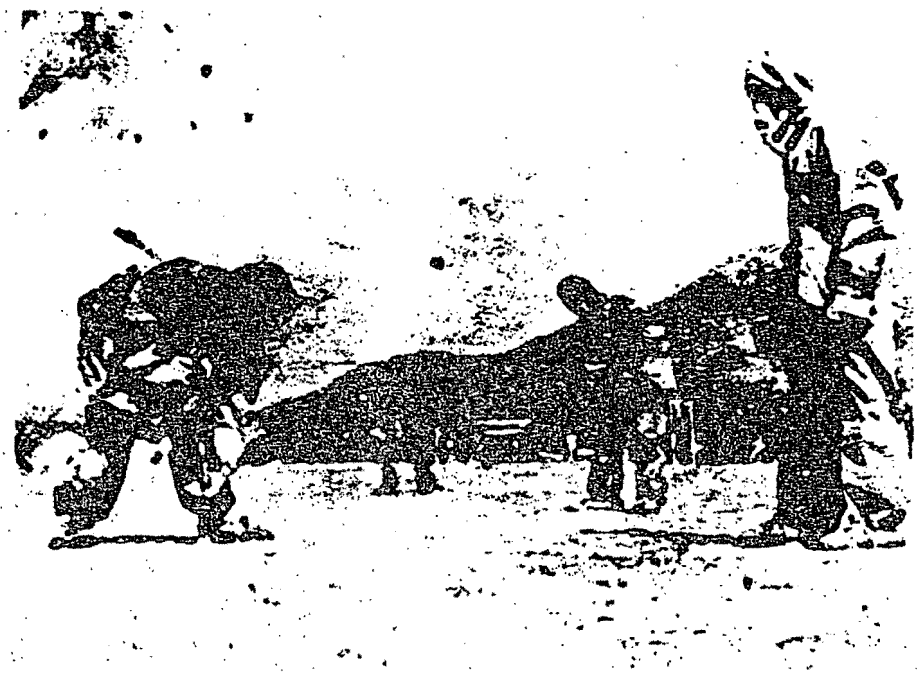

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(C) Figure 1. CBR reconnaissance troops in light protective clothing (U).

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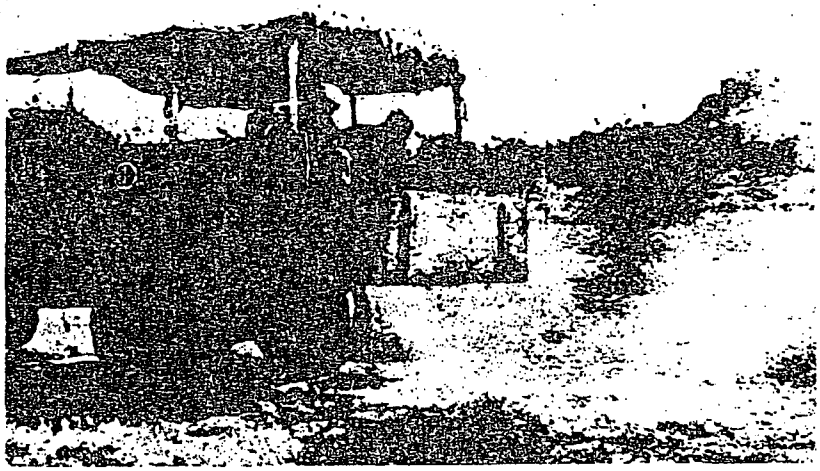

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Figure 2. Vehicle ground decontamination exercises (U).

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Figure 3. Troops preparing to enter stream in full protective clothing (U).

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Figure 6. Troops in full protective clothing training with detector kits at CW school (U).

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7. (TSCR) (b)(1) Naval BW Capabilities (U)

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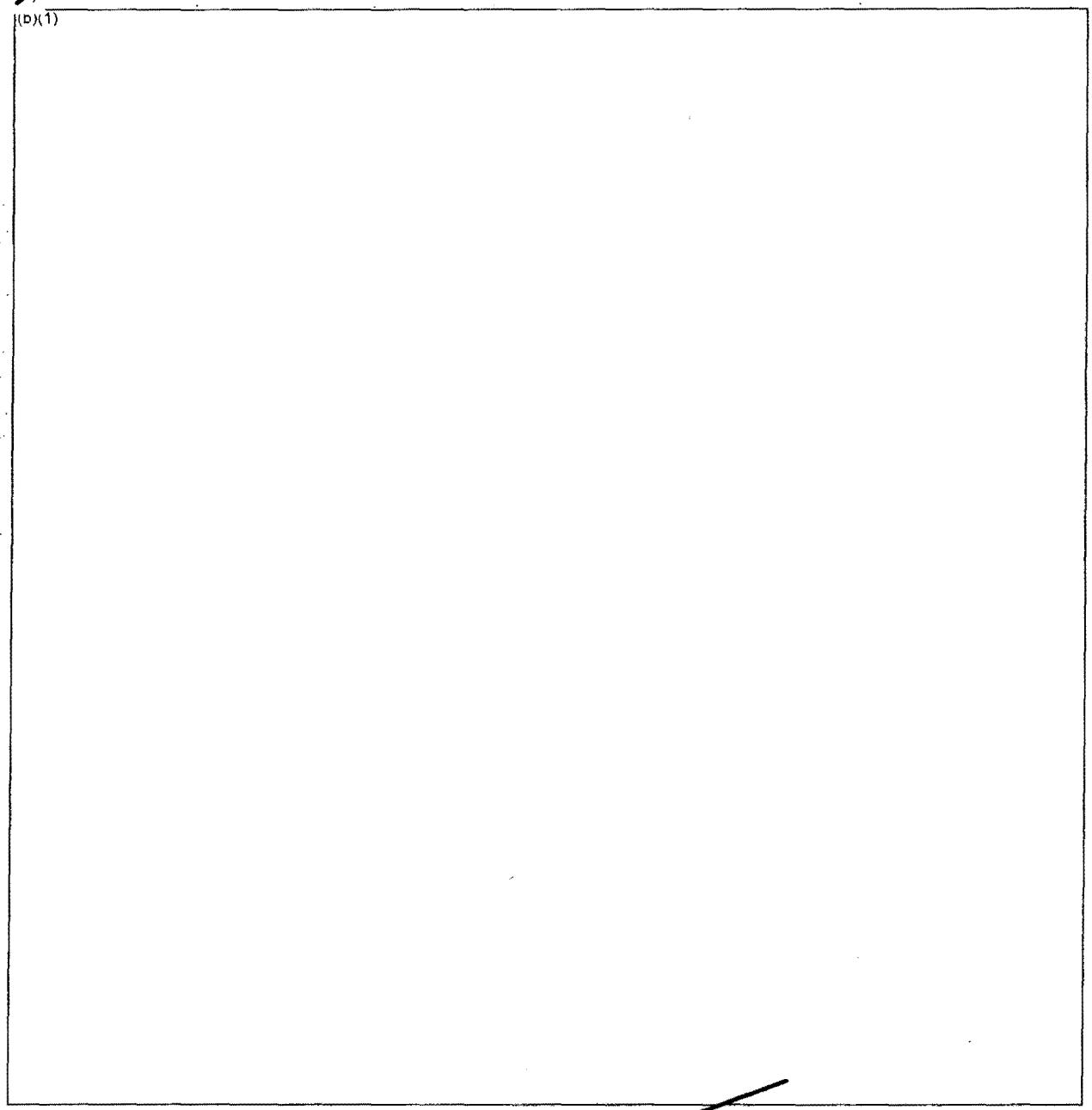

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Figure 8. Decontamination exercise aboard ship (U).

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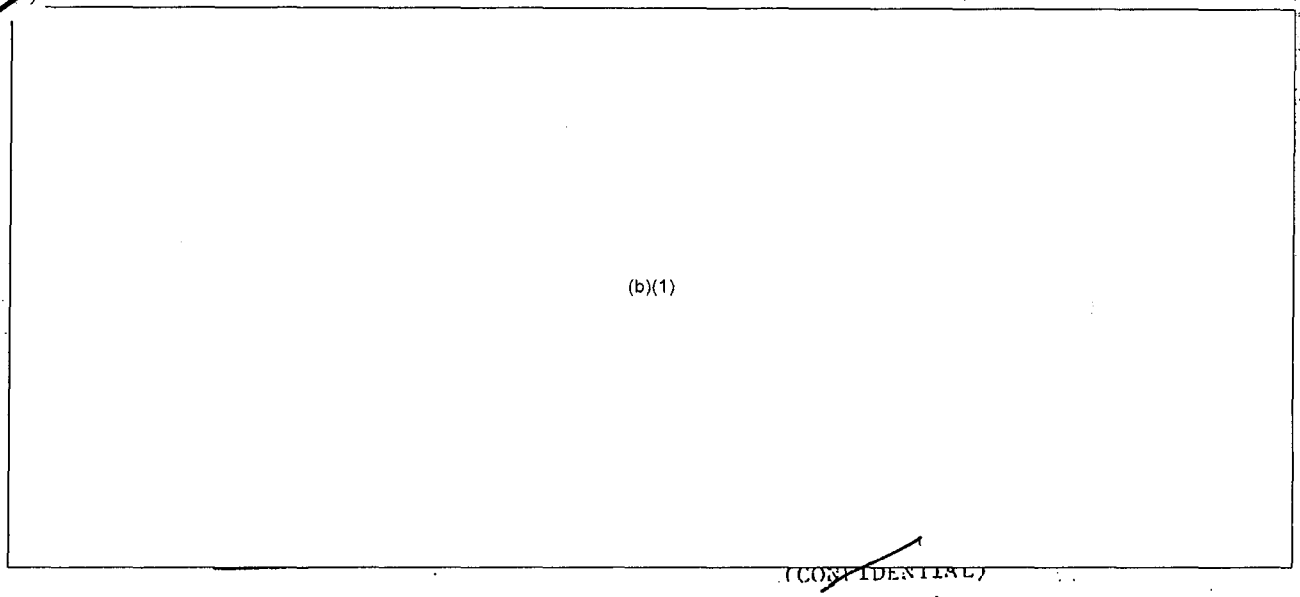

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Figure 9. C&R exercise aboard Chinese ship (U).

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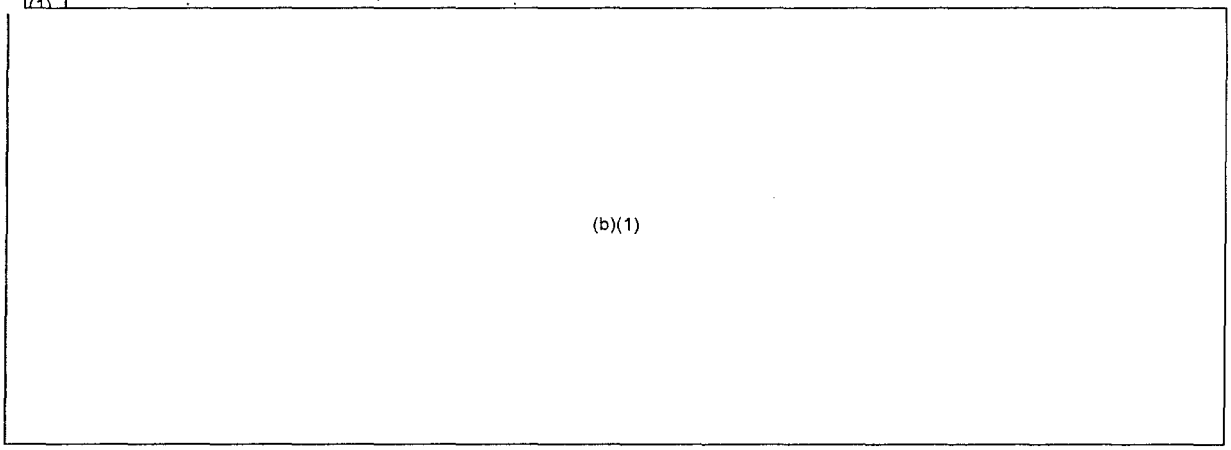

C. POLICY, STRATEGY AND TACTICS REGARDING USE OF BW (U)

8. (C) Policy (U)

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9. (C) Procedures (U)

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D. POLICY, STRATEGY AND TACTICS REGARDING DEFENSE AGAINST BW (U)

10. (C) Policy (U)

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11. (C) Procedures (U)

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E. BW MATERIEL (OFFENSIVE) (U)

12. (C) Agents (U)

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13. (C) Delivery Systems (U)

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g. (U) The Institute of Genetics, Chinese Academy of Sciences (CAS), is studying special topics in "microbacteriology" and entomology, areas of research considered the "vanguard for future bacteriological warfare."[40] Allegedly, recent discoveries in the field of bacteriology made by this institute have had profound effects on the entire mainland, but these discoveries were not disclosed.

F. BW MATERIEL (DEFENSIVE) (U)

14. (C) Decontamination (U)

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15. (C) Detection and Identification (U)

a. (U) There is little indication that the Chinese have conducted research to develop means of detecting and identifying biological agents. The results of some related research could be exploited for such a purpose. Tseng Fan-chi of the Wuhan Army General Hospital obtained rapid results in identifying 55 different species of bacteria by their biochemical reactions. The time required to identify bacteria by this technique was 20-24 hours as opposed to 4-5 days by conventional means.[33] An unknown author summarized a method in 1964 for determining the generation time of Bacillus anthracis.[34] The following year Li Liang-shan compared a broth method with the agar method to demonstrate the string-of-pearls reaction for B. anthracis. Details of the test were not given, however, the author claimed that results were identical. Possibly the modified reaction would have contributed to more rapid identification of B. anthracis.[35] Other studies suggestive of rapid identification were published by Chiang Shun-Ch'iu who experimented with incomplete antibodies for the diagnosis of brucellosis[36] and by Yun Chao-Chuan who compared various methods for identifying Brucella.[37]

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16. (C) Prophylaxis (U)

a. (U) Chinese military cadre are inoculated with a combined cholera and typhoid vaccine once a year. Claims have been made that all people of the nation have received vaccination for smallpox, and that the disease has been eradicated. Vaccines or antisera for typhoid, paratyphoid, typhus, diphtheria, tetanus, rabies, plague, cholera, yellow fever, and Japanese B encephalitis have been developed, but the scale of use is not known. The use of live vaccines has been exploited in China. Live vaccines for brucellosis, plague, and anthrax are available.[3] Vaccines for the more serious animal disease, such as, swine plague, hog cholera, rinderpest, and foot-and-mouth disease have been developed. A method of aerosol immunization was introduced into veterinary practice in 1964. The vaccine materiel was sprayed or dusted in a room so that animals were exposed and immunized.[57] There are no known instances concerning immunization of humans by the aerosol route. Continued efforts in aerosol research could have provided means for the mass immunization of (C) the population and of animals in the event biological agents are used.

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G. PRODUCTION FACILITIES (U)

17. (C) Agents and Munitions (U)

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18. (C) Defensive Equipment (U)

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H. BW RESEARCH, DEVELOPMENT, AND TESTING (U)

19. (C) General (U)

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20. (C-Releasable to UKCanAusNZ) Military Facilities (U)

(C) a. (C-Releasable to UKCanAusNZ) The China Science and Agricultural Scientific Research Institute, Hainan Island. (U)

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c. (U) The CPLA Veterinary University of China. The location of this institute and its true military affiliation cannot be verified. It could be part of the China People's University in Peking, or it might be misnamed because of incorrect translation.[74] An investigator, Liu Ching-hua, reportedly associated with the University, has studied the various types of Pasteurella isolated from 11 species of animals and fowl.[75] His observations of morphological, physiological, and biochemical properties indicated that there were no consistent host/bacterial specificities which could be reliably used to classify the 62 types of Pasteurella isolated. In general, although one strain Pasteurella might attack many species of domestic animals and fowl, a single species of animal might be infected by several strains of the bacteria. All strains isolated in nature could give rise to variant types when grown in artificial media. Although this study was apparently conducted to advance veterinary immunology, the basic data concerning susceptibility of animals to this disease and the genetic selection of mutant strains could be applied to other infectious diseases.

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21 (U) (C Releasable to UKCanAusNZ) Non-Military Facilities (U)

a. (C) Chinese Academy of Science (Academia Sinica) 5 Wen Chin Chieh, Peking. (U)

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(C) b. (C-Releasable to UKCanAusNZ) The Institute of Virology, Peking. (U)

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(6) (U) Mao Chiang-sen studied the effect of temperature and pH on the production of JBE virus and the effect of those parameters on interferon subsequently synthesized in chick embryo cell cultures.[104] The optimal temperature for virus growth was found to be 33.5° C, although interferon production increased as higher temperatures were reached. The optimal pH for interferon production ranged between 7.1 and 7.6, while the optimal pH for production of the infective virus was 7.8. These data suggest, therefore, that at pH7.8 and at 34.5° C, the Peking strain of JBE virus would propagate to maximum titers under conditions severely inhibiting the production of interferon. The Peking strain of JBE virus is the most virulent of those known.

(7) (U) Many other investigators at this institute have contributed also to general knowledge of the JBE virus. Included are P'ang Chi-fang who in 1964 reported observations made with an electron microscope while the virus of JBE was developing in chick embryo fibroblasts and in hamster kidney cells.[105] Wang Chin, 1960, studied

comparatively the growth of JBE virus in the brain and in the extra central nervous tissues of white mice; coauthor of the finished report was Huang Chen-hsiang.[106-107]

(8) (U) Hsu performed studies involving the use of mice in determining the mechanism of immunization against JBE.[108] Lieu investigated the enzymatic activity and effects of ribonucleic acid of JBE on mouse brain tissue.[109] Much of the data obtained from these studies relative to the growth characteristics of the JBE virus would be essential to support any effort to mass produce this virus as a potential BW agent.

c. (C) Institute of Epidemiology and Microbiology, Peking. (U)

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(2) (U) Other work on brucella involving the agar diffusion reaction has been done by Yün Chao-ch'uan.[111] This spotty interest in brucellosis shown by Chinese investigators suggests that China is not free of the consequence of this chronic disease. Attempts to resolve problems affecting public health and the practice of veterinary medicine will generate a great deal of data, some of which would be applicable to the development of brucella pathogens for BW.

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e. (C-Releasable to UKCanAusNZ) The Institute for Biological Products Research (National Institute of Vaccine and Serum) Peking. (U)

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(3) (U) In 1962, Wang Yung-chi, Lu Chin-han, Li Mei-jung, and Chang Yung-fu induced allergic encephalomyelitis in guinea pigs, albino rats, white mice, rabbits, and monkeys.[113] It was found that the pathological changes observed were much more complex in monkeys; this might have been used as a parameter to determine similar results in man.

(4) (U) In a paper presented at the 1963 Symposium sponsored by the Microbiology Society of China[114] Wang Yung-chi and coworkers described their findings of an interferon-like substance in chick embryo cultures infected with either type B epidemic encephalitis virus or yellow fever virus. Effective inhibitory concentrations were still present, even upon dilution of 1:160, a fact which indicated a need to make further adjustments in concentration to reduce the plaque count to 50%. In a follow-up study (1964), Wang investigated JBE virus culture, and elucidated the nutritional aspects of viral growth using monolayer tissue cultures.[115]

(5) (U) Other notable research conducted at the institute was that by Han Hung-lin and Pan Jen-chiang who studied the activation of botulinum type E toxin by trypsin.[116] This study confirmed the

previous observations of others. Available published research on the incidence of botulism in China is scarce, and the extent of research on the toxin is not apparent. Research on botulism would probably be in consonance with similar studies in other countries to combat its incidence, but might also aid any effort to develop this potential BW agent.

f. (U) Chengtu Institute of Biological Products (Chengtu Vaccine and Serum Institute), Chengtu. (U)

(1) (U) Wei Wen-pin characterized an interferon-like substance found in the supernatant fluid of a suspension of mouse lung tissue infected with a virulent strain of Rickettsia prowazekii.[117-118] The substance exhibited some properties quite distinct from other interferons. Wei and his coworkers were subsequently able to propagate R. prowazeki in monolayer cultures of embryonic mouse lung cells. Wei from 1946 to 1951 was engaged in research at the Pasteur Research Institute in France. In 1952 he was a member of the Chinese Committee to Investigate Alleged US Use of Bacterial Warfare in Korea.

(2) (U) Tung Tien-shun and K'ang Hsien-yuan are responsible for several original studies on Salmonella typhosa, causative agent of typhoid fever.[119] Chou has also done original work in isolating new subtypes of Shigella flexneri, causative agent of dysentery.[120] Studies on the rickettsiae and on the enteric pathogens make up much of China's efforts in microbiology. Work in these areas probably enjoys an emphasis second only to that given to JBE. The endemicity and epidemicity of these diseases demand that such work be performed primarily to upgrade the public health standards in attempts to eradicate these diseases from the environment. The studies they perform and data gathered therefrom could be used to support applicable R&D efforts.

g. (S) Changchun Institute of Vaccines and Serum, Changchun. (U)

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(2) (U) Yang Chung-ch'i has published a paper entitled "Changes in the Amino Acids Composition of Culture Fluid of Pasteurella *(Yersinia) pestis EV strain During Their Growth."[121] The study revealed that various amino acids originally present in the growth medium were utilized by P. pestis according to a definite sequence--proline, serine, and theonine first, followed by glutamic acid only when the first three had been exhausted, and then aspartic acid. Glycine and alanine were utilized only after aspartic acid had been exhausted. Plague, carried chiefly by the tropical rat flea, has occurred in China for centuries and is likely to be present for some time to come. Data realized from studies of the pathogen are applicable to establishing growth parameters of this pathogen.

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i. (U) Other Institutes of Interest. (U)

(1) (U) Investigators at the Fukien Institute of Epidemiology, Foochow have studied the vectors of Rickettsia tsutsugamushi,[128-129] the detection of Leptospira,[130-133] and immunological methods for identifying Coxiella burnetii. An Infectious Diseases Hospital at Foochow and the Fukien Provincial Hospital have also been mentioned. Studies on antibiotic resistant dysentery bacilli[134] and the serological variability of Shigella flexneri[135-136] were conducted there.

*The use of the genus name Yersinia is consistent with current taxonomic practice, however because of past common usage and the greater familiarity of investigators with the genus name Pasteurella, the latter term will be used throughout this report.

(2) (U) Ch'en, China Medical College, studied the antibiotic resistance of a large number of strains of Shigella.[137] The Inner Mongolia Medical College, Huhekot published results of efforts to isolate drug resistant variants of Shigella flexneri.[138] The Institute of Antibiotics, Peking has evaluated various nitrogen sources for growth of Shigella species,[139] and the effect of additives on growth has been determined.[140] These studies might have some application in a BW program, although the enteric diseases are prevalent public health problems.

22. (S) Potential Agent Development (U)

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23. (S-Releasable to UKCanAusNZ) Molecular Biology as Related to BW Agent Research and Development (U).

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Table I. Potential BW Agents (U).

Causative Agent	Disease Produced
(C) Bacteria:	
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(C) Viruses:	
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Rickettsiae:	
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Table II. Suspected Chinese Biological Warfare Agent Production Facilities (U).

Organization	Location	Activity
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[1]May be same as Central Biological Products Institute, which is currently the Institute for Biological Products Research.

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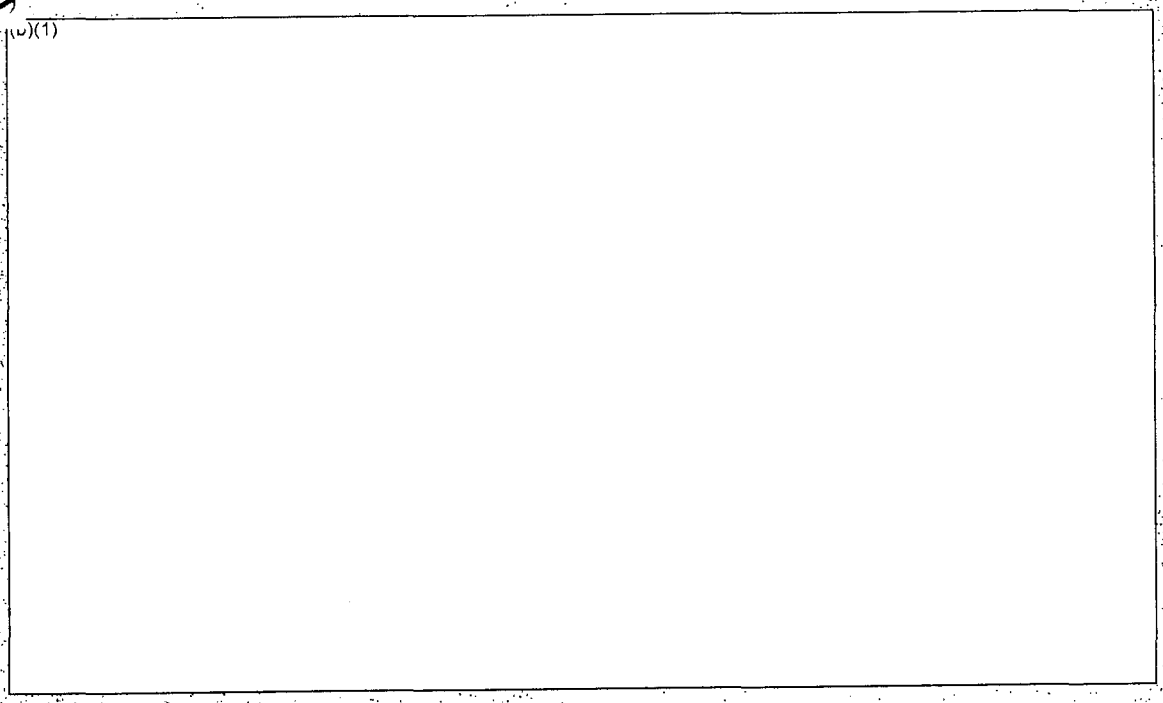

24. (S)(W) Biofermentation/Bioengineering as Related to BW Agent Developments (U)

a. (U) If a successful BW program is ever to be established, fundamental data derived from R&D efforts must first be scaled-up, through process research, so that large volumes of precisely defined biological materiel ultimately can be produced at will. Unfortunately for those who are working very hard to identify this effort, equipment and facilities used for these purposes are simply not unique. For instance: processes by which biological agent fills are produced need differ but slightly from those schedules which are used to manufacture bulk volumes of vaccine materiel; and fermentors already in use to cultivate yeasts and actinomycetes for established commercial purposes could be adapted easily to produce pathogenic organisms with but appropriate modifications for safety purposes. The facilities used for this research in China appear to be under civilian control but nevertheless these could be used to support military needs for the development of BW agents.

b. (U) Chiao Jui-shen, an investigator at the Institute of Plant Physiology, CAS, spoke at the 1963 Symposium on Progress in Microbiology held in Wuhan University and pointed out that although current emphasis

had been placed on developing the antibiotics industry, outstanding progress had also been made on developing biochemical engineering and industrial fermentation.[163] By isolating mutant strains of selected molds, by determining carefully critical parameters of their metabolism, and by modifying their nutritional requirements, notable increases in antibiotic yields had been made possible.

c. (U) At the Third All-China Scientific and Technical Conference on Antibiotics held in Dairen, September 1964, Chiang Ching-i and Ch'en Hung-shan of the Institute of Antibiotics, CAMS, outlined the conditions found necessary for the optimal culture in chicken embryos of cowpox and fowl plague viruses.[164]

d. (U) At this same symposium, Ma Yu-ch'eng of the Hua-tung Chemical Engineering College, Shanghai, noted the debt which biological engineering owed to chemical engineering.[165] The author forecast the continued development and greater application of biological engineering; he also stressed the need of specialized training in order to develop competent biological engineers.

e. (U) Lu Pao-lin presented a paper at the 20th annual symposium of the Entomology Society of China held in Peking in 1964, at which he reviewed progress made and elucidated major problems still facing those who were interested in medical insect culture.[166] He noted the work of Ho Ch'i in the fertilization of Chinese mosquitoes (A. Sinenses) by forced mating, and the work of Hu Neng who used fermented culture media to stimulate hatching; he also stressed the homogeneity of insect quality, and emphasized the importance of controlling culture conditions and population densities in order to increase breeding efficiency. He also urged extensive studies in order to keep abreast of foreign developments in insect culture.

f. (U) Su Ch'eng-ch'in, Chang Ching-fang, Chu Nan-ying, and Li Chi'huai of the Institute of Medical Biology, CAMS, Kun-ming, did original work in 1961-1962 on the isolation of latent cytopathogenic viruses from uninoculated tissue culture.[167] The viruses were not named, but data were obtained on the effects associated with regrowth of these viruses in monkey kidney cells.

g. (U) Ts'ao Chen-ch'in designed a continuous sterilizer for use in the fermentation industry.[168] In his report, the author evaluated various parameters related to the design, namely the time of continuous sterilization, the reaction speed constant, and the absolute temperature of sterilization.

h. (U) Another significant accomplishment has been the development of an automatic defoaming method for use in the fermentation industry.[149] Shen Yung-hsing described details of this development which compared in quality to the work of the Czechoslovaks, who have recently acquired equipment which controls automatically pH, foam, etc.

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25. (S) Preservation of Microorganisms as Related to BW Agent Development (U)

a. (U) Another prerequisite for the militarization of biological materiel is an appreciation of the technology needed to stockpile agents in a viable state, so as to assure their availability for offensive use when required. The Chinese have conducted various studies which increased their knowledge of the applicable technology, mainly laboratory techniques associated with lyophilization (freeze-drying).

b. (U) In 1959, an improved method of lyophilization was described by Hsieh Chen-ying of the Second Military Medical College, Shanghai, CPLA Academy of Medical Science.[151] Many strains of fungi and influenza viruses, together with strains of bacteria which cause anthrax, cholera, brucellosis, and plague, were maintained in a lyophilized state without loss of cultural or physiological properties. These studies demonstrated the competence of Chinese investigators to control the stability, viability, and virulence of potential agents for BW purposes.

c. (U) Hsing Tsu-p'ei of the Hungshan Sanitation and Antiepidemic Experimental Institute, Wuchang, studied the survival of lyophilized Rickettsia tsutsugamushi (orientalis).[152] The results indicated that the rickettsiae retained their viability up to 9 years when stored at -10 to -20° C in sucrose solutions.

d. (U) Li Tut'ang and Hsu Hung-li of the Institute for Biological Products Research (Ministry of Public Health), Peking, studied survival rates of Vibrio cholerae after lyophilization.[153] V. cholerae was chosen as a model because of its marked sensitivity to physical and chemical factors associated with biological decay. The investigators found that after 10 years in the lyophilized state, cholera organisms survived without undergoing significant changes in morphological, biochemical, or serological properties.

e. (U) In 1965, investigators in the laboratory of the Wuhan Municipal Contagious Disease Hospital reported on a "simple and practical way of preserving bacteria," which allowed them to keep their cultures either in a refrigerator or at room temperature.[154] This method was used for 3 years and proved effective.

f. (U) Chu Cheng-ch'ing and Tung Ts'un of the Shanghai Insitute of Medical Industry, Ministry of Chemical Industry, Shanghai have also conducted a study of microbial preservation by refrigeration and desiccation.[155]

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26. (TSR (b)(1) -NFD) Testing (U)

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1. ANTICROP RESEARCH (U)

27. ~~(U)~~ General (U)

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b. This unfavorable population-land balance, which provides less than 0.4 acre of cultivated land per person, has been a major deterrent to the country's economic progress. Between 80% and 85% of the population are engaged in farming, and agriculture currently supplies one-third to one-half of the national income. Agriculture also supplies the bulk of the raw material base. Farm products and the finished agricultural products constitute 60% to 70% of total exports.

c. During the first decade of Communist rule, gains in agricultural production were registered almost every year. Then 4 years of devastating reverses in agriculture, because of the reckless adventure of the Great Leap Forward (1958-60) and unfavorable weather during 1959-61, dropped farm output to a dangerously low level and resulted in a near collapse of the economy.

d. Under the guise of central planning during the Great Leap Forward, officials had ignored traditional farming culture--thereby badly upsetting one of the most intricate farming systems in history. Because of the successive crop reverses, the regime beat a hasty retreat and announced a new policy of giving priority to agriculture. Since that time, gains have occurred in numerous industries designated to support agriculture.

e. Although sufficient justification exists for official claims that the current level of food consumption exceeds that of the 1959-61 period, agricultural production in the socialist sector has failed to make a net per capita gain since 1964, and remains substantially below levels of production achieved before the Great Leap Forward. Large imports of grain and substantial production increases on private plots of land account for most of the increased consumption since 1961. On socialist farms, the production of food crops in 1966 failed to meet consumer needs for the eighth consecutive year.

f. Although exports of agricultural commodities have increased significantly since 1962, they apparently have not regained the 1959 level. Thus, almost a decade after the Great Leap Forward that was to solve China's economic problems within a few years, the country's agriculture is still in a state of stagnation. As one authority observed, "It may turn out that the Great Leap Forward will have cost the Chinese economy roughly a decade of growth."

28. (U) Major Crops (U)

Rice is by far the most important crop in Communist China. The production of rice is more than three times that of all the other major crops

combined: wheat is next in acreage and production. Other principal crops are soybeans, peanuts, rapeseed, and cotton. Acreage and production figures of the major crops grown in Communist China are listed in table III.

Table III. Acreage and Production of Major Crops in Communist China (U).

Crops	Acres	Production (tons)
Rice	---	91,800,000
Wheat	62,114,000	22,927,000
Soybeans	20,433,000	8,100,000
Peanuts	4,339,000	2,209,000
Rapeseed	2,830,000	965,000
Cotton	10,950,000	1,241,000

(UNCLASSIFIED)

29. (U) (C) R&D Against Naturally Occurring Crop Pests and Anticrop Warfare Agents (U)

a. (C) Sources of Information. (b)(1)

(b)(1)

b. (U) Research on Rice Diseases and Insects. Since rice is the most important source of food in Communist China, its diseases would be expected to receive the greatest attention of ChiCom scientists. This opinion seems to have no basis in fact, however, since the rust diseases of wheat apparently are the object of much more research.

(1) (U) Investigations on rice diseases. Rice blast is a serious disease in Communist China, especially in the northeast, but only one article since the beginning of 1965--concerning the application of kasugamycin, a Japanese antibiotic, for the control of rice blast--has been noted in a Chinese Communist publication.[156] The study on which the article was based was conducted by a Japanese scientist. During the same time period. three papers on other rice diseases appeared:

(a) (U) The Mycelial Activities of the Rice Sheath Blight Fungus in Relation to the Disease Development;[157]

(b) (U) Studies on the Spore Dispersal of Helminthosporium oryzae;[158]

(c) (U) Field Control of Bacterial Leaf Streak (Xanthomonas oryzicola) of Rice in Kwangtung.[159]

(2) (U) Rice insects. The following two papers on rice insects have been noted; both concern research on the control of the paddy borer:

(a) (U) Outbreak, Rhythm, and Control Technique of Paddy Borer (Tryporyza incertellus Walker) in Huang, Hsin, Hsi, and Demonstration Regions in Hopeh Province;[160]

(b) (U) Forecasting the Third Generation Paddy Borer (Tryporyza incertellus Walker) and Chemical Control Techniques.[161]

c. (U) Research on Wheat Disease and Insects. (U)

(1) (U) Races of wheat stem rust. The physiological races of the fungus causing stem rust of wheat were analyzed in 1964. Stem rust was epiphytotic in all areas of China in 1964, being generally more serious in the north than in the south. In 1964 a total of 2835 samples of stem rust spores was collected from 229 cities and districts within 26 provinces; 2006 of them have been identified. The identifications were conducted from November 1964 to March 1965 according to the usual international procedure and rules. The races and types found were: 17, 19, 21, 21C1, 21C2, 21C3, 34, 34C1, 34C2, 40, and 194. The predominance of race 21 has

been gradually decreasing, whereas race 34 has been increasing in occurrence, as seen from the analyses of the physiological races found from 1962 to 1964. This survey was conducted by personnel from the Mukden Agricultural College, Heilungkiang Agricultural Research Institute, and the Kirin Agricultural Research Institute, all in Northeast China.[162]

(2) (U) Control of wheat diseases. Four effective means of stripe rust control have been developed in China: (a) breeding of rust-resistant varieties, (b) postponing the sowing time from 100 days to 80 days before the winter solstice, (c) destroying disease-infested plants, and (d) applying fungicides like sodium fluorosilicate and sulfanilamide.[163] According to available statistics, 6 million acres were sown with about 100 varieties of good rust resistant strains of wheat in Shansi, Hopeh, Shantung, Honan, Shensi, Kansu, and Northern Kiangsu in the autumn of 1964.[164] The variety Nei-hsiang 36 was reported to be immune to stripe rust but susceptible to leaf and stem rusts. A second variety, Hopeh Agriculture University 3, is almost immune to stripe rust and is resistant to stem rust, while a third variety, Hsu-chou 4, is almost immune to all three types of rust.[165]

(3) (U) Development of chemical rust fungicides. Sulfonic acid, a systemic fungicide against wheat rust, has been tested in the field. The optimum concentration found was 6.5 to 13 pounds of 65% acid per acre. Methods for producing the acid have been developed.[166,167]

(4) (U) Development of antibiotic fungicides. During 1965, seven papers were published on antibiotic fungicides. All but one concerned the fungicide "Nung-K'ang-101," and isocycloheximide isolated from Streptomyces aureus, by the Pharmacology Institute, Chinese Academy of Sciences, Shanghai. Nung-K'ang-101 was tested and found to be effective against wheat rust and Gibberella disease of wheat.[168-170]

(5) (U) Research on control of wheat insect pests. The oriental army worm, Leucania separata Walker, is the pest most destructive of cereal crops in Kirin Province, Northeast China. Studies have been conducted on its life history and the effects of microclimate on its population density. The wheat stem fly, Meromyza saltatrix Linn, is a serious pest of wheat in Shensi. Differences in varietal susceptibility have been noted; plants growing in fertile soils sustain less injury. Benzene hexachloride (BHC) or parathion provide very effective control of the adult fly. One paper describes the development of the aphid Macrosiphum granarium--the chief wheat pest in the province of Hsi-Nan.[171-179]

d. (U) Research on Soybean Diseases and Pests. Although the soybean is a major crop in Communist China, research on its diseases and pests is sketchy. Only three papers have been noted: one on the analysis of the soybean mosaic virus, and two on the soybean pod borer. The latter is a serious pest of soybeans in Northeast China. Recommended control methods are the use of resistant varieties of soybean, proper cultural practices, and insecticides like BHC together with DDT.[redacted]

e. (U) Research on Rape Disease and Pests. The Institute of Microbiology has conducted an intensive study of the rape mosaic viruses. The Chinese Communists have identified and characterized 40 strains of the virus. A partial purification of the virus has been accomplished, and its properties have been described. Another institute has studied the epidemic relations between the vector aphid, Myzus persicae Salz, and the virus.[183-185]

f. (U) Research on Cotton Disease and Pests. Analysis of the published research papers indicates that the principal diseases and insects of cotton are: fusarium wilt, verticillium wilt, and pink bollworm. Stopping the spread of fusarium wilt and verticillium wilt appears to be the principal difficulty. Use of BHC and DDT is recommended to control the bollworm.[186-188]

g. (U) Insect Pest Control Research. (U)

(1) (U) Chemosterilants. Two forestry institutes have been investigating the use of the chemosterilants to control Dendrolimus punctatus Walker, Bombyx mori, and other insects. Chemosterilants selected experimentally included Thio-TEPA, 5-fluorouracil, 5-fluorouratic acid, colchicine, nitrogen mustards, and thiocarbamide. The effects of the various chemosterilants on the different insects were described.[redacted]

(2) (U) Organic insecticides. Research on chemical insecticides in Communist China appears to concern chiefly the testing of Western-developed organophosphorus and organochloro insecticides on Chinese crops. The development of synthetic processes for producing the desired insecticides for Chinese crops also is of concern.

(3) (U) Biological control. Spores of the bacteria B. bassiana and B. thuringiensis are used to control such insects as D. punctatus Walker, the pine caterpillar Grapholitho glycinivosella, and Cylas formicarius. Applications of the insect fungus, Spicaria fumoso-rosea, have been considered for the control of a wide range of insects, including L. separata Walker and Pyrausta nubilalis Huebner. The use of Chinese bees and the insect Trichogramma australicum to control the sugar cane borer has been investigated and has produced satisfactory results.[redacted]

30. (U) Assessment of Communist China's Anticrop BW Capabilities (U)

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J. CONCLUSIONS (U)

31. (U) Offensive Posture (U)

(b)(1)

32. (U) Defensive Posture (U)

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Section II.

NORTH VIETNAM

A. INTRODUCTION (U)

1. (U) Historical Background and Competence in Microbiology (U)

(b)(1)

(b)(1)

2. (U) Geographical and Political Factors (U)

a. North Vietnam lies in the northeastern part of the Indochina Peninsula, bordering the Gulf of Tonkin. This relatively small and irregular shaped country narrows from a maximum width of 375 miles in the north to about 30 miles in the south. The maximum north-south axis is about 450 miles. Its size approximates that of the State of Washington. The population of about 18.5 million is chiefly concentrated in the Red River Delta and along the coastal plains. Of the 1850 miles of land boundaries, about 800 miles borders on Communist China and about 1000 miles on Laos. There are two routes into North Vietnam from Communist China, both served by a road and a railroad. Two selected routes from Laos contain a road suitable for vehicular movement, but are poor access routes because of the mountainous terrain and inferior roads. The best air approaches are from the east, over the South China Sea.

b. The DRV Government is a highly centralized structure paralleled by the Lao Dong (Communist Party) organization, composed of more than half a million members. Civil obedience is maintained by an elaborate police and security service backed up by the military service. The economy is tightly controlled and the people are held to an austere level of living. North Vietnam's position in the Communist World was greatly enhanced by the personal stature of Ho Chi Minh. The Soviet Union and Communist China have each actively sought the support of the DRV in their contention for leadership in the Communist world. This has been done partly by making competitive grants of both military and economic assistance. North Vietnam, although heavily dependent on the larger and more advanced Communist countries for military and economic aid, has remained largely independent in the formulation of its domestic and foreign policies. The DRV controls its own territory through the usual Communist machinery and methods.[198]

c. The government structure was substantially reorganized in 1960. A new constitution was promulgated for further centralization and for an elected National Assembly. The constitution was modeled extensively on the Chinese constitution and serves as an organic law for the government as well as a propaganda document for the Lao Dong. Like all Communist constitutions, it ascribes considerably more responsibility and authority to the governmental organization than exists in actual practice. The most important centers of power within the government are the executive agencies--the President of the Republic; the Premier; the Council of Ministers; and the administrative committees of the local governments. The Council of Ministers is the organization closest to the policy making process, and the most important ministries of the Council are the Ministries of National Defense, Foreign Affairs and Public Security. Each of these Ministries is headed by Politburo members. The Communist regime has continued to reshuffle local government organizations and generally has developed a unified, nationwide system of local administration, dominated by Lao Dong Party members.[198]

B. ASSESSMENT (U)

3. (C) Order of Battle (U)

(b)(1)

(b)(1)

(b)(1)

4. (C) Doctrine and Procedures (U)

(b)(1)

(b)(1)

5. (C) BW Equipment (U)

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6. (C) Production and Stockpiling (U)

(b)(1)

(b)(1)

7. (C) Research, Development, and Testing (U)

(b)(1)

(b)(1)

8. (C) Conclusions (U)

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Section III.

NORTH KOREA

A. INTRODUCTION (U)

1. (C) Historical Background and Competence in Microbiology (U)

(b)(1)

2. (U) Geographical and Political Factors (U)

a. North Korea is a rugged land which occupies the northern part of the Korean peninsula between the Yellow Sea on the west and the Sea of Japan on the east. It adjoins Communist China and the USSR on the north and South Korea on the south. North Korea has an area of about 47,000 square miles, or approximately the size of Pennsylvania. Because

of the rugged mountainous terrain, North Korea is poorly suited for ground or air operations. Pyongyang is the political, commercial, and cultural center of the country. The Hamhung-Wonsan area is the largest industrial center and includes nonferrous metal plants, chemical works, a munition plant, and an industrial machinery plant. There are also army and navy installations in the area.[45]

b. North Korea is a Communist party state dominated by a closely knit clique under Premier Kim Il-song. Occupation of the northern part of the country by the USSR in 1945 set conditions for the political development, and the presence of Soviet military guaranteed its direction. Initially a figurehead under Soviet direction, Kim has moved to consolidate his position by eliminating rivals and has sought to establish independence from both the USSR and Communist China. The strongest priority of the regime is directed toward the reunification of Korea. An aggressive policy on reunification was pronounced at a Labor Party Conference in October 1966. Propaganda campaigns were reinforced with incidents created along the demilitarized zone and terrorist attacks throughout South Korea. Another strong objective of the regime is to enhance North Korea's international position. Almost all domestic policies are integrated to establish a highly integrated, self-supporting economy under state control. Some progress has been made in this direction, but North Korea has not attained economic and scientific self-sufficiency.[45] Very limited scientific effort could be diverted into a biological warfare program.

B. ASSESSMENT (U)

3. (TS FD) Order of Battle (U)

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4. (U) Doctrine and Procedures (U)

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5. (U) BW Equipment (U)

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6. (C) Production and Stockpiling (U)

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7. ~~(C)~~ Research, Development, and Testing (U)

(b)(1)

(b)(1)

8. (C) Conclusions (U)

(b)(1)

Section IV.

THE MONGOLIAN PEOPLE'S REPUBLIC

A. INTRODUCTION (U)

1. (U) Historical Background and Competence in Microbiology (U)

a. (U) Prior to 1921 medical services in the Mongolian People's Republic were provided by Lamaists. In 1921 the Soviet army furnished medical aid to Mongolia's army, which resulted in the adoption of modern methods of health and sanitation throughout Mongolia. Additional advancements in public health services have occurred since the country asserted its independence in 1924. The Soviet Union has provided technical assistance in the development of health and sanitation programs and has helped to train medical personnel. Assistance is also provided by the United Nations organization and by the East European Communist Countries. With this aid, the public health standards have become comparable with those in most other Asian countries. Evidence does not show that any research in progress is associated with biological warfare programs.

b. (e) (b)(1)

(b)(1)

2. (U) Geographical and Political Factors (U)

a. Mongolia's proximity to the Trans-Siberian railroad in the Soviet Union, and its position between the USSR and Communist China

lends it a unique strategic significance. It provides road and rail routes from the USSR to the coast of Communist China. The main strategic area is Ulan Bator, the capitol city. A single track railroad links Ulan Bator with the Trans-Siberian Railroad in Russia and extends southeast to connect with the Communist Chinese system at Erk-lien. Of Mongolia's boundaries, 2600 miles border Communist China and 1850 miles border the Soviet Union. Since tensions arose between the USSR and Communist China, Mongolia has been used as an advanced position for the Soviet Army. Soviet units reportedly are stationed in Mongolia, and the Chinese border is constantly under observation.[26] Geographically, Mongolia includes vast desert plains in the south and east, long mountain ranges in the west, and hills mountains with broad valleys in the north. The climate is continental with great daily and seasonal extremes of temperature.

b. The Mongolian People's Republic is governed by a Communist dictatorship which maintains control through a centralized system modeled on that of the USSR. The Politburo is the center of power and the source of all executive, legislative, and judicial authority in the country. Soviet influence dominates public health planning and activities in Mongolia. The USSR has provided technical assistance since 1925 in establishing a public health program, epidemiological systems, and laboratory facilities for investigating diseases. In 1931 the Soviet Union established at Ulan Bator the first antiplague laboratory which became the Central Antiplague Station in 1936. Prophylaxis is the basic philosophy in Mongolia, and all health care and medical research units are owned and maintained by the state. The Ministry of Public Health is responsible for all health and medical services. The political reliability and loyalty to the Communist party often outweigh qualities, professional skill, and ability in the selection of scientific administrators. For this reason the effectiveness of the public health services and the advancement of scientific programs are often hampered.[27]

B. ASSESSMENT (U)

3. (C) Order of Battle (U)

(b)(1)

4. (U) Doctrine and Procedures (U)

The Mongolians are not known to have policies or procedures for conducting biological warfare.

5. (U) BW Equipment (U)

The Mongolians do not have biological warfare agents or munitions. Some vaccines, antibiotics, and sera are available for defense.

6. (C) Production and Stockpiling (U)

(b)(1)

7. (C) Research, Development, and Testing (U)

(b)(1)

b. (U) A Bacteriological Research Office was formed in 1932 by combining several small laboratories in Ulan Bator. This was the first facility under the Ministry of Health to conduct microbiological research. Diseases for which vaccines have been prepared at this facility include typhus, rabies, smallpox, dysentery, typhoid fever, and brucellosis.[276] A Soviet specialist, L. S. Rezninkova, assisted in directing research programs for the development of vaccines and medicines.

c. (U) The Office for Studying and Combating Especially Dangerous Infectious Diseases which was an outgrowth of the Anti-Epidemic Office now has five substations under its jurisdiction. It is probably the largest Mongolian organization which supports studies of measures for preventing diseases, such as anthrax, glanders, plague, poliomyelitis, and tularemia. During 1966, the organization prepared and administered vaccines to an estimated 150,000 persons.[276]

(b)(1)

8. (C) Conclusions (U)

(b)(1)

APPENDIX I.

SELECTED MEDICAL MATERIEL MANUFACTURERS AND MEDICAL LABORATORIES, COMMUNIST CHINA (1971) (U)

Annexes

GROUP-1
Excluded from automatic
downgrading and declassification.

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MANUFACTURERS OF MEDICAL MATERIEL (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT	PRODUCTS
CH'ANG-CH'UN 43°52' N., 125°21' E.	
(G) Ch'ang-ch'un Biological Products Plant	Serums, vaccines
(G) Ch'ang-ch'un Pharmaceutical Plant	Drugs
CH'ANG-SHA 28°12' N., 112°58' E.	
(G) Ch'ang-sha Pharmaceutical Plant	Drugs
(G) Ch'ang-sha Provincial Pharmaceutical Plant No. 8	Drugs
CH'I-CH'I-HA-ERH 47°22' N., 123°57' E.	
(G) Ch'i-ch'i-ha'erh Pharmaceutical Plant	Drugs and antibiotics
DAIREN 38°55' N., 121°39' E.	
(G) Lu ta Biological Products Plant	Biologicals
FOOCHOW 26°05' N., 119°18' E.	
(G) Foochow Pharmaceutical Plant	Drugs, antibiotics

MANUFACTURERS OF MEDICAL MATERIEL (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT	PRODUCTS
FU-HSING-CHEN 22°46' N., 101°05' E.	
(G) Fu-hsing-chen Pharmaceutical Plant	Drugs
FU-SHUN 41°52' N., 123°53' E.	
(G) Fu-shun Pharmaceutical Plant	Drugs
HANGCHOW 30°15' N., 120°10' E.	
(G) Che-chiang Pharmaceutical Plant No. 1	Drugs
(G) Min Sheng Pharmaceutical Plant	Drugs
HANKOW 30°35' N., 114°16' E.	
(G) Hankow Institute of Biological Products	Drugs, biologicals, and official reagents
(G) Hankow Pharmaceutical Plant	Drugs
(G) Min-k'ang Pharmaceutical Plant	Drugs
(G) Wu-han Antibiotics Plant	Drugs; antibiotics

MANUFACTURERS OF MEDICAL MATERIEL (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT	PRODUCTS
HARBIN 45°45' N., 126°39' E.	
(G) Bacterial Fertilizer Plant of Northeast Agriculture Institute	Biological agents
(G) Harbin Pharmaceutical Plant	Vaccines
HSI-NING 36°37' N., 101°46' E.	
(G) Ch'ing-hai Provincial Pharmaceutical Plant	Drugs, antibiotics, biologicals, and official reagents
(G) Hsi-ning Pharmaceutical Plant	Antibiotics
HUAI-NAN 32°40' N., 117°00' E.	
(G) Huai-nan Pharmaceutical Plant	Drugs
HU-HO-HAO-T'E 40°47' N., 111°37' E.	
(G) Hu-ho-hao-t'e Biological Pharmaceutical Plant	Drugs, biologicals
(G) Hu-ho-hao-t'e Pharmaceutical Plant	Extracts of liquorice for use in medicines

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MANUFACTURERS OF MEDICAL MATERIEL (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT	PRODUCTS
K'AI-FENG 34°51' N., 114°21' E.	
(G) K'ai-feng Drug Factory	Drugs, antibiotics
KUEI-YANG 26°35' N., 106°43' E.	
(G) Guei-yang Pharmaceutical Plant	Drugs, antibiotics
K'UN-MING 25°04' N., 102°41' E.	
(G) K'un-ming Pharmaceutical Manufacturing Plant	Drugs
LAN-CHOU 36°03' N., 103°41' E.	
(G) [illegible] Pharmaceutical [illegible]	Drugs
(G) [illegible] Research Institute of Biological Products	Vaccines
MUKDEN 41°48' N., 123°27' E.	
(G) Hung-hsing Pharmaceutical Plant	Antibiotics
(G) Mukden Pharmaceutical Plant	Drugs, antibiotics
(G) Tung Pei Chemical Pharmaceutical Plant	Antibiotics

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MANUFACTURERS OF MEDICAL MATERIEL (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT	PRODUCTS
NANKING 32°03' N., 118°47' E.	
(G) Nanking Pharmaceutical Plant	Drugs and antibiotics
(G) Pai Ching Yu Pharmaceutical Plant	Drugs
NAN-NING 22°49' N., 108°19' E.	
(G) Kwangsi Biological Pharmaceutical Plant	Serums, vaccines
(G) Nan-ning Pharmaceutical Plant	Drugs, biologicals
NING-PO 29°53' N., 121°33' E.	
(G) Ning-po Pharmaceutical Plant	Drugs
PANG-PU 32°57' N., 117°21' E.	
(G) Pang-pu Chemical Plant	Drugs
PAO- 25°07' N., 99°09' E.	
(G) Pao-shan Foot-and-Mouth Disease Vaccine Production Plant	Biologicals
(G) Pao-shan Pharmaceutical Plant	Drugs and antibiotics

MANUFACTURERS OF MEDICAL MATERIEL (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT	PRODUCTS
PAO-TING 38°52' N., 115°29' E.	
(G) Pao-ting Pharmaceutical Plant	Drugs and antibiotics
PAO-T'OU 40°36' N., 110°03' E.	
(G) Pao-t'ou Pharmaceutical Plant	Drugs and antibiotics
PEKING 39°56' N., 116°24' E.	
(G) Peking Antibiotic Serum and Vaccine Plant	Serums, vaccines
(G) Peking Pharmaceutical Plant	Drugs and antibiotics
SHANGHAI 31°14' N., 121°28' E.	
(G) Shanghai Artificial Blood Vessel Plant	Biologicals
(G) Shanghai Medicinal Herbs Plant	Drugs
(G) Shanghai Pharmaceutical Plant No. 1	Antibiotics
(G) Shanghai Pharmaceutical Plant No. 2	Drugs
(G) Shanghai Pharmaceutical Plant No. 3	Antibiotics
(G) Shanghai Pharmaceutical Plant No. 4	Drugs

MANUFACTURERS OF MEDICAL MATERIEL (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT	PRODUCTS
SHANGHAI (Continued)	
(G) Shanghai Pharmaceutical Plant No. 5	Drugs
(G) Shanghai Pharmaceutical Plant SINE	Drugs and antibiotics
(G) Shanghai Serum and Vaccine Institute	Drugs, vaccines, serums, blood and blood products
(G) Ta-Chung Drug Factory	Drugs
(G) T'ien-P'ing Drug Factory	Drugs and antibiotics
SHIH-CHIA-CHUANG 38°03' N., 114°29' E.	
(G) Shih-chia-chuang Pharmaceutical Plant	Drugs, antibiotics
SIAN 34°16' N., 108°54' E.	
(G) Sian Pharmaceutical Plant	Drugs
SOOCHOW 31°18' N., 120°37' E.	
(G) Soochow Pharmaceutical Plant	Drugs

MANUFACTURERS OF MEDICAL MATERIEL (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT	PRODUCTS
SWATOW 23°22' N., 116°40' E.	
(G) Cheng Ch'un Medicines Manufacturing Plant	Drugs, antibiotics, and biologicals
(G) Lien Hua Drug Store	Drugs
(G) Swatow Pharmaceutical Plant	Drugs
(G) Swatow Special District Pharmaceutical Corporation	Drugs and antibiotics
T'AI-YÜAN 37°52' N., 112°33' E.	
(G) Red Flag Pharmaceutical Plant	Drugs and antibiotics
(G) T'ai-yüan Pharmaceutical Plant	Drugs and antibiotics
TA-T'UNG 40°05' N., 113°18' E.	
(G) Ta-t'ung Pharmaceutical Plant	Drugs
T'ENG-CH'UNG 25°02' N., 98°28' E.	
(G) T'eng-ch'ung Pharmaceutical Plant	Drugs

MANUFACTURERS OF MEDICAL MATERIEL (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT	PRODUCTS
TIENTSIN 39°08' N., 117°12' E.	
(G) Ho-p'ing Pharmaceutical Plant	Vaccines
(G) Lo-jen-t'ang Pharmaceutical Plant	Drugs
(G) Po-hai Pharmaceutical Plant	Vaccines
(G) Tientsin Pharmaceutical Plant No. 1	Drugs
(G) Tientsin Pharmaceutical Plant No. 2	Drugs, biologicals
(G) Tientsin Pharmaceutical Plant No. 3	Drugs, biologicals
(G) Wei ti shih Pharmaceutical Plant	Drugs, biologicals
(G) Yu-i Pharmaceutical Plant	Drugs
TSINAN 36°40' N., 117°00' E.	
(G) Ken-i-t'ang Pharmaceutical Plant	Drugs
(G) Tsinan Light Chemical Plant	Drugs
TZU-PO 36°48' N., 118°03' E.	
(G) Hsin-hua Drug Plant	Drugs

MANUFACTURERS OF MEDICAL MATERIEL (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT	PRODUCTS
WEI-FANG 36°43' N., 119°06' E.	
(G) Wei-fang Pharmaceutical Plant	Drugs, antibiotics
WU-CH'ANG 30°32' N., 114°18' E.	
(G) Wu-ch'ang Biological Products Institute	Drugs, biologicals
YAO-HSÜ 33°53' N., 118°00' E.	
(G) Yao-hsü Pharmaceutical Factory	Drugs, antibiotics, and biologicals
YIN-CH'UAN 38°28' N., 106°19' E.	
(G) Yin-ch'uan Pharmaceutical Plant	Drugs
YING-K'OU 40°40' N., 122°17' E.	
(G) Ying-k'ou Pharmaceutical Plant	Drugs

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ANNEX B.

MEDICAL LABORATORIES (U)

LOCATION AND NAME (G) GOVERNMENT (M) MILITARY	TYPE	MISSION
CANTON 23°07' N., 113°15' E.		
(G) Canton Tuberculosis Control Institute	Public health; research	Conducts research on, and engages in TB control programs.
(G) Canton Veterinary Research Institute	Research	Conducts veterinary research.
(G) Canton Academy of Medical Sciences	Public health; research	Provides research for attached hospitals and conducts epidemiological research on major public health problems.
(G) Kwantung Institute of Epidemiology	Research	Conducts research in medical zoology, entomology, and communicable diseases.
(G) South Central Microbiology Institute	Public health; research	Provides microbiological support for epidemiological programs and conducts research programs in epidemiology.

MEDICAL LABORATORIES (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT (M) MILITARY	TYPE	MISSION
CH'ANG-CH'UN 43°52' N., 125°21' E.		
(G) Ch'ang-ch'un Serum and Vaccine Institute	Production; research	Conducts research on the influenza virus and produces serums and vaccines.
(G) Ch'ang-ch'un Veterinary Research Institute	Research	Conducts veterinary research.
(G) Kirin Medical Institute Department of Microbiology	Research	Conducts microbiological research.
CH'ANG-SHA 28°12' N., 112°58' E.		
(G) Ch'ang-sha Veterinary Research Institute	Research	Conducts veterinary research.
CHUNGKING 29°34' N., 106°35' E.		
(G) Chungking Traditional Chinese Medicine Institute	Research	Conducts research on traditional medicine.

MEDICAL LABORATORIES (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT (M) MILITARY	TYPE	MISSION
FOOCHOW 26°05' N., 119°18' E.		
(M) Foochow Military Region Hygiene and Epidemic Prevention Laboratory	Public health	Functions as the disease control center for hospital laboratories in the Foochow environs; establishes and controls hygienic measures within military establishments.
HAI-K'OU 20°03' N., 110°19' E.		
(G) Central Research Institute	Public health; research	Conducts malaria research and other disease control programs.
HANKOW 30°35' N., 114°16' E.		
(G) Hankow Institute of Biochemistry	Research	Conducts research in hematology.
(G) Wuhan Biological Products Institute	Research; production	Conducts research and produces biologicals.

MEDICAL LABORATORIES (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT (M) MILITARY	TYPE	MISSION
HANKOW (Continued)		
(M) Wuhan Military Region Hygiene and Epidemic Preventive Laboratory	Public health	Functions as a disease control center for hospital laboratories; assists in identifying and combating diseases within the region, and establishes and controls hygienic measures within military establishments in the region.
HARBIN 45°45' N., 126°39' E.		
(G) Harbin Veterinary Research Institute	Research	Conducts veterinary research.
HO-FEI 31°51' N., 117°17' E.		
(G) Chinese Academy of Medical Sciences, Anhwei Branch	Public health; research	Provides clinical support for affiliated hospitals; conducts epidemiological research.

MEDICAL LABORATORIES (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT (M) MILITARY	TYPE	MISSION
K'UN-MING 25°04' N., 102°41' E.		
(G) Chinese Academy of Medical Sciences: Medical and Biological Institute	Research	Conducts research in virology.
(M) K'un-ming Military Region Hygiene and Epidemic Prevention Laboratory	Public health	Functions as a disease control center for hospital laboratories; assists in identifying and combating diseases within the region, and establishes controls for hygienic measures with military establishments.
LAN-CHOU 36°03' N., 103°41' E.		
(G) Lan-chou Biological Products Research Institute	Research	Conducts research on antibiotics
(G) Northwestern Institute of Animal Husbandry and Veterinary Sciences	Research	Conducts veterinary research

MEDICAL LABORATORIES (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT (M) MILITARY	TYPE	MISSION
LAN-CHOU (Continued)		
(G) Veterinary Biological Drug Plant	Research; production	Conducts research on and production of veterinary biologicals.
MUKDEN 41°48' N., 123°27' E.		
(G) Mukden Veterinary Research Institute	Research	Conducts veterinary research.
(G) Shen-yang Medical College	Research	Conducts research on prevention and treatment of organophosphorus agent poisoning.
NAN-CH'ANG 28°41' N., 115°53' E.		
(G) Nan-ch'ang Veterinary Research Institute	Research	Conducts veterinary research.

MEDICAL LABORATORIES (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT (M) MILITARY	TYPE	MISSION
NANKING 32°03' N., 118°47' E.		
(G) Central Research Institute	Research	Conducts research on parasitic diseases.
(G) Nanking Veterinary Research Institute	Research	Conducts veterinary research.
PAO-SHAN 25°07' N., 99°09' E.		
(G) Pao-shan Veterinary Research Institute	Research	Conducts veterinary research.
PEKING 39°56' N., 116°24' E.		
(G) Academy of Medical Sciences:		
Institute of Epidemiology and Microbiology	Research	Conducts epidemiology and microbiology research.

MEDICAL LABORATORIES (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT (M) MILITARY	TYPE	MISSION
PEKING (Continued)		
(G) Academy of Medical Sciences:		
Institute of Genetics	Research	Conducts research on hereditary problems.
Institute of Microbiology	Research	Conducts research on microbiological problems.
Institute of Virology	Research	Conducts research in virology.
(M) Aeronautical Medical Institute	Research	Conducts aeromedical research.
(G) Chinese Traditional Medicine Research Institute	Research	Conducts research in surgery, internal medicine, Chinese traditional medicine, epidemiology.
(G) National Control Institute of Pharmaceutical and Biological Products	Public health; research; testing and controls.	Conducts research in virology and tests and controls drugs and biologicals.
(G) National Institute of Serums and Vaccine	Research	Conducts research on the vaccine against brucellosis.

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MEDICAL LABORATORIES (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT (M) MILITARY	TYPE	MISSION
PEKING (Continued)		
(G) Peking Central Biological Research Institute	Public health; research	Conducts research on trachoma and its epidemiology.
(M) Peking Military Research Institute	Research	Conducts military medical investigations of an unspecified nature.
(G) Peking Ophthalmological Research Institute	Public health; research	Conducts research in trachoma and in the eipdemiology of eye diseases.
(G) Peking Pharmaceutical Research Institute	Research	Conducts research on herbal medicines.
(G) Peking TB Research Institute	Public health; research	Conducts TB prevention and treatment programs and research.
(G) Peking Veterinary Research Institute	Research	Conducts veterinary research.

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MEDICAL LABORATORIES (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT (M) MILITARY	TYPE	MISSION
SHANGHAI 31°14' N., 121°28' E.		
(M) Academy of Military Medical Sciences Laboratory (not otherwise identified)	Public health; research	Provides support for military medical epidemiological programs; conducts physiology and pharmaceutical investigations.
(G) Chinese Academy of Medical Sciences:		
East China Entomology Institute	Public health; research	Provides entomological support for communicable disease control programs and performs research on entomological problems.
Institute of Biochemistry	Research	Conducts research on synthesis of insulin.
Nutrition Research Laboratory	Research	Conducts research on biochemistry, nutrition, parasitology, pharmacology, and physiology.
Pharmacology Institute	Research	Conducts research in pharmacology.

MEDICAL LABORATORIES (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT (M) MILITARY	TYPE	MISSION
SHANGHAI (Continued)		
(G) First Shanghai Medical College	Research	Conducts trachoma research.
(G) Shanghai Hygiene and Epidemic Station	Research	Conducts research in microbiology; subordinate to Shanghai Health Bureau.
(G) Shanghai Veterinary Research Institute	Research	Conducts veterinary research.
(G) Trachoma Prevention Center	Research	Conducts trachoma research.
SIAN 34°16' N., 108°54' E.		
(G) Sian Veterinary Research Institute	Research	Conducts veterinary research.

MEDICAL LABORATORIES (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT (M) MILITARY	TYPE	MISSION
T'AI-YÜAN 37°52' N., 112°33' E.		
(G) Department of Bacteriology, Shansi Medical College	Research	Conducts research on Japanese B encephalitis and its epidemiology.
WU-CH'ANG 30°32' N., 114°18 E.		
(G) Wu-ch'ang Veterinary Research Institute	Research	Conducts veterinary research.

(CONFIDENTIAL)

APPENDIX II.

SELECTED MEDICAL MATERIEL MANUFACTURERS AND MEDICAL LABORATORIES, NORTH VIETNAM (1971) (U)

Annexes

GROUP-1
Excluded from automatic
downgrading and declassification.

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ANNEX A.

MANUFACTURERS OF MEDICAL MATERIEL (U)

LOCATION AND NAME (M) MILITARY (G) GOVERNMENT	PRODUCTS	REMARKS
HA DONG 20°58' N., 105°46' E.		
(G) Ha Dong Drug Production Enterprise	Drugs, antibiotics, and reagents	
(M) Hospital No. 103	Injectable solutions	
HAIPHONG 20°52' N., 106°41' E.		
(G) Drug Production Enterprise	Oriental drugs	Subordinate elements located in provinces; exact locations not available.
HANOI 21°02' N., 105°51' E.		
(G) Central Antituberculosis Institute	BCG vaccine	
(G) Central Pharmacological Institute	Drugs, antibiotics, and reagents	

MANUFACTURERS OF MEDICAL MATERIEL (U) (Continued)

LOCATION AND NAME (M) MILITARY (G) GOVERNMENT	PRODUCTS	REMARKS
HANOI (Continued)		
(G) Chemicopharmaceutical and Glass Institute	Drugs, laboratory equipment and supplies	
(M) Don Thuy Hospital	Injectable solutions	
(G) Drug Production Enterprise I	Drugs, antibiotics, and reagents	Subordinate elements located in provinces; exact locations not available.
(G) Drug Production Enterprise II	Drugs, antibiotics, and reagents	Subordinate elements located in provinces; exact locations not available.
(G) Hygiene and Epidemological Institute	Biologicals, veterinary medicines	
(G) Pharmaceutical Chemical Plant	Produces chemical intermediates for the preparation of drugs	Largest pharmaceutical chemical plant in the country.

MANUFACTURERS OF MEDICAL MATERIEL (U) (Continued)

LOCATION AND NAME (M) MILITARY (G) GOVERNMENT	PRODUCTS	REMARKS
HANOI (Continued)		
(G) Research Institute of Traditional Eastern Medicine	Oriental drugs	
NINH BINH 20°15' N., 105°59' E.		
(M) 320th Division Drug Production Base	Drugs	
THAI NGUYEN 21°36' N., 105°50' E.		
(G) Thai Nguyen Pharmaceutical Enterprise	Drugs	
VIET TRI 21°18' N., 105°26' E.		
(G) Pharmaceutical Plant (not otherwise identified)	Drugs	

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ANNEX B.

MEDICAL LABORATORIES (U)

LOCATION AND NAME (G) GOVERNMENT	TYPE	MISSION	REMARKS
HANOI 21°02' N., 105°51' E.			
(G) Central Antituberculosis Institute	Clinical, diagnostic, manufacturing, research.	To conduct research into causes and treatment of tuberculosis. To conduct a program of treatment at the Tuberculosis Hospital. Manufactures BCG vaccine	Subordinate to Ministry of Public Health.
(G) Central Malaria Institute	Clinical, diagnostic, public health, research.	To organize and conduct antimalaria teams and campaigns, and to conduct anthelmintic research.	Subordinate to Ministry of Public Health. Also known as the Malariology, Parasitology, and Entomology Institute.
(G) Central Pharmacological Institute	Diagnostic, manufacturing, research.	To conduct research and to manufacture anthelmintics, insecticides, toxins, antibiotics, hormones, and vitamins.	Subordinate to Ministry of Public Health.

MEDICAL LABORATORIES (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT	TYPE	MISSION	REMARKS
HANOI (Continued)			
(G) Hygiene and Epidemiological Institute	Clinical, diagnostic, manufacturing, public health, research.	To conduct research in epidemic prevention, control, and treatment of communicable diseases. Manufactures vaccines and trains sanitation instructors. Conducts scientific and investigative work for the veterinary service.	Subordinate to Ministry of Public Health. Also known as Pasteur Institute, Bacteriological Institute and Public Sanitation Institute.
(G) International Disease Laboratory	Clinical, diagnostic, public health.	To diagnose, treat, and plan control programs for contagious diseases.	Subordinate to Ministry of Public Health.
(G) Institute of Cancer	Clinical, diagnostic, research.	To conduct cancer therapy and research on cause and treatment of cancer.	Subordinate to Ministry of Public Health. Also known as the Radium Institute.

MEDICAL LABORATORIES (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT	TYPE	MISSION	REMARKS
HANOI (Continued)			
(G)		(b)(1)	
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APPENDIX III.

SELECTED MEDICAL MATERIEL MANUFACTURERS AND

MEDICAL LABORATORIES, NORTH KOREA (1971) (U)

Annexes

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downgrading and declassification.

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ANNEX. A.

MANUFACTURERS OF MEDICAL MATERIEL (U)

LOCATION AND NAME (G) GOVERNMENT (M) MILITARY	PRODUCTS
HAMHUNG 39°54' N., 127°32' E.	
(G) Hamhung Pharmaceutical Factory	Pharmaceuticals
HUNGNAM-NI 39°51' N., 127°29' E.	
(G) Hungnam Pharmaceutical Factory	Drugs, antibiotics, insecticides
NANAM 41°42' N., 129°41' E.	
(G) Nanam Pharmaceutical Factory	Drugs, antibiotics, insecticides
PAENGMA-RI 40°04' N., 124°34' E.	
(*) Bacteriological Research Center	Vaccines
P'YONGYANG 39°01' N., 125°45' E.	
(M) Central Preventive Military Medical Unit	Biologicals, vaccines, sera
(G) Pharmaceutical Institute of the Academy of Medical Sciences	Biologicals
(G) P'yongyang Pharmaceutical Factory	Drugs, antibiotics, insecticides

*Data not available.

MANUFACTURERS OF MEDICAL MATERIEL (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT (M) MILITARY	PRODUCTS
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ANNEX B.

MEDICAL LABORATORIES (U)

LOCATION AND NAME (G) GOVERNMENT	TYPE	MISSION
HAMHUNG 39°54' N., 127°32' E.		
(G) Research Institute, Hamhung Medical College	Diagnostic, research, and development.	Provides chemical and bacteriological analyses.
P'YONGYANG 39°01' N., 125°45' E.		
(G) Central Pharmaceutical Laboratory	Research and development.	Research and development of pharmaceuticals.
(G) Central Sanitation Laboratory	Diagnostic.	Analyses of disinfectants, chemicals, and bacteria.
(G) Research Institutes, Academy of Medical Sciences	Diagnostic, research and development.	Provides chemical and bacteriological analyses.

MEDICAL LABORATORIES (U) (Continued)

LOCATION AND NAME (C) GOVERNMENT	TYPE	MISSION
		(b)(1)

APPENDIX IV.

SELECTED MEDICAL MATERIEL MANUFACTURERS, MONGOLIAN PEOPLE'S REPUBLIC (1971) (U)

LOCATION AND NAME (G) GOVERNMENT	PRODUCTS	REMARKS
JIRGALANTA (HOBDO) 48°01' N., 91°38' E. (G) Biological Plant (not otherwise identified)	Veterinary biologicals to include production of vaccines against sheep pox and goat pox; detailed information is not available on the specific types or quantities produced or stockpiled.	
SONGINO SUMA 48°54' N., 95°54' E. (G) Biological Plant (not otherwise identified)	Veterinary biologicals, antibiotics; detailed information is not available on the specific types and quantities produced or stockpiled	In 1967, a section for the production of foot-and-mouth vaccine was in the planning stage.

SELECTED MEDICAL MATERIEL MANUFACTURERS, MONGOLIAN PEOPLE'S REPUBLIC (1971) (U) (Continued)

LOCATION AND NAME (G) GOVERNMENT	PRODUCTS	REMARKS
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(CONFIDENTIAL)

BIBLIOGRAPHY (U)

1. 00-U-3,055,679, 6 February 1958 (FOUO).

2. (b)(1)

3.

4. Hsieh, A. L., Communist China's Military Doctrine and Strategy, Memorandum, RM-3833 PR, (The Rand Corporation) October 1963 (U).

5. (b)(1)

6.

7. (b)(1)

8. DOD AO-133, DA PAM 360-769 (U).

9. (b)(1)

10. Department of State Publication 8499, East Asian and Pacific Series 173, December 1969 (U).

11. (b)(1)

12. JPRS 52264, 27 January 1971, Translation on Communist China, No. 132 (U).

13. (b)(1)

14.

15.

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21.
22.
23.
24.
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26. (b)(1)
27.
28.
29.
30.
31.
32.

33. Tseng Fan-chi. "A Microtechnique for Rapid Determination of Bacteria by Their Biochemical Reactions," People's Health, Vol 1, No. 12, 1959 (U).

34. "Generation Time of Bacillus Anthracis and the Method for its Determination," Acta Microbiologica Sinica, Vol 10, No. 4, 1964 (U).

35. Li, Liang-shou and Ku, Hsiang-pao. "Study on "String-of-Pearls Test" of B. Anthracis," Acta Microbiologica Sinica, Vol 11, No. 1, 1965 (U).

36. Chiang Shun-chiu, Wang Ching-hsi, Chang Chien-lin, Lu Hsiu-chih, and Tsui Chun-huai, "Experimental Study on the Use of Incomplete Antibodies for the Diagnosis of Brucellosis: I Preparation of Antiglobulin Serum and Study of the Method," Acta Microbiologica Sinica. Vol 11, No. 3, pp 433-439, 1965 (U).

37. Yun Chao-chuan and Niu Hui-chen. "The Identification of Brucella," Acta Microbiologica Sinica. Vol 17, No. 12, pp 560-463, June 1966 (U).

38. (b)(1)

39. Tsai Shang-ta, Ko Hsiang-lin, Jung Kuan, and Li Tzu-i. "Studies on the Insect Vectors of B Type Encephalitis in Canton," Acta Microbiologica Sinica. Vol 5, No. 4, pp 369-378, November 1967 (U).

40. Op. cit. No. 86 (U).

41. Wang Tun-ch'ing, Wen Shih-chen, Huang Yu-mo, and Yu En-sun. "Transovarial Transmission of Rickettsia Tsutsugamushi By Two Types of Trombicula Deliensis," Acta Parasitol. Sinica. Vol 2, No. 3, pp 213-217, 1965 (U).

42. Lu Pao-lin, "Medical Insect Culture," Chung-kuo k'un ch'ung hsueh hui erh shih chow nien hsueh shu t'ao lun hui hui k'an. pp 50-51, 1966 (U).

43. Chen Hung-shan. "Disinfection of the Air," Khuli tszachzhi No. 5. pp 229-234, 1956 (U).

44. Liu Yuan-yuan and Wang Chih-lun, "Experimental Studies on the Rate and Duration of Aerial Disinfection With Triethylene Glycol and With Calcium Hypochlorite in Case of Air-Borne Influenza Virus," Acta Virologica Sinica, Vol 7, No. 4, pp 313-319, 1959 (U).

45. Liu Yuan-yuan and Li Pei-yun, "Experimental Studies on Air-Borne Influenza Infection and the Disinfection of Air," People's Health. Vol 1, No. 12, pp 1100-1111, 1 December 1959 (U).

46. Ch'i Chao-sheng. "The Model-71 Transportable Wheel-Propelled Spraying Cart and Improvements Thereupon." Chinese Agricultural Science, No. 7, pp 38-39, July 1961 (U).

47. Ting Hung-chi, "Investigation of pressure effect on atomizer droplets," Acta Plytophylacica Sinica, Vol 4, No. 3, pp 285-292, 1965 (U).

48. (b)(1)

49. Li Shen-te, "Fluorescent Antibodies and Their Use in Clinical Investigations," Chung-hua i hsueh tsa chih, Vol 48, No. 8, pp 540-544, 1962 (U).

50. Li Shen-te, "A Modified Complement Fixation Test for Tick-Borne Encephalitis," Acta Microbiologica Sinica, Vol 10, No. 3, pp 395-399, 1964 (U).

51. Chang Li-pi, Pang, C. F., and Cheng, P. Y. "Studies of Virus-Infected Cells by Means of Supravital Fluorochrome Staining," Acta Microbiologica Sinica. Vol 10, No. 3, pp 287-293, 1964 (U).

52. "Fluorescein, A New Drug for Rapid Diagnosis," Pei-ching Wan Pao (China), p 1, Col 5, 15 June 1964 (U).

53. "Experimental Manufacture of Fluorescein in China is Successful," Hsin-min Wan-pao, Shanghai, 15 June 1965 (U).

54. Pai Ch'ang-lo, Chao Pin, and Chia Ming-ho. "A Brief Report on the Application of Fluorescent Antibodies to the Detection of Pasteurella Pestis," Acta Microbiologica Sinica, Vol 10, No. 3, pp 406-407, 1965 (U).

55. Han Shih-chieh and Pogodina, V. V. "Use of the Method of Fluorescent Antibodies to Study the Development of Infection in Immune Organism in the Tick-borne Encephalitis," Journal of Hygiene, Epidemiology, Microbiology, and Immunology. Vol 9, No. 3, pp 308-315, 1966 (U).

56. Ch'ang ju-hsu and Lui Chin-t'ang. "Studies on the Removal of Non-Specific Fluorescent Staining Factors in Fluorescent Antibody Technique," Acta Microbiologica Sinica. Vol 12, No. 1, pp 91-92, 1966 (U).

57. Yeh Chia-ch'i. "A New Method of Immunizing Domestic Animals," Science Pictorial. No. 4, p 128, April 1964 (U).

58. (b)(1)
59.
60.
61.
62.
63.
64.

65. (b)(1)
66.
67.
68.
69.
70.
71.

72. FBIS Daily Report, 11 June 1971 (U).

73 (b)(1)
74

75. Lin Ching-hua. "Study on the Types of Pasteurella, "Acta Veterinaria et Zootechnica Sinica. Vol 7, No. 3, pp 187-200, 1964 (U).

76. Huang, Chen-Hsieng, Chou, Ming-Hsien, Wang, Chin, and Tai, Ying. "The Correlation Between the Pathogenicity in Peripheral Infection, the Duration of Viremia and Thermostability of the Virus of Japanese B Encephalitis," Ref. Zhur Biol. No. 6, 1959 (U).

77. Huang, Chen-hsiang and Tai, Ying. "Pathogenicity of Different Strains of Japanese B Encephalitis Virus Isolated From Human, Swine, and Mosquitoes," Acta Microbiologica Sinica. Vol VI, No. 1, Peking, February 1958 (U).

78. Hsu, Chao-hsiang, Chou, Ming-hsien, and Ch'en, Li-te. "Experimental Studies on Active Immunization Against Japanese B Encephalitis," Acta Microbiologica Sinica. Vol 10, No. 1, pp 9-16, 1964 (U).

79. Mao, Chiang-sen and Huang, Chen-hsiang. "Enhancement of Japanese B Encephalitis Titer," Acta Microbiologica Sinica. Vol 12, No. 1, pp 24-28, 1966 (U).

80. Mao, Chiang-sen, Huang, Chen-hsiang, and Wang, Ch'ang-shou. "The Effect of Temperature and pH on the Production of Japanese B Encephalitis Virus and Interferon in Embryo Cell Cultures," Acta Microbiologica Sinica, Vol 12, No. 2, pp 152-157, May 1966 (U).

97. Hsu Chao-hsiang, Chen Po-chuan, and Liu Yuan-yuan. "Isolation of Virus Strains of Different Subcutaneous Pathogenicity From Japanese B Encephalitis Virus (Peking Strain) by Means of Plaque--selection Method," Acta Microbiologica Sinica, Vol 11, No. 1, pp 108-113, February 1965 (U).

98. Huang Chen-hsiang, Hsu Chao-hsiang, Tai Jung, and Chou Ming-hsien. "Influence of Sleep of Mice Induced by Small Dose of Luminal on the Development of Japanese B Encephalitis Virus Infection," Acta Microbiologica Sinica, February 1958 (U).

99. Liu Yuan-yuan, Hsu Chao-hsiang, Chen Li-te, Chan Mei-yun, and Liu Hua-chen. "Studies On Infectious RNA of Japanese B Encephalitis Virus: I. Infectivity of Viral RNA Isolated From Infected Mouse Brains and Chick Embryos," Scientia Sinica, Vol XI, No. 7, 1962 (U).

100. Liu Yuan-yuan and Liu Hua-chen. "Studies on Infectious RNA of Japanese B Encephalitis Virus: II. Change of RNase Activity in Mouse Brains During Virus and RNA Infections," Scientia Sinica, Vol XII, No. 10, 1963 (U).

101. Liu Yuan-yuan and Liu Hua-chen. "Studies on Infectious RNA of Japanese B Encephalitis Virus: IV. The Effects of the Virus and its Infected RNA on Brain Tissue RNase Activity in the Mouse," Acta Microbiologica Sinica, Vol X, No. 1, pp 24-30, 1964 (U).

102. Liu Yuan-yuan, Chang Han-ching, Chang Li-pi, Chang Chi-hsiang, and Kuan Hsueh-ching. "Purification of Type B Infectious Encephalitis Virus: I. The Effect of pH on Virus Infectivity, the Virus pH Release Curve--Virus Isoelectric Points: II. Virus Purification Using a Combination of Agglutination and Adsorption Agents," JPRS 33,002, 23 November 1965, #246 (Research Paper Read at the First National Symposium of Biochemistry) (U).

103. Liu Yuan-yuan and Hou Yun-te. "The Effect of Type B Infectious Encephalitis Virus Multiplication on Xanthine Oxidase Activity in Host Tissue," JPRS 33,002, 23 November 1965, #246 (Research Paper Read at the First National Symposium of Biochemistry) (U).

104. Op. cit. No. 7 (U).

105. Pang Chi-fang and Chang Li-pi. "Electron Microscopic Studies on Japanese B Encephalitis in Tissue Culture Cells," Acta Microbiologica Sinica, Vol 10, No. 3, pp 294-301, 1964 (U).

106. Wang Chin and Huang Chen-hsiang. "Dynamics of Multiplication of Japanese B Encephalitis Virus in the Extra Central Nervous Tissue of White Mice," Acta Microbiologica Sinica, Vol 8, No. 1, pp 85-92, February 1960 (U).

107. Wang Chin and Huang Chen-hsiang. "Comparative Studies of the Peripheral Multiplication of the Peking and the Nakayama Strains of Japanese B Encephalitis Virus in White Mice," Acta Microbiologica Sinica, Vol 8, No. 1, pp 93-98, February 1960 (U).

108. Hsu Z. Z., Chow M. S. and Chen Li-Te. "Experimental Study of Active Immunization Against Japanese B Encephalitis. II. The Relationship Between the Passage of Attack and the Protective Power of Immunized Mice," Acta Microbiologica Sinica, Vol 10, No. 1, pp 9-15, 1964 (U).

109. Licu Y. Y. and Lieu H. C. "A Study on the Japanese B Encephalitis Virus Ribonucleic Acid (RNA): IV. The Effects of the Infection of the Virus and its RNA on the Enzymic Activity of the RNA in the Brain Tissues of Mice," Acta Microbiologica Sinica, Vol 10, No. 1, pp 24-29, 1964 (U).

110. Lu Hsiu-chih, Chiang Shun-chiu, and Tsui Chun-huai. "Observations on the In Vitro Survival and Multiplication of Brucella in Monocytic Culture," Scientia, Vol 17, No. 5, pp 227-228, 1966 (U).

111. Yun Chao-chuan, Kuo Chang-kai, and Chu Hui-chen. "Preliminary Study of Agar Diffusion on Brucella Reaction," Acta Microbiologica Sinica, Vol 11, No. 3, pp 459-461, 1965 (U).

112. (b)(1)

113. Wang Yung-chi, Lu Chin-han, Li Mei-jung, and Chang Yung-fu. "Encephalomyelitis Produced by Injection of Mouse Brain Tissue," Acta Microbiologica Sinica, Vol 9, No. 1, pp 1-8, February 1963 (U).

114. Wang Yung-chi, Sun Mien, and Ku Pei-wei. "Interferon--A Product of Japanese B Encephalitis Virus Infected Chick Embryo Tissue Culture," Acta Microbiologica Sinica, Vol 12, No. 1, pp 95-96, February 1966 (U).

115. Wang Yung-chi, Chou Ning-chen, Ku Pei-wei, Sun Mien, Ma Wen-hsin, Sun Sheng-hao, and Li Mei-jung. "Japanese B Encephalitis Vaccine Prepared From Monolayer Tissue Culture: I. Virus Cultivation and Vaccine Preparation," Vol 10, No. 1, pp 31-38, 1964 (U).

116. Han Hung-lin and Pan Jen-chiang. "The Activation of Clostridium Botulinum Type E Toxin by Trypsin," Acta Microbiologica Sinica. Vol 11, No. 3, pp 368-373, August 1965 (U).

117. Wei Wen-pin, An Ching-wu, and Ching Lo-huai. "Some Observations on the Production of Rickettsial Interferon from Mouse Lung." Acta Microbiologica Sinica. Vol 12, No. 1, pp 29-33, 1966 (U).

118. Wei Wen-pin, Chen Shou-ni, and An Ching-wu. "Tissue Culture of Rickettsia prowazeki: Part I. Mouse--embryo--lung Monolayer Tissue Cultures for the Cultivation of Rickettsia prowazeki," Acta Microbiologica Sinica. Vol 12, No. 1, pp 34-40, 1966 (U).

119. Rung Tien-shun and Kang Hsin-yuan. "Three Strains of Salmonella Typhosa Nontypable by 34 Types of Vi-Phages," Acta Microbiologica Sinica. Vol 12, No. 1, pp 100-101, February 1966 (U).

120. Chou Hui-min and Sun Chia-chien. "A Report on Isolation of a New Subtype (V:4,7) of Type 5 Shigella flexneri," Acta Microbiologica Sinica. Vol 12, No. 1, pp 99-100, February 1966 (U).

121. Yang Chung-chi. "Changes in the Amino Acids Composition of Culture Fluid of Pasteurella pestis EV Strain During Their Growth," Acta Microbiologica Sinica. Vol 8, No. 1, pp 59-64, February 1960 (U).

122. Pi Ai-hua "Problems Relating to the Pathogenic Mechanism of Typhoid," Wuhan Medical Journal. Vol 1, No. 5, pp 401 and 404-405, October 1964. (JPRS 45,150, 24 April 1968) (U).

123. Kao Shang-yin. "Notes on the Second Symposium of Czechoslovak Virologists," Scientia. No. 24, p 762, 1958 (U).

124. Kao Shang-yin. "Comments on the Current Status and Future Development of Virology," Wuhan University Natural Science Journal--Special Number on Biology. No. 3, pp 6-12, April 1960 (U).

125. Kao Shang-yin. "Microbiology in China, and in Particular, Virological Research at the Institute of Microbiology in Wuhan," Priroda (Nature). Vol XI, No. 6, pp 108-112, Sofia, Bulgaria, November-December 1962 (U).

126. Kao Shang-yin. "Contributions of Tobacco Mosaic Virus Research to Virology," Collected Papers on Microbiology. pp 110-122, 1964 (U).

127. Chang Li-jen and Kao Shang-yin. "Studies on the Structure of Viruses: I. An Electron Microscopic Study of the Morphology and Structure of 'Virus Bundle' of the Polyhedral Virus (Nuclear Type) of Armyworm Leucania Separata Walker," Acta Biol Exp Sinica, Vol 10, No. 4, pp 295-304, 1965 (U).

128. Yuan Kwang-lieh, Yi Ying-nan, Kao Ling-yin, Lin Chin-shui, Yu En-shu, and Cheng Bi-de. "Study of the Natural Infection of Ticks Ixodes Species with Rickettsia Tsutsugamushi," Chinese Journal of People's Health, Vol 1, No. 8, pp 703-732, 1959. (From Meditsinskiy Referativnyy Zhurnal, No. 7, Part III, July 1960, Abstract No. 2588) (U).

129. Wang Tun-ching, Wen Shih-chen, Huang Yu-mo, and Yu En-shu. "Transovarial Transmission of Rickettsia tsutsugamushi by Two Types of Trombicula deliensis," Acta Parasitologica Sinica, Vol 2, No. 3, pp 213-217, 1965. (From Referativnyy Zhurnal--Biologiya, ST, No. 3, 1966, Abstract No. 3K221) (U).

130. "Hosts and Insect Vectors of Leptospirosis in Foochow," National Medical Journal of China, Vol 46, No. 1, pp 72-74, January 1960 (U).

131. Yu En-shu, Wu Hsi-i, and Li Te-fen. "Relationship Between Two Types of Leptospira in Vitro and Vivo: I. Mutual Suppressive Effect of Different Types of Leptospira in Vitro," Acta Microbiologica Sinica, Vol 11, No. 1, pp 72-75, February 1965 (U).

132. Yu En-shu and Wu Hsi-i. "Relationship Between Two Types of Leptospira in Vitro and Vivo: II. A Study on the State of Growth of Two Types of Leptospira in Mixed Infections," Acta Microbiologica Sinica, Vol 11, No. 1, pp 76-79, February 1965 (U).

133. Yu En-shu, Li Te-fen, Wu Hsi-i, and Wu Yung-ying. "Leptospirosis Due to Leptospira sorex," Chinese Journal of Internal Medicine, Vol 13, No. 2, pp 135-136, February 1965 (U).

134. Lin Ta-liang and Cheng Chia-lin. "Broad-spectrum Resistant Dysenteric Bacilli in Foochow," Chinese Journal of Internal Medicine, Vol 13, No. 5, p 479, 1965 (U).

TCS-692023/72
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TALENT-KEYHOLE (b)(1)
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135. Hsu Cheng-yin. "Studies on Biological Behavior and Variation of Shigella flexneri 4," Acta Microbiologica Sinica. Vol 12, No. 1, pp 110-111, February 1966 (U).

136. Chu Chung. "Components of the Type-specific Antigens of Shigella flexneri 4," Acta Microbiologica Sinica. Vol 12, No. 1, pp 112-113, February 1966 (U).

137. Chen Hung-shan. "The Resistance of Shigella, Isolated from 1947 to 1953, to Medicinal Preparations," Acta Microbiologica Sinica. Vol 3, No. 2, pp 151-158, 1955. (From Referativnyy Zhurnal-Biol, No. 6, 25 March 1957, Abstract No. 21841.) (U).

138. Tien Kuo-tsai and Liu Chao. "Study on a Laboratory Induced Drug-resistant Variant of Shigella," Acta Microbiologica Sinica. Vol 11, No. 3, pp 396-400, 1963 (U).

139. Liang Yea-kai, "The Amino Acid Requirements of Various Types of Shigella," Acta Microbiologica Sinica, Vol 11, No. 3, pp 396-400, 1965 (U).

140. Yeh Hsien-kun, Ni Shao-chang, Tang Shan-hsiang, and Yang Ku-yung. "Study on Increase of Positive Rates in Dysentery Bacillus Culture," Chieh fang chun i hsueh tsa chih. Vol 2, No. 3, pp 268-269, 1965 (U).

141. Chang Shing-yi, Chou Lien-tse, Wang Ting-tse, and Chi Chi-ming. "Preparation of Infective RNA from Spring-Summer Encephalitis Virus and the Action of Protein-Splitting Enzymes on its Infectivity," Acta Microbiologica Sinica. Vol 10, No. 3, pp 317-324, 1964 (U).

142. Wang Yung-chi. "The Variation of Virus," Popular Science. No. 8, pp 250-252, August 1962 (U).

143. Chiao Jui-shen: "Recent Progress in Industrial Microbiology," Wei sheng wu chuan ti pao kao chi. pp 11-44, 1964 (U).

144. Chiang Ching-i and Chen Hung-shan. "A Method of Studying Anti-virulent Drugs: 1. Conditions for the Culture of Cowpox and Fowl Plague Viruses in Chicken Embryos," Chuan kuo ti san tzu kang chun su hsueh shu hui i lun wen chi - Hsin kang chun su. No. 1, pp 172-178, 1965 (U).

ICS-692023/72
Handle via
TALENT-KEYHOLE (b)(1)
control systems jointly

145. Ma Yu-cheng. "Antibiotics and Biological Engineering," Collected Papers of Third All-China Symposium on Antibiotics Production Technology. Vol 2, pp 14-29, December 1965 (U).

146. Lu Pao-lin. "Medical Insect Culture," Chung-kuo ku chung hsueh hui erh shih chou nien hsueh shu tao lun hui hui kan. pp 50-51, 1966 (U).

147. Su Cheng-chin, Chang Ching-fang, Chu Nan-ying, and Li Chih-huai. "Latent Viruses Isolated from Tissue Cultures of Rhesus Monkey Kidney Cells," Acta Microbiologica Sinica. Vol 11, No. 1, pp 114-118, 1965 (U).

148. Tsao Chen-chin. "The Continuous Sterilization of Culture Medium and the Design of the Height of a Sterilizer," Chemical World. No. 5, pp 236-238, May 1966 (U).

149. Sehn Yung-hsing. "An Automatic Defoaming Method of Fermentation of Antibiotics," Chemical World. Vol 19, No. 11, pp 521-524, 1965 (U).

150. (b)(1)

151. Hsieh Chen-yang. "Improved Method of Lyophilization for Preservation of Microorganisms," Acta Microbiologica Sinica. Vol 7, No. 4, p 375, December 1959 (U).

152. Hsing Tsu-pei. "Observations on the Length of Survival of Lyophilized Rickettsia Orientalis," Acta Microbiologica Sinica. Vol 11, No. 1, p 147, 1965 (U).

153. Li Tu-tang and Hsu Hung-li. "Studies of Some Factors Influencing the Recovery of Bacterialin Lyophilization Process (the Part of Vibrio)," Acta Microbiologica Sinica. Vol 10, No. 4, pp 508-513, 1964 (U).

154. "A Simple and Practical Way of Preserving Bacteria," Wuhan Medical Journal. Vol 2, No. 4, p 256, August 1965 (U).

155. Chu Cheng-ching and Tung Tsun. "Experience on Production of Strain Preservation by Refrigeration and Desiccation," Collected Papers of Third All-China Symposium on Antibiotics: Antibiotic Production Technology. Vol 2, pp 113-117, December 1965 (U).

156. Ishiyama, T. "The Application of Kasugamycin As an Agricultural Pesticide," Chung Kuo Nung Yeh Hua Hsueh Hui Chih, 4(3-4), 1966, A23-A30 (U).

157. Peng, S. -C., Tseng, C. -J., Tiu, C. -L., and Wang, T. -P. "The Mycelial Activities of the Rice Sheath Blight Fungus in Relation to the Disease Development," Acta Phytophylac. Sin. 4(4), 1965, 347-354 (U).

158. Ch'en Li-jen, Ch'en Hui-Ch'in, and Sun Hui'hung. "Studies on Spore Dispersal of Helminthosporium oryzae," Acta Phytophylac. Sin. 4(1), 1965, 7-14 (U).

159. Fan, Huai-chung, and Wu Shang-chung. "Field Control of Bacterial Leaf Streak (Xanthomonas oryzicola) of Rice in Kwangtung," Acta Phytophylac. Sin. 4(1), 1965, 1-6 (U).

160. Anonymous. "Outbreak Rhythm and Control Technique of Paddy Borer (Tryporyza incertellus Walker) in Huang, Hsin, Hsi and O Demonstration Regions in Hupeh Province," Acta Phythophylac. Sin. 5(1), 1966, 35-40 (U).

161. Anonymous. "Forecasting the Third Generation Paddy Borer (Tryporyza incertellus Walker) and Chemical Control Techniques," Acta Phytophylac. Sin. 5(1), 1966, 41-49 (U).

162. Wu, Yu-san, Huang, Chen-t'ao, Feng, Shao-hsing, Jen, Yu-chen, and Hsueh, Li-hsin. "An Analysis of Physiological Races of Stem Rust of Wheat in 1964," Acta Phytophylac. Sin. 5(1), 1966, 59-61 (U).

163. Anonymous. "Experiences in Controlling Stripe Rust of Wheat," Agricultural Technology (Peking). 1965 (8), 27-29 (U).

164. Anonymous. "Rust-Resistant Wheat Acreage Being Expanded in China," Chin-jih Hsin-wen (Peking). 3 June 1965, 4 (U).

165. Ti, Mui-sen. "On Several Rust-Resistant Wheat Varieties," Agricultural Technology (Peking). 1965 (8), 12-13 (U).

166. Liu, H. -W., Xia, Y. -T., and Chang, Y. -L. "Field Experiments on Application of Sulfanilic Acid for Controlling Stripe Rust of Wheat in Shensi Province," Acta Phytophylac. Sin. 4(4), 1965, 341-346 (U).

167. Anonymous. "Calcium Sulfamate--a Chemical for Wheat Rust Prevention," Hua hsueh kung yeh. 1966 (7), 1966, 32-33 (U).

168. Chang, H. -L., "Liu, Su." "Two Kinds of Antibiotics Produced by Actinomyces ahygroscopicus 508," Acta Microbiologica Sinica. 11(2), 1965, 153-160 (U).

169. Hua, C. -H., Chou, L. -C., and Hsieh, Y. -Y. "Isolation and Determination of Effective Elements of Nung-k'ang-101," Collected Papers of the Third All-China Symposium on Antibiotics: Vol 4, December 1965, pp 37-40 (U).

170. Chen, C. -Y., Chen, H. -M., and Yang, C. -C. "Experiment With Nung-k'ang-101 for the Control of Wheat Rust," Collected Papers of the Third All-China Symposium on Antibiotics. Vol 4, December 1965, pp 44-49 (U).

171. Chen, C. -Y., Wang, C. -S., and Chen, H. -M. "Application of Nung-k'ang-101 for the Control of Gibberella saubinella Disease of Wheat," Collected Papers of the Third All-China Symposium on Antibiotics. Vol 4, December 1965, pp 50-54 (U).

172. Chiang, C. -H., and Hsieh, K. -C. "A Preliminary Report on the Selection of Internal-Absorption Antibiotics and Their Effect on Gibberella saubinella Disease of Wheat," Collected Papers of the Third All-China Symposium on Antibiotics. Vol 4, December 1965, pp 25-26 (U).

173. Anonymous. "A Study of Antifungous Antibiotics. III. Separation and Identification of the Actidione Produced by Actinomycete GF-455," Collected Papers of the Third All-China Symposium on Antibiotics. Vol I, June 1965, pp 91-95 (U).

174. Anonymous. "Determination of the Effect of Nung-k'ang-101 on Wheat Rust Control," Collected Papers of the Third All-China Symposium on Antibiotics. Vol 4, December 1965, pp 55-58 (U).

175. Li, M. -C., Chen, J. -L., Tiu, T. -I., and Lu, C. -H. "Studies on the Source of the Early Spring Generation of the Armyworm, Leucania separata Walker, in Kirin Province. I. Studies on the Hibernation and Problems of the Source," Acta Entomologica Sinica. 14(1), 1965, 21-30 (U).

176. Chen, J. -L., Tu, C. -H., Liu, T. -I., Li, M. -C., and Hsiang, L. -Y. "Studies on the Source of the Early Spring Generation of the Armyworm, Leucania separata Walker in the Kirin Province.

II. Studies on the Original Ground of the Immigrant," Acta Phytophylacica Sinica. 4(1), 1965, 49-58 (U).

177. Ti, K. -P., Wang, H., Chao, S. -C., Tsao, S. -C., and Lin, C. -Y. "Field Studies on the Effect of Microclimate on the Population Density of the Armyworm." Acta Phytophylacica Sinica. 2(1), 1963, 58-62 (U).

178. Liu, S. -Y., and Sun, I. -C. "Preliminary Studies on the Wheat Stem Fly Meromyza saltatrix (Linn.) in the Central Part of Shensi," Acta Entomologica Sinica. 14(1), 1965, 32-44 (U).

179. Ting, H. -S., and Yu, Y. -Y. "A Study of the Aphid Macrosiphum granarium (Wheat Pest)," Entomological Information. 10(1), 1966, 10-13 (U).

180. Liu, I. "Preliminary Report on Analysis of Soybean Mosaic Virus Disease," Acta Phytopathologica Sinica. 6(2), 1963, 209-213 (U).

181. Hsu, C. -F., Kuo, S. -K., and Han, Y. -M. "A Preliminary Study of the Resistance of Soybean Varieties to the Soybean Pod Borer (Leguminivor) glycinivorella (Mats.) Obrazts," Acta Phytophylacica Sinica. 4(2), 1965, 111-117 (U).

182. Hsu, C. -F., Kuo, S. -K., and Han, Y. -M. "Study on the Soybean Pod Borer (Leguminivor) glycinivorella (Mats.) Obrazts." Acta Entomologica Sinica. 14(5), 1965, 461-479 (U).

183. Li, T. -P. "Preliminary Report on Viruses Causing Rape Mosaic Disease in Chekiang," Chih wu pao hu hsueh pao. 3(2), 1964, 199 (U).

184. Chang, C. -C., Wu, Y. -S., and Li, L. -H. "Studies on the Properties of Chinese Rape Mosaic Virus 15 (YMV sub 15) and Its Nucleic Acid (YMV sub 15-RNA)," Acta Biochemica et Biophysica Sinica. 5(2), 1965, 171-178 (U).

185. Pei, M. -Y., Tien, P., Chang, Y. -S., Chien, Y. -J., and Tsao, T. -C. "Partial Purification of Chinese Rape (Brassica Campestris L. Youcai) Mosaic Virus, YMV Sub 6, and Some of Its Properties," Acta Biochemica et Biophysica Sinica. 5(3), 1965, 303-310 (U).

186. Kuan, C. -H. "Preliminary Observations on the Flight of Aphids on Cruciferous Crops," Acta Entomologica Sinica. 14(1), 1965, 99-102 (U).

187. Liu, T. -S. "Symposium on Fusarium Wilt and Verticillium Wilt of Cotton," K'o hsueh t'ung pao. 12, 1965, 1125-1126 (U).

188. Fu, S. -F. "Control of Injurious Insects Infesting Cotton Balls along the Yangtze River." Collected Papers of the Twentieth Anniversary Scientific and Technical Symposium of the Entomological Society of China, Peking, 8-18 July 1964. 1966, 54-56 (U).

189. Ho. P., Shen, K. -P., and Tiu, Y. -H. "Response of Dendrolimus punctatus Walker to Chemosterilants," Acta Entomologica Sinica. 15(3), 1966, 239-241 (U).

190. Chang, T. -P. "Insect Chemosterilants," Chung-kuo K'un ch'ung hsueh hui erh shih chou nien hsueh shu t'ao lun hui k'an. 1966, 17-27 (U).

191. Lin, Y. "Insecticidal Effects and Safe Usage of 'Suhua 203' (containing sulfatepp)," Acta Phytophylacica Sinica. 4(2), 1965. 191-194 (U).

192. Lin, L. "'Le-kuo'--a Highly Effective Internal Absorption Insecticide of Low Toxicity." K'o hsuehta chung. 5, 1964, 182 (U).

193. Teng, C. "Studies on the Biology of Beauveria bassiana (Bals.) Vuill. With Reference to Microbial Control of Insects," Acta Botanica Sinica. 10(3), 1962, 210-232 (U).

194. Tsai, J. "Preliminary Test on the Application of a Bacterial Insecticide, Bacillus thuringiensis, to Control the Pine Caterpillar, Dendrolium punctatus Walk.," Acta Entomologica Sinica. 13(6), 1964, 855-861 (U).

195. Tseng, S., Yin, H. -Y., and Chao, Y. -C. "Studies on the Entomogenous Fungus--Spicaria fumoso-rosea (Wize) Vassilijevsky," Acta Phytophylacica Sinica. 4(1), 1965, 59-68 (U).

196. Liu, C. -L. "Problems Concerning Insect Resources," Chung-kuo k'un ch'ung hsueh hui erh shih chou nienhsueh shu t'ao lun hui hui k'an. 1966, 63-66 (U).

197. (b)(1)
198.
199.
200.
201. (b)(1)
202.
203. (b)(1)
204. JIBSUM No. 2/60, 22 January 1960 (U).
205. (b)(1)
206.
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218. (See this reference in bibliography, ST-CS-03-148-72).

(b)(1)

225. 6 075 0167 65, 6 May 1965 (U).

(b)(1)

(b)(1)

243. ST 68-18, 9 January 1969 (U).

(b)(1)

262. (See this reference in bibliography, ST-CS-03-148-72).

263. The Frederick News-Post, February 1970 (U).

(b)(1)

275. FSTC-HT-23-572-68, 6 March 1969 (U).

(b)(1)

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13. ABSTRACT

The purpose of this study is to consolidate all available information concerning the many facets of biological warfare activities in the Asian Communist Countries and to determine their biological warfare capability. (U)

Sources of information included information reports, intelligence publications, abstract publications, and available open scientific literature. The information relating to biological warfare was collated and analyzed. The study has been organized under the following topics: order of battle for BW; BW materiel (offensive and defensive); production facilities and capabilities; stockpiles and storage facilities; doctrine and procedures governing use of BW weapons; doctrine and procedures for defense against BW; BW research, development and testing; anticrop research. (U)

Sufficient historical material has been presented to provide a background for the investigation and analysis of current BW or related activity in these countries. (U)

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This is in further response to your Freedom of Information Act (FOIA) request of October 23, 2008, and supplements our electronic message of May 12, 2010.

Coordination has been completed with another element of our command and other government agencies and records returned to this office for our review and direct response to you. We have reviewed the records and determined the records are partially releaseable to you. A copy of the records are enclosed for your use.

We have completed a mandatory declassification review in accordance with Executive Order (EO) 13526. As a result of our review information has been sanitized and 4 pages have been withheld in their entirety as the information is currently and properly classified TOP SECRET, SECRET and CONFIDENTIAL according to Sections 1.2(a)(1), 1.2(a)(2), 1.2(a)(3) and 1.4(c) of EO 13526. This information is exempt from the public disclosure provisions of the FOIA pursuant to Title 5 U.S. Code 552 (b)(1). It is not possible to reasonably segregate meaningful portions of the withheld pages for release. The records are enclosed for your use. A brief explanation of the applicable sections follows:

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Sincerely,

Brad S. Dorris
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PREFACE

(U) This study was prepared in response to guidance from DIA requesting a series of studies on selected nonaligned countries. Countries treated here are those that have the technological base and possess a scientific expertise which give them the potential to engage in biological warfare programs. Sweden, Finland, and Japan have been assessed on this basis. Other countries will be included in subsequent amendments.

(U) Pertinent information except in R&D matters is scarce. In this regard, it is recognized that there are major gaps in our knowledge of: doctrine and procedures controlling the use of biological weapons; materiel for both offensive and defensive operations; production and storage facilities for biological agents; and existing agent/weapon stockpiles.

(U) The data base and analyst experience committed in support of this effort are not available at any single office within the intelligence community. Accordingly, inputs for this report were solicited from various groups. The US Army Foreign Science and Technology Center was responsible for basic coverage by area and subject matter; the Naval Intelligence Support Center was tasked for information dealing with naval offensive and defensive biological warfare capabilities; the Foreign Technology Division, US Air Force was queried for inputs covering aerospace offensive and defensive applications; and appropriate elements of DIA were responsible for information involved with order of battle, training, doctrine, policy, production, and stockpiling.

(U) Although the cutoff date for information in this document was December 1972, items of major significance have been incorporated up to the date of final approval for printing.

(U) This revised study is being disseminated devoid of bibliographic material to facilitate wider distribution. A compiled bibliography has been prepared separately and can be made available to authorized recipients upon written request to the Defense Intelligence Agency, ATTN: DT-1A, Washington, D.C. 20301. Individuals making such requests are cautioned that the addition of the bibliography to (or its association with) the study makes mandatory a more restricted distribution. When the bibliography is attached, the study must carry the additional caveat NO DISSEMINATION ABROAD.

(U) As the prime producer of this study, the Foreign Science and Technology Center was charged with the final collation, preparation, and editing of copy material.

(U) Constructive criticism, comments, and suggestions for changes are solicited. Critical evaluations from readers of this report will provide direct guidance so that future updatings of this study will result in a product which is most responsive to the varied needs of the users. Additional information concerning this study may be addressed to the Defense Intelligence Agency, ATTN: DT-1A, Washington, D. C. 20301.

LIST OF EFFECTIVE PAGES

SUBJECT MATTER	PAGE NUMBERS	DATE
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RECORD OF CHANGES

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SUMMARY

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Section I.

SWEDEN

A. INTRODUCTION

1. (U) Background on Swedish Biological Warfare (BW)

Sweden is extremely competent and progressive in the fields of public health and safety. Her health service is a model for other countries throughout the world.

2. (U) Vulnerability

(b)(1)

a. (U) The Swedes' awareness of their vulnerability to attack has resulted in intensive research efforts on the problem of defense against CBR agents.

b. (U) Sweden has had the necessary organizational facilities, qualified professional and technical personnel, and funds to support BW research and development. The country has long had a vigorous defensive BW program centered about activities at two principal installations where BW research has been performed. These are the Försvarets Förskningsanstalt (FOA) and the Bacteriological Institute of the Royal Caroline Medical-Surgical Institute, Stockholm, more commonly known as the Karolinska Institute. Defensively oriented research and development activities have emphasized the need for rapid detection and identification systems. FOA has studied the use of ultraviolet absorption phenomena to measure the fluorescence of biological agents. The aim of this and related research has always been to develop an automated BW agent detection system that will collect, fix and stain a sample, respond to characteristic fluorescence photometrically, and provide specific identification (fig 1). Research has also been underway on a decontamination device for tents, clothing, weapons, and equipment.

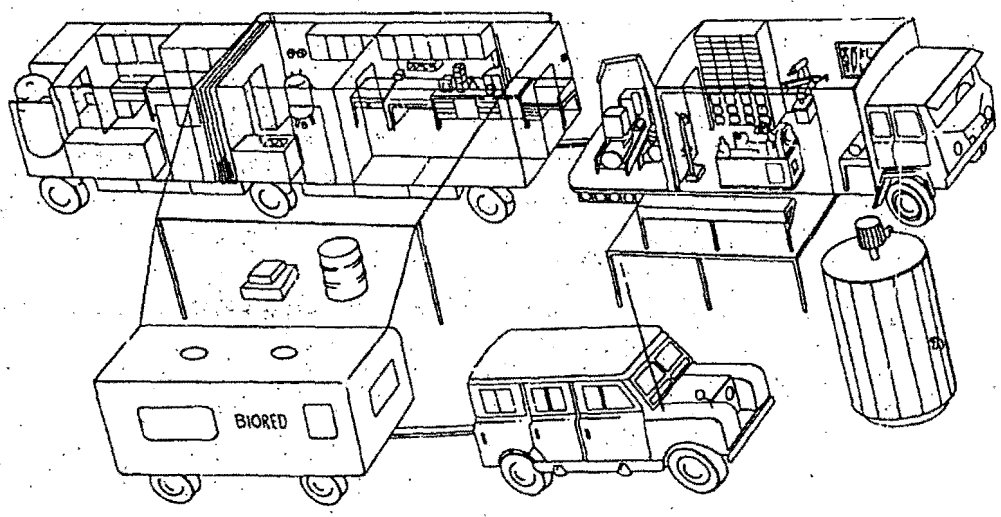

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Figure 1. Mobile biological laboratory, Sweden (U).

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d. (U) The Swedes have conducted microbiological research at the State Bacteriological Laboratory where they have successfully produced microorganisms in mass culture. Fermentation work leading to the development of a "portable"* fermentor was carried out at the Karolinska Institute under the direction of Dr. Karl Goran Heden, who has become a very active participant in international peace movements. The Swedes have also done and are continuing to do research on human and animal disease agents such as those causing tularemia, Russian spring-summer encephalitis (RSSE), myxomatosis, leptospirosis and foot-and-mouth disease.[1]

*"Portable" is a misleading term because the weight of some equipment exceeds 4000 lb. One report indicates that the Heden fermentors originally called mobile or portable may have been small units of 100 liters capacity or less. Any unit containing 100 liters or more is not a truly portable piece of laboratory equipment even though it is mobile (on wheels) as opposed to a fixed installation type. Another report includes a factory technical description of the Biotechnical Work Unit, Model Heden, a 400 liter fermentor unit fitted with wheels "for easy transport." Unless a unit is clearly defined, it is suggested that the description of "portable," be used guardedly or replaced by "mobile."

e. (U) Disciplines of microbiology are explored by highly qualified scientists working at modern, well-equipped facilities, and a vigorous exchange of scientific information at international conferences is encouraged.

f. (U) Swedish biomedical research in general is outstanding, because of the overall excellence of medical talent, education, training, and leadership. Moreover, considerable sums of money have been appropriated for basic and applied research. Medical research is linked closely with teaching and is carried out principally at the laboratories of the Karolinska Institute, which is twice as large as any of the other four medical schools situated respectively within the Universities of Goteborg, Lund, Uppsala, and Umea.[1]

3. (U) Military Medical and Veterinary Capabilities

Capabilities for military medical research are excellent and Swedish veterinary research compares very favorably with that of other European countries. Serious animal diseases have been almost totally eliminated. Sweden has over 1000 veterinarians and hundreds of these are engaged in some form of basic or applied veterinary research.[1]

B. ORDER OF BATTLE

4. (U) Organization

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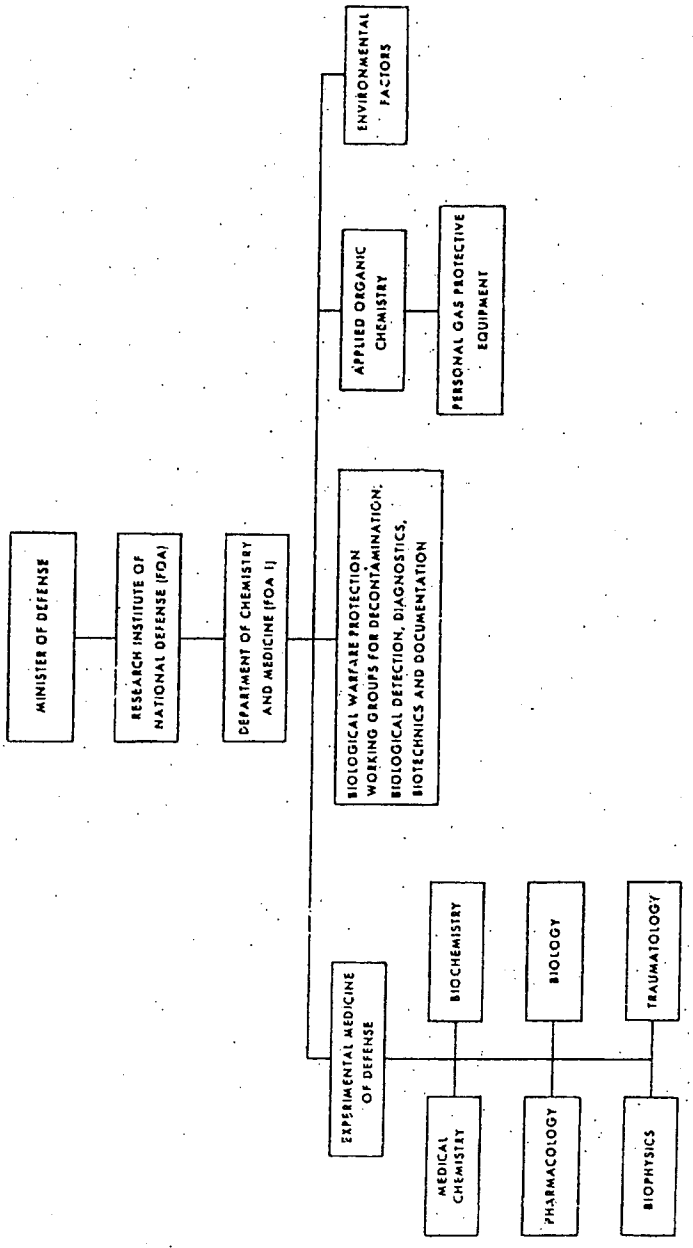

Figure 2. Swedish BW research organization (U).

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5. (c) Training

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C. BW MATERIEL

6. (C-NFD) Offensive Materiel

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7. (C-NFD) Defensive Materiel

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(1) (C-NFD) Protective masks.

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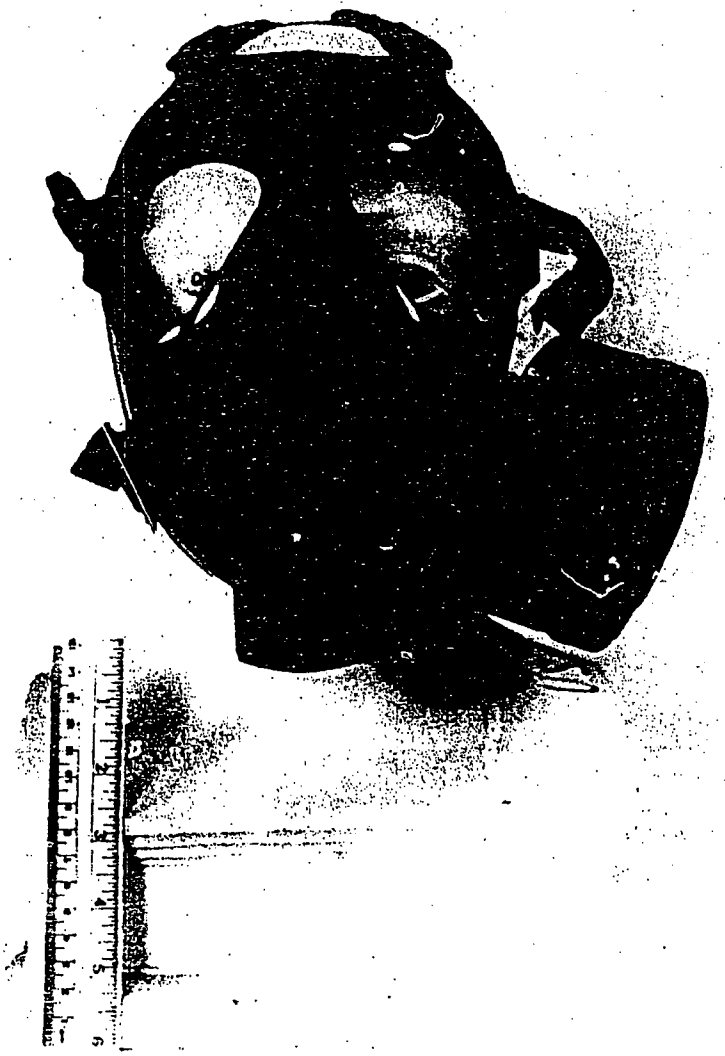

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Figure 3. Swedish M-51 military protective mask. (U).

NO ~~FOREIGN~~ DISSEM

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(2) (U) Collective protection. Swedish military vehicles are now designed with CBR protection as a consideration. The IKV-91, infantry gun vehicle produced by Haegglunds, has a device which maintains a slight excess pressure within the vehicle.[18] Similar protection has been reported for the VK/155 self-propelled automatic gun L50, the PBV-302 armored personnel carrier, and the "S" tank.

(c)

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(b) (U) Technical requirements for the Trelleborg mask. Swedish civil defense authorities set the following requirements for private companies bidding on the protective mask contract:

1. Respiratory organs must be protected against CB agents and radioactive dust.

2. The mask must be easy to don—within 5 seconds.

3. The mask shall be light in weight, comfortable to wear, and easy to breathe in so that it can be worn for several hours without inconvenience.

4. The mask shall be provided with a single strap which keeps the mask in such a position that the dustproofing is kept intact during moderate movements.

(c) (U) Degree of protection.

1. The amount of impregnated activated charcoal quality should exceed 100 cm^3, and material used should be of high quality.

2. Maximum aerosol penetration: 0.05%

3. Maximum leakage of the valve: 0.001%

4. Minimum average of leakage: 0.01%

(d) (U) Development by AB Trelleborg (Gummifabrik). Starting with the above standards, the civil defense authorities asked four different Swedish industries to develop prototypes of normal-sized protective masks. After careful testing in cooperation with FOA Research Institute and the University of Göteborg, the Trelleborg mask proved superior in meeting stated requirements, and this product was selected as the new civil defense mask for Sweden. Certain alterations were made subsequently as a result of the experience achieved by these tests.

(e) (U) Civil defense budget for mask purchase. Subject to the availability of civil defense funds, it was planned to purchase the mask at the rate of one million per year for the next 8 years. Since Sweden's population was about eight million in 1969, a

mask would be available for every person in 1977. Sweden's civil defense budget for 1969 approximated 147 million Swedish Kronor (S. Kr.) ($39,690,000), an increase of 18.3 million S. Kr. ($4,900,000) over the civil defense budget for the previous year. This amount is ample to allow purchases of the mask as planned.

(b)(1)

(g) (U) Unit costs and suppliers. It was thought that the production order for 200,000 masks per annum would be divided between two companies, the Trelleborg Group, and Forsheda. Further assuming a Trelleborg production rate of 100,000 per year, the Trelleborg civil defense masks would cost $6.00 each. It seems doubtful that the price could ultimately be reduced below this level. The $6.00 unit price would appear to be the Trelleborg "sticking point," should others be interested in making sizeable purchases.

(2) (C-NFD) Collective protection.

(b)(1)

D. DOCTRINE, POLICY, AND PROCEDURES

8. (~~C~~) Doctrine

(b)(1)

9. (~~C~~) Policy

(b)(1)

E. PRODUCTION FACILITIES AND CAPABILITIES

10. (~~C~~NFD) Institutes and Laboratories

(b)(1)

(b)(1)

*Possibly this should read "Biological Warfare (Protection) Department, FOA-165."

11. (U) Industry

(b)(1)

b. (U) AB BIOTEC, Stockholm. BIOTEC is a small (50 people) design, assembly, and sales outlet for laboratory fermentors, manufactured primarily by Getinge Mechanical Works. The research is provided by Dr. Heden (who is on the BIOTEC board of directors) and his staff at the Karolinska Institute. BIOTEC is a division of LKB Producter and has a US outlet in Rockville, Maryland.

c. (U) *Forenade Fabriksverken* (United Factories). The FFV is an industrial concern at Eskilstuna which oversees about 25 undertakings of various kinds all over the country, from Boden in the north to Lund in the south. The plants were established to produce war materiel in the event of mobilization, and, therefore, have a considerable over-capacity. The peacetime production of this state-owned facility competes with private industry. The production slack is taken up by manufacturing civilian products of high quality. Public capital is invested and profits are handed to the Crown. As an industrial concern, the FFV consists of five factories, located respectively at Eskilstuna, Karlsborg, Karlstad, Motala, and Aker. Only 7 of the 25 enterprises are engaged in the production of military materiel. FFV employs 8000 people, directly or indirectly, and has an estimated per annum of 500 million S. Kr. ($135 million). Six to seven percent of FFV's total budget is spent on research and development. The FFV manufactures CBR protective equipment and a wide variety of other military materiel.

d. (U) Kabi, Inc., Stockholm. This facility, a well-equipped biological plant, could be modified for the production of BW agents.

e. (U) Astra Chemical and Pharmaceutical Plant, Inc., Sodertalje. With some modification, this plant probably could manufacture BW agents.[3]

F. STOCKPILES AND STORAGE FACILITIES

12. ~~(C)~~ BW Stockpiles-Agents

(b)(1)

13. ~~(C)~~ Defensive Materiel or Medicines

(b)(1)

G. RESEARCH, DEVELOPMENT, AND TESTING

14. (S-NFD) Organization, Institutes, and Facilities

a. (U) Organization and Coordination.

(1) (U) Economic data indicate that the government supports a substantial part of industrial R&D efforts, mostly through military and other governmental contracts. According to other statistical sources, approximately 25% of all governmental support for R&D went to universities and schools, 11% to research councils and funds, 22% to government agencies, including the AB Atomenergi and the Defense Research Institute while the remainder was diverted to service diverse contracts let mostly for defense purposes.

(2) (U) Traditionally, the overwhelming part of scientific research in Sweden has been conducted at the universities and technical schools, but there has been a gradual development of government supported technical organizations which specialize mainly in applied research. After World War II, when the need for an increased research effort became more pressing, several research councils were established to provide a supplementary and more flexible system of channeling government support to projects and programs. The councils were attached to several different ministries, and there was little or no coordination at the national level. The Science Advisory Council was established in 1963 to help formulate and develop a national research policy.[9]

(3) (U) The Technical Research Council has a somewhat different status. It deals more with applied research than any other council, and its bylaws emphasize its charter to collaborate with industry. This council initiates and supports research in areas of

special interest by appointing special advisory commissions. Such commissions are, for the present, active in biotechnology, graphic arts, and medical engineering. In 1964-65, the money allocated by the government to the Research Councils amounted to more than 80 million Swedish Kronor (S. Kr.) (approximately $15,200,000). Of this amount, 25 million were earmarked for the Malmfonden and Norrland Foundations. Both of these nonprofit organizations were created in 1961. Government funds allocated to the natural sciences, atomic and technical research councils increased from 4.3 million S. Kr. in 1950-51 to 36 million in 1964-65.

(4) (U) As previously noted, the bulk of fundamental research in Sweden is in the universities, institutes of technology, and similar schools. Such research is funded partly through the regular budget, partly by grants from research councils and public and private foundations, and to some extent by contributions from the United States, which are now gradually decreasing. At the institute of technology, where applied research is more favored than at the universities, research is also financed to a certain extent by contracts.[9]

b. (U) Technical Institutes.

(1) (U) For technical education at the university level, there existed as early as 1961 two institutes of technology, the Royal Institute of Technology in Stockholm, and Chelmers University of Technology in Gothenburg. Both have departments of technical physics, mechanical engineering, shipbuilding, electrical engineering, civil engineering, chemistry, and architecture.[9]

(2) (U) Other scientific and technical research is emphasized to varying degrees at such establishments as the Research Institute of National Defense (with a staff of more than 250 graduate scientists), the National Road Research Institute, the Royal Geotechnical Institute, the Geological Survey, the Aeronautical Research Institute, the National Institute for Consumer Information, the Building Research Institute, the State Shipbuilding Experimental Tank, the Meteorological and Hydrological Institute, and the National Institute of Materials Testing.[9]

c. (U) Industrial Research. Statistics indicate that Swedish industry spent about 540 million S. Kr. on research and development programs during 1963. This figure is lower than previous estimates (800 million). The greatest part of this research was undertaken by industries dealing with hardware, electrical engineering, transportation equipment, machinery, and shipbuilding. Some limited direct support is given by the development foundations and through the Technical Research Council. In 1963-64 the Technical Research Council allocated to industrial firms 0.87 million S. Kr., which amounted to

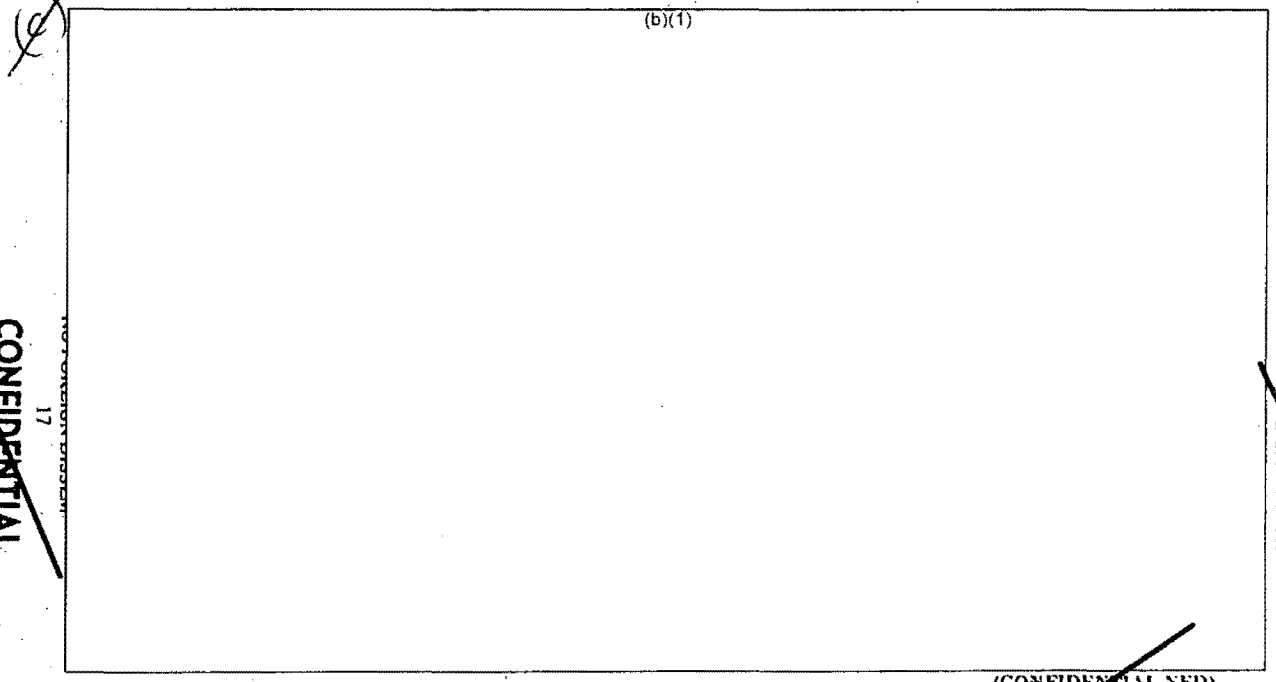

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Figure 4. Medical defense research in Sweden (U).

e. ~~(c)~~ Department of Defense Research Institute (FOA).

(b)(1)

f. ~~(S-NFD)~~ Caroline Medical-Surgical Institute (Karolinska).

(1) (U) General. The Karolinska Institute is the most prestigious bioengineering research facility in all of Sweden. Well known scientists and engineers on the faculty there include K. G. Heden, B. Malmgren, T. Holme, R. Brookes, L. Rutberg, S. Warenius, and S. Goranson. At Karolinska, bioengineers under the supervision of Heden, the former director, have worked since the early 1950's on systems for the continuous

*Possibly this should read "Biological Warfare (Protection) Department, FOA-165."

cultivation of microorganisms. Scientists there conduct basic research primarily, and pathogenic microorganisms are handled routinely (?).[9] Although the institute is still excellent, many of its facilities have become antiquated by current standards and its past glories are more notable than its present achievements. This may be attributed, at least in part, to Dr. Heden's preoccupation with SIPRI rather than with efforts to guide basic microbiological research at the institute. Unless Heden returns to full time work at the institute or he is replaced by someone able to provide direction, it is doubtful if Karolinska will regain its preeminence.

(2) (U) Project for Applied Microbiology. The Project for Applied Microbiology occupies a new temporary building at the Karolinska Institute. There, an Institute of Applied Microbiology was expected to be operable in 1971. Project members are to examine opportunities for research in nonmedical bioengineering, for contract work for industry, and for applied microbiology relevant to international needs, especially to those of the developing countries. This new venture is supported by the Swedish government's Council for Applied Research.[11]

(3) (U) Bioengineering unit.

(a) (U) In 1960, a bioengineering group had been created in the Karolinska's bacteriological department for Heden.[11,19] He will continue to direct the efforts of that unit although he takes less interest in the unit than in his activities in the Stockholm International Peace Research Institute (SIPRI).

(b) (U) With the risks of biological warfare in mind, the Swedish Medical Research Council, which deals with military as well as civilian matters, established the bacteriological bioengineering unit. In addition to advising the government, Heden was to study and develop techniques for the large-scale handling of pathogenic microorganisms, particularly in connection with the preparation of vaccines. The work was not classified, and was deemed compatible with the unit's status as a university department; Heden had a free hand in selecting research projects.

(c) (U) The group's interests have broadened continuously. Current work on methods for large-scale tissue culture was originally prompted by the probable need for the rapid production of viral vaccines in the event of biological warfare. Other studies involve fundamental research on the physical properties of DNA; findings coming from these investigations may prove relevant to the identification of unknown nucleic acids. As expected, the Karolinska pilot plant has proved useful for purposes other than experiments related to vaccine production. Its scale made possible the preparation of rare metabolites

and enzymes in sufficient quantities for fundamental research both in Sweden and abroad; its flexibility permitted wide-ranging experimental work on the culture of microorganisms. Now that the Swedish Defense Research Institute (FOA) has its own group to work on problems concerned with biological warfare, the Institute for Applied Microbiology, using the same Karolinska pilot plant, will eventually take over the remaining defense activities from the bioengineering group.[3]

(4) (U) Pilot fermentation plant.

(a) (U) A special attraction for the Medical Research Council has been the big pilot-scale fermentation plant completed by the Karolinska in 1958 for its own purposes. As a facility for growing in mass both pathogenic and nonpathogenic species, it is unusually large for academic biological work. Indeed, in light of the present trend to continuous culture techniques, some of the older equipment looks cumbersome. Heden had played a leading part in the planning and design for the pilot plant, recognizing that existing industrial techniques were inadequate. The plant features instrumentation for extensive automation and remote control, and can be easily adapted to reduced-pressure operations so that pathogens may be studied safely. Much versatility has been built into this equipment due to the use of steam-sterilized "stericonnectors" invented by Heden. These devices allow vessels to be quickly and safely linked by flexible tubing.

(b)(1)

assigned to SIPRI. It must be assumed that all results will be available to the Swedes since the work is being done in their facilities and Dr. Heden is intimately involved in SIPRI CBW research.

S

(b)(1)

(6) (U) Department of Virus Research. This department, directed by Sven Gard, shares a building with the virus diagnostic laboratory and with the vaccine production facilities of the National Bacteriological Laboratory (paragraph 10.d.). The Department is well equipped and precautions are taken to isolate the work from other parts of the building. There are separate air duct systems for each floor, air pressure in the rooms is higher than in the corridors to diminish chance of contamination, workers change shoes and gowns when entering and leaving work areas through air locks, and waste fluids are chlorinated or heat treated/chlorinated before disposal. Research and teaching are conducted in the Department.[2]

S

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[2] Possibly this should read "Biological Warfare (Protection) Department, FOA-165."

h. (U) Publication of Research Work.

(1) (U) Journals. The results of Swedish research are published largely in foreign journals, in monograph series, such as the Scandinavian Acta publications, or in others emanating from the academies, universities, and research institutes. Swedish publications are satisfactorily covered by the main foreign abstract publications. Abstracts of articles printed in Swedish scientific and technical journals are also distributed through the Reference Service of the Swedish Society for Technical Documentation while abstracts of reports to the Technical Research Council are published in TVF, a journal published by the Swedish Academy of Engineering Sciences. Specialized abstract services are also provided by research institutes, industrial libraries, the Swedish Building Center and other agencies. The Swedish scientific library system is built around a core consisting of the university libraries and the Royal Swedish Library. Besides these, specialized libraries are connected with both the institutes of technology and the other specialized colleges at university level. The libraries at the various institutes closely support diverse research programs. Some of these collections are of considerable size.[9]

(2) (U) Documentation. There is no central documentation institute in Sweden, although the need for one has often been pointed out. Certain documentation activities common to the whole country are carried out by the Information Service of the Swedish Academy for Engineering Sciences and by the Swedish Society for Technical Documentation. For some industrial sectors there are information centers connected with central research institutes. Interest in documentation is growing in Sweden, as shown by the establishment of the Swedish National Committee for Documentation in 1964, and by the fact that the government's budget of 1965-66 included a sum of 77,000 S. Kr., which was used at university level to begin training specialists in documentation.[9]

i. (U) International Scientific Relations.

(1) (U) Sweden cooperates internationally with organizations for scientific research on the governmental level: *CERN, IAE,* and *ESRO*. Sweden also participates in the other international research activities, and under its cooperative research program supplies experts to many groups.

(2) (U) Collaboration with international unions is achieved through a number of national committees, namely those for astronomy, biology, physics, geodesy and geophysics, geography, geology, pure and applied chemistry, crystallography, mathematics, theoretical mechanics, scientific radio, and documentation. Through the activities of the Nobel Foundation, Swedish scientists are also brought into close contact with foreign colleagues.

(3) (U) For liaison purposes, the Royal Swedish Academy of Engineering Sciences has maintained two scientific attaches; one in Washington since 1944, and one in Moscow since 1960. A third scientist has been "temporarily" on station in Japan since 1962. These representatives observe and report developments and current trends in the engineering fields and in the related fields of pure science.

(4) (U) Swedish scientists are able to obtain travel grants for short study trips or for longer visits to research establishments, and they actively take part in international conferences. A list of scientific conferences and exhibitions is published three times a year by the Royal Academy of Engineering Sciences.[9]

15. (~~C-NFD~~) Biological Agent Development

a. (~~C-NFD~~) Agents.

(b)(1)

b. (~~C~~) Stabilization of Agents.

(b)(1)

[9]Possibly this should read "Biological Warfare (Protection) Department, FOA-165."

interest in the stabilization of viruses causing Venezuelan equine encephalitis (VEE) and Eastern equine encephalitis (EEE), neither disease being indigenous to Sweden. Both have been suggested to be excellent candidate BW agents; VEE virus is an excellent incapacitating agent, while EEE virus causes one of the most fatal of the encephalitides.[3] This interest expressed by a member of the Swedish Defense Medical Council in the stabilization of viruses might suggest an interest in military applications for such biological materiel. If the concern of this official was to provide increased protection against deleterious environmental factors (drying, storage, aerosol dissemination, etc.), the inference is justified.

(2) (U) A different interpretation may be the need to stabilize viral preparations used in the production of vaccines, and to protect the antigenicity throughout the preparation procedure and storage. This interpretation has a more definite defensive connotation.

(b)(1)

16 (C) Process Research

(U) Swedish scientists and engineers are in the forefront in developing bioengineering techniques for both continuous cultivation and batch processes. Sweden's technological base is broad and deep, its instrumentation is among the best, and its fermentation equipment is of high quality. The Swedish research community in this field is highly capable. Dr. Karl Goran Heden and Dr. Bengt Zacharias are recognized authorities in the continuous cultivation of microorganisms. Scientists in Sweden maintain close professional ties with their colleagues in Czechoslovakia, the Soviet Union, the United Kingdom, the United States, Japan, West Germany, and elsewhere.

a. (C) Biphasic Polymer System.

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d. (U) Tissue Culture Apparatus. The FL203 tissue culture apparatus was developed to meet an obvious requirement for a more efficient means of growing mammalian diploid cells on a large scale (fig 5). The original apparatus contains a series of titanium plates (disks) having a total surface area of 15.8 square feet. These disks rotate within a small glass vessel of 3 liters capacity which contains the culture medium. A drive mechanism, operating through a magnetically coupled shaft, slowly rotates the disks so that the cells adhering to them are alternately exposed to the culture medium and the air. The FL203 can also be utilized for culturing fungi and other surface growing microorganisms.

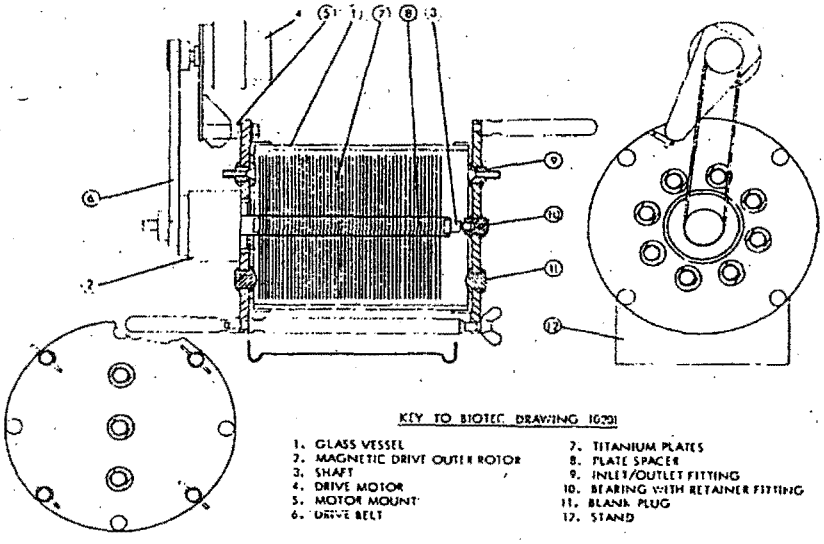

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Figure 5. BioTec titanium disk equipment FL203 (U)

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17 (C-NFD) Agent Dissemination

(b)(1)

b. (C-NFD) Cloud Studies.

(b)(1)

(3) (U) Extensive theoretical studies on cloud travel have also been completed. The hazard of CBR agents expressed as a function of distance and other parameters has been carefully evaluated.

(b)(1)

18. (C-NFD) Agent Detection and Identification

(b)(1)

(b)(1)

d. (U) Also see paragraph 14.f.(5), SIPRI research.

H. NAVAL OPERATIONAL BW CAPABILITY

19. (S-NFD) Organization

(b)(1)

20 (S-NFD) Ships and Equipment

(b)(1)

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Original

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21. (C/NFD) Summary of Naval Capabilities

(b)(1)

I. CONCLUSIONS

23. (C) Offensive Capability

(b)(1)

(b)(1)

24. (C) Defensive Capability

a. (U) The Swedes have one of the strongest CBW defense capabilities among the nations in Western Europe. Their traditional concern with defense has been accentuated by their estimate of the Soviet threat. They seem firmly convinced that CBW would be used against them, and are taking all measures economically feasible to protect themselves against chemical and biological attack.

(b)(1)

J. TRENDS AND FORECASTS

25. (U) Trends

Swedish R&D in recent years has involved modifications and improvements to existing equipment. Examples of this are the improvement and replacement of the protective mask and improvement in controls and instruments on fermentation equipment. Work in BW detection is not novel and is exploiting present technology. No technological breakthroughs

have been reported from Sweden although the Swedes are abreast of current work in BW related areas.

26. (C) Forecasts

a. (U) Short Range (5-Year Projection). The Swedish record of excellence in the biological and medical fields will continue and improvement in disease prophylaxis/treatment should result. Techniques and equipment will be developed. Work in BW defense will receive impetus from the BW Disarmament Convention regardless of Sweden's official policy towards it. Sweden will be able to provide technical competence applicable to the onsite inspection and monitoring necessitated by BW disarmament.

(b)(1)

Section II.

FINLAND

A. INTRODUCTION

1. (U) General Background

a. Although the government of Finland recognizes the importance of science and technology and encourages research and development activities, the limited financial resources of the country restrict both the size and the scope of scientific programs. Finnish scientific activities in general lag behind those of Sweden.[1]

b. Finland has a long tradition of fostering scientific research at the universities. Scientific societies and academies are insignificant as research centers but are primarily and most prominently concerned with the dissemination of scientific information. Medical research of high quality is underway, but investigations are limited to a few fields.[1]

c. Finland participates actively in international scientific activities through its membership in specialized agencies of the United Nations and in collaboration with all Scandinavian organizations concerned with research.[1 1]

d. The government and the scientific community guide research and development indirectly by soliciting the voluntary cooperation of personnel and institutions. Research is carried out at facilities operated by various governmental ministries, in universities and other institutions of higher education, and at cooperative research institutes maintained by industry. The National Science Council serves as a permanent link between government and scientists and is concerned with long term plans to promote research objectives. The National Research Councils are primarily consultant bodies of experts who can focus research efforts toward goals of high priority.[1]

e. Scientific education, manpower, and facilities are adequate to meet the needs of the country. Most of the best facilities are located in Helsinki.[1]

2. (U) Competence in Public Health

The quality of medical and related research is comparatively high in selected fields. The finest research is approximately equal to the best research conducted in either Western Europe or in the United States. Basic and applied research receive equal emphasis and are strongly supported by both the national government and private foundations. Significant work has been done on cardiovascular diseases, lung cancer, anemia, health physics, antibody formation, Vitamin B research, eye surgery, and epidemiological investigations. Tick-borne encephalitis which is endemic in two regions of Finland has been given special attention. Finnish scientists have actively investigated the role of interferon resistance to viral infections. Veterinary researchers, although few in number, are disciplined workers doing research of an internationally recognized standard.[1]

3. (U) Military Medicine

a. There is little information available on the status of Finnish military medicine. It matches the high standards of civilian medical practice, however.

b. The Finnish Army maintains a CBR school at which medical aspects of CBR warfare are taught.[1]

B. ORDER OF BATTLE

4. (C-NFD) Organization

(b)(1)

b. (C-NFD) Military.

(b)(1)

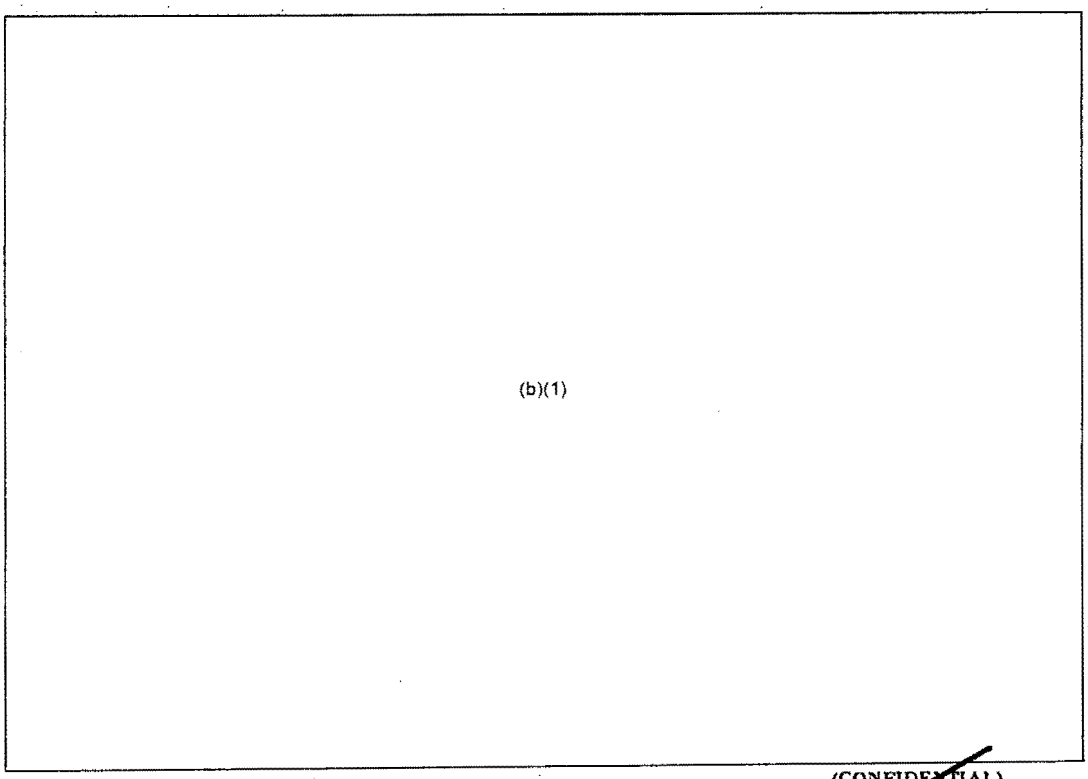

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Figure 6. Finnish BW research organization (U).

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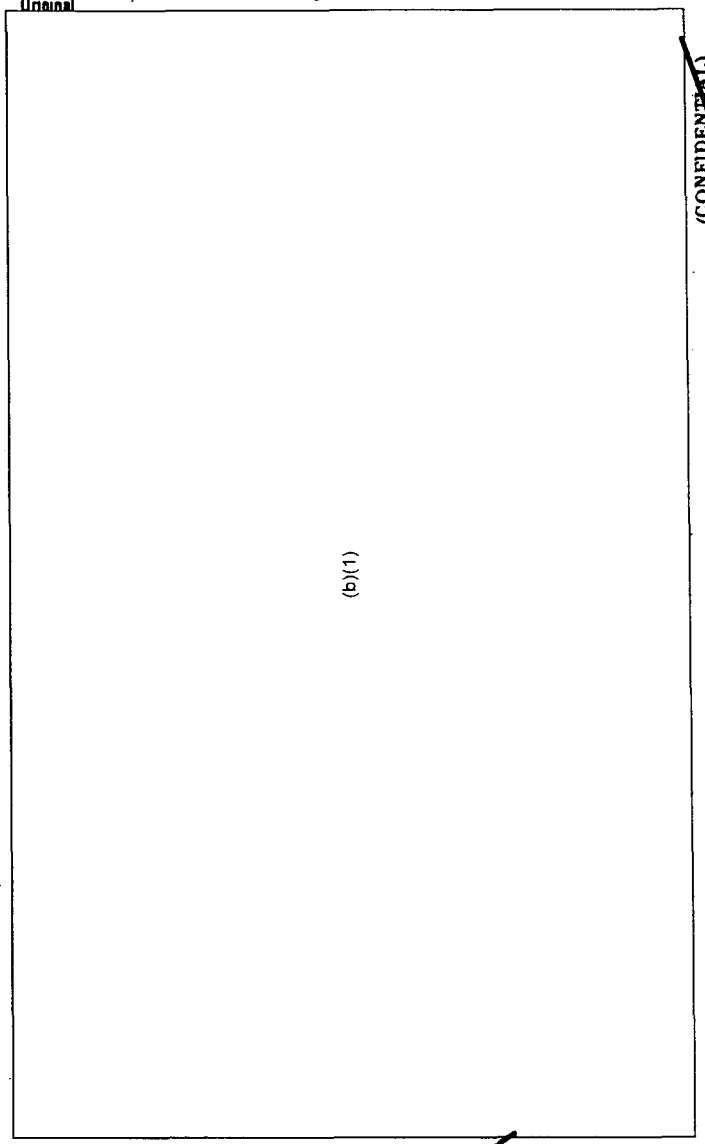

Figure 7. Finnish BW defense organization (U).

446

(b)(1)

c. (U) Civil Defense. The Civil Defense Act of 1959 upgraded the civil defense requirements in Finland. The Civil Defense Section within the Ministry of Interior is responsible for implementing all routine and wartime civil defense actions. The exact structure of this organization is not known, but reports indicate that because of this organization the civil defense posture during peacetime is considered poor. FDF support is presently required for rescue, search, and other incidents. What changes and improvements there would be in time of hostilities is not known.

5. ~~(U)~~ Training

(b)(1)

(b)(1)

d. (U) CBR subjects are taught in the reserve officer's and NCO schools. Students enrolled in this curriculum receive approximately 10 hours of CBR defense training. During these hours the students are taught the duties of a platoon leader and company commander operating in a CBR environment. They are also taught the CBR defense organization of an Infantry Brigade. Upon graduation from school 10 officers are selected to attend a 5-week special training course at the ABC Defense School to qualify them as CBR defense officers; CBR defensive responsibilities are probably additional duties.

(b)(1)

C. BW MATERIEL

6. (S-NFD) Offensive Materiel

(b)(1)

7. (U) (S) Defensive Materiel

a. (S) Military.

(b)(1)

NO FOREIGN DISSEM

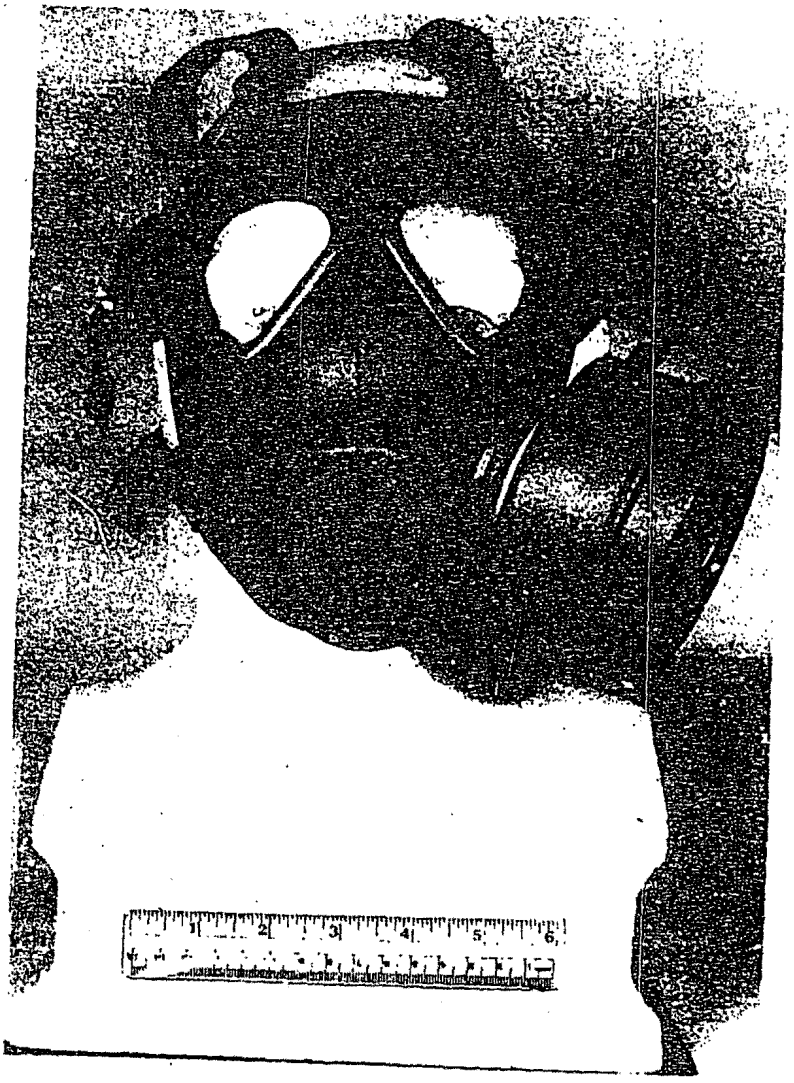

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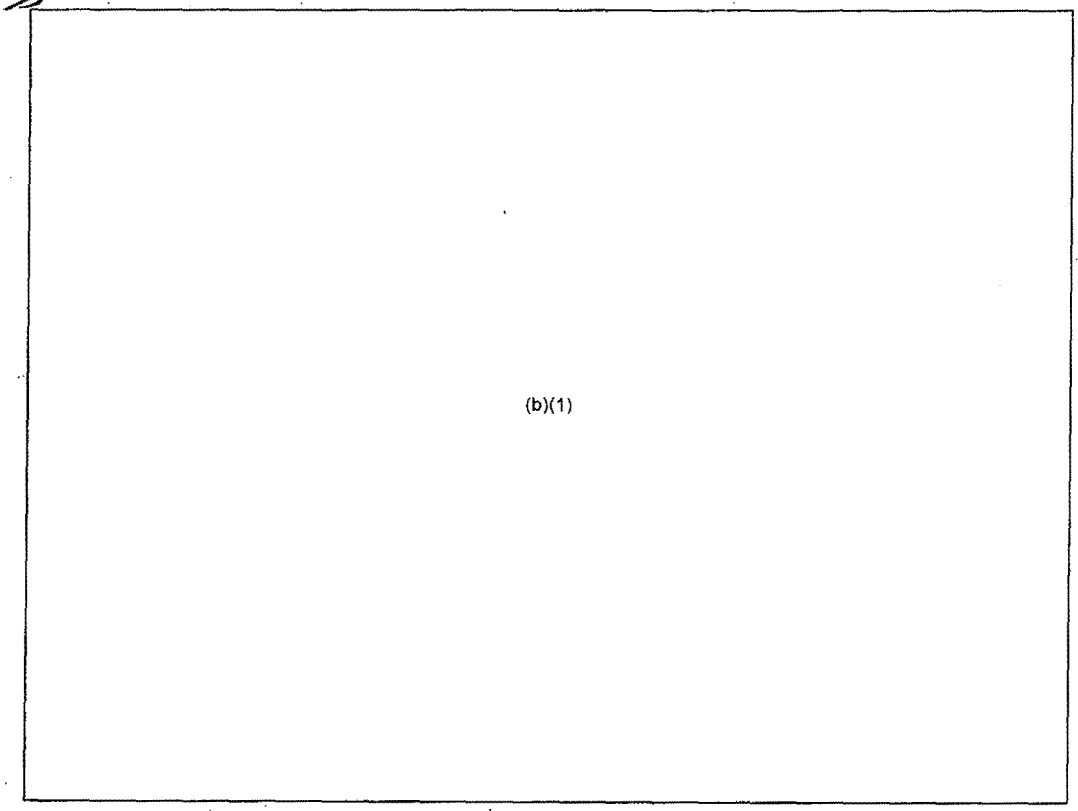
Figure 8. Finnish protective mask Model 61 (U).

NO FOREIGN DISSEM

S



(6) (U) Decontamination. A prototype field decontamination tent was demonstrated in 1970. The facility provides for twenty showers plus changing areas. The heated water supply is provided by a 20,000-liter per hour pump utilizing any local source for water, including the sea. It is not known if this is now in the inventory of the Defense Forces.

(7) (U) Readiness. An official publication of the Finnish Defense Forces, "Operation Report for 1970," states that the materiel situation in the CBR service is deteriorating mainly because the 30–40 year old rubber material in the protective masks and clothing is losing its elasticity. In many cases defective masks have not been replaced.

b. ~~(U)~~ Civilian

(1) (U) Protective masks. Protective masks are not known to have been issued to the civilian population.

(b)(1)

D. DOCTRINE, POLICY, AND PROCEDURES

8. ~~(U NFD)~~ Doctrine

(b)(1)

9. ~~(U)~~ Policy

a. (U) Finland ratified the 1925 Geneva Protocol Agreement on 26 June 1929 and is a signatory of the April 1972 BW Disarmament Convention. Finland's official policy has been to not use biological agents at any time.[7]

(b)(1)

E. PRODUCTION FACILITIES AND CAPABILITIES

10. ~~(C)~~ Agent Production

(b)(1)

11. (C-NFD) Vaccine Productio

a. (U) The State Serum Institute produces approximately 90% of all vaccines produced in Finland (a 1972 figure). Contrary to previous reports, the Orion Pharmaceutical Company does not produce but only sells those they have purchased from the institute. There are only two live virus vaccines produced at the institute: mumps vaccine, which is produced solely for the Finnish Defense Forces, and smallpox vaccine, which is produced for all of Finland as well as the World Health Organization. All other vaccines are prepared using killed microorganisms to include vaccines for influenza, diptheria, tetanus, salmonella, and typhoid. Polio, cholera, and yellow fever vaccines are imported.

(b)(1)

F. STOCKPILES AND STORAGE FACILITIES

12. (C) BW Stockpiles

(b)(1)

13. (~~C~~) Medical Supplies

(b)(1)

6. RESEARCH, DEVELOPMENT, AND TESTING

14. (~~S-NFD~~) Organization, Institutes, and Facilities

a. (U) Organization and Coordination.

(1) (U) Research activities are carried out within industry itself, in research institutes maintained by industry, at governmental research institutes, in the various universities, and at the Finland Institute of Technology. Industrial enterprises owned by the government and other private concerns oversee a small amount of scientific and technical research.[3]

(2) (U) In 1964, the total expenditure for research and related activities in all fields of learning amounted to 104 million Finnish Marks (Fmk) ($2.6 million), or 0.9% of the gross national product of Finland. Of this sum, the government contributed 71 million Fmk, an amount which constituted 1.76% of the State budget for that year.[3] Figures for more recent years are not available.

(3) (U) The central authorities who formulate national research policy in Finland are the President of the Republic, and constituent members of the Parliament, the ministries, the National Science Council, the six research councils, and the Academy of Finland, together with representatives from the private sector and from learned societies.

(4) (U) The National Science Council forms a permanent link between the government and the scientists. The Prime Minister is chairman of the council and the members consist of the Ministers of Finance, Education, Agriculture, and Commerce and Industry, and additionally the chairmen of the six research councils.

(5) (U) The six research councils listed below are all under the jurisdiction of the Ministry of Education: The Finnish Scientific Research Council, The Finnish Medical Research Council, The Finnish Research Council for Forestry and Agriculture, The Finnish Technical Research Council, The Finnish Research Council for the Humanities, and The Finnish Social Science Research Council.

(6) (U) Each council has a part-time secretary and about ten well-known scientists, all of whom are active in their field. The common aims of the six councils are to promote research and to encourage the publication of its results. Investigations and advisory functions on behalf of the authorities are among other duties of the councils. The councils also make grants for the purchase of equipment, for the employment of personnel to assist in research projects, and for travel and personal expenses incurred by scientists while supervising research projects. Recruitment and postgraduate training of scientists are promoted through the employment of young scientists as scientific assistants and by the placement of scientists in positions of responsibility.[3]

(7) (U) The Delegation of the National Research Councils coordinates council activities, and the presidents and vice presidents of each council are ad hoc members of this body.

(8) (U) It is clear that the research councils have a great responsibility, and financial means also are available to implement their decisions. In distributing allocations, each council is in a key position to influence the lines of research toward goals having the highest priority. At present, however, a shortage of staff hampers the planning of research policy in general, the coordination of research activities, and the direct support of major investigations.

(9) (U) Six universities and other institutions of higher learning report to the Ministry of Education; activities at the Institute of Veterinary Science are overseen by the Ministry of Agriculture; while Schools of Business Administration and the Institute of Technology are under the control of the Ministry of Commerce and Industry.

b. (S-NFD) Scientific Commission for National Defense. "

(b)(1)

(b)(1)

d. (U) Publication of Research Work.

(1) (U) Research results are disseminated through traditional channels by means of technical periodicals, journals, scientific series, reports, papers presented at scientific meetings, etc. Special documentation and information services are available.

(2) (U) The Department for Technical Information of the State Institute for Technical Research serves industry as well as the staff of the Research Institute. This department also administers the Scandoc Office of The Finnish Academy of Technical Sciences, functioning as the Finnish liaison office for the Scandinavian Documentation Center in Washington. The Finnish Association for Documentation also is active and provides a central forum for discussions of problems in the field of documentation.

(3) (U) At present a national investigation of documentation and information activities is being conducted by a committee appointed by the government.

e. (U) International Scientific Relations.

(1) (U) Finnish participation in international affairs is assured by its membership in the United Nations specialized agencies, UNESCO, FAO, and IAEA. Further, Finland is a member of the International Council of Scientific Unions as well as of most of the other separate unions that are affiliate members of ICSU. Hitherto, Finland has remained unaffiliated with those intergovernmental international organizations which aim at economic integration. Their activities have included the OECD/ENEA Halden Project in Norway.[3]

(2) (U) In Scandinavian scientific matters, Finland is an active collaborator by virtue of its membership in the Nordic Council, The Nordic Cultural Commission, Nordforsk, The Nordic Institute for Theoretical and Nuclear Physics (NORDITA) and the Scandinavian Building Research Congress, for example.[3]

15. (U) Biological Agent Development

a. (U) Evidence indicates that the Finns investigate organisms that are a problem in Finland including tick-borne encephalitis (TBE) viruses, *Fusarium*,[4] barley yellow dwarf

virus,[5] potato viruses, bovire tick fever agent,[6] rabies virus, influenza virus, West Nile virus, and anthrax bacilli, although the last disease is not much of a problem in Finland.

b. (U) Most of the plant disease research is aimed at developing resistant strains of crops or improving chemical means of plant disease control.[4] Plant disease vectors are of interest.[5] The Agricultural Research Center at Tikkurila is a federally supported agency concerned with applied problems of plant pathology, entomology, plant protection, and soils. Its facilities and equipment are excellent and compare with those available at US institutions of similar size. The plant pathology and entomology departments at the University of Helsinki, which deal with the problems of winter injury in plants caused by a number of fungi that grow under the snow, work closely with the center. Among insects, leafhoppers cause the most damage in Finland. No indications of anticrop research have appeared.

(b)(1)

17. (U) Vaccines, Sera, and Chemotherapeutics

The Department of Virology of the State Serum Institute, under the direction of (b)(6) (b)(6) produces high quality interferon at the rate of 30,000 units/ml in a 10-hour period. Some of this interferon has been used for cancer research but side effects at certain dosage levels and the limiting factor of biogenicity have hindered research.

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H. CONCLUSIONS

18. (C) Offensive Capability

(b)(1)

19. (C) Defensive Capability

(b)(1)

I. TRENDS AND FORECASTS

20. (C) Trends

(b)(1)

21. (C) Forecasts

(b)(1)

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Section III.

JAPAN

A. INTRODUCTION

1. (U) History

a. General.

(1) Modern Japan had its beginning in 1868 when the Emperor Mutsuhito (Meiji) recovered power from the feudal lords who had ruled for 250 years. The feudal clan system was abolished and the territories of the feudal lords were divided into prefectures, as they remain today. Industrialization of Japan was initiated by the Emperor who sent missions to Europe and the United States to study the factories and transport systems of the Western World. Japan had become highly industrialized by the early 1920's due to direct financial support from the government, an abundant labor force, and a fervent nationalism that replaced the old clan loyalties.[1-3]

(2) Before World War II, Japan exercised sovereignty over Korea, all the Kuril Islands, the Bonins, the Ryukus, Taiwan, and southern Sakhalin. Manchuria was a military satellite, and the Caroline and Marshall Islands were under Japanese mandate. The government was not content with this, and in the 1930's set out to create an East Asian military and economic sphere which was intended to stabilize the entire region and ensure Japan's security and prosperity. The United States was opposed to Japanese hegemony in China and Southeast Asia, and Japan's leaders came to see the US as the main obstacle to their success. They attempted to eliminate this obstacle by delivering a smashing blow to the US fleet at Pearl Harbor and by sweeping over Southeast Asia and into the islands of the southwest and central Pacific. The result was Japanese and US entry into World War II.[4]

b. Biological Warfare.

(1) A number of documents provide a unique account of the Japanese BW program in existence prior to and during World War II. These are transcripts of some of the interrogations of key figures who were in this program, and summary reports prepared by US scientists who subsequently interviewed them on technical matters. The initial interrogations were conducted shortly after the surrender of Japan in 1945. It was learned

later that the information supplied was minimal because those interrogated feared prosecution for "war crimes." In the ensuing months several anonymous letters that described a much more comprehensive program than previously revealed were received at Allied Headquarters. Experiments with humans formed a part of this effort. Early in 1947, a representative was sent from Camp Detrick (the US Biological Warfare Laboratory) to Tokyo to evaluate this later information and to conduct further interviews with a number of the medical men who had been connected with the Japanese BW organization (Boeki Kyusui Bu). Those who had participated in studies evaluating the effectiveness of various BW agents against humans had taken a vow never to reveal these experiments. When they were convinced that the information was wanted for its technical value and not for "war crimes" prosecution, they provided a comprehensive account of the program. This was done largely from memory because many of the documents and records relating to this work had been destroyed in the closing days of the war. It was known also by this time that at least two of their co-workers who were captured in Manchuria had told the Soviets all they knew about the program, including details concerning the human experiments. Although all of the documents that were generated as a result of the investigation of Japan's BW program are not available, it is thought that a fairly complete account still survives. The information of greatest interest is summarized below.[5-7]

(a) A large Japanese BW installation was built in Harbin Province within Manchuria in the mid-to-late 1930's. The main facility was at Heibo (called Pingfan by the Chinese). Subsidiary installations were also located there, including a proving ground at Anta. The main facility was known as the Department of Prevention of Diseases and Water Supply of the Kwantung Army or Manchu 731. Lt. General Shiro Ishii was actively involved in the planning and organization of the installation, and was its first commander. Available at Heibo and/or at its branches were equipment for growing large quantities of organisms, facilities for vaccine production, at least one aerosol chamber, equipment for drying organisms, and special flea-breeding facilities. A completely separate installation, also located in Manchuria at Singking (Changchun), was used for veterinary research having BW applications. This installation was known as Manchu 100 or the Kwantung Army Stables. Those interrogated claimed that no BW-related work was done in Japan, and that it was all in Manchuria.

(b) The infectious diseases that were studied most extensively at Heibo were anthrax, plague, typhoid and paratyphoid fever, bacillary dysentery, cholera, glanders, tetanus, and epidemic hemorrhagic fever. The infectious and lethal doses of these for man were established by several routes of administration, and the efficacy of vaccines prepared by several methods was determined. Other diseases receiving less intensive study included botulism, brucellosis, smallpox, gas gangrene, influenza, tuberculosis, and tularemia. A large

collection of slides was available which represented pathological sections from several hundred human cases of disease caused by various BW agents. These slides had been buried rather than destroyed.

(c) The human subjects used in laboratory and field experiments were said to have been Manchurian coolies who had been condemned to death for various crimes. They were used in the same manner as other experimental animals in field trials when bacteria were disseminated by spray and bombs, in immunization experiments, and in studies to establish minimum infectious and lethal doses of various organisms.

(d) Twelve offensive operations were conducted against Chinese soldiers and civilians using plague, cholera, and typhoid organisms. Nine of the twelve operations were known to have caused definite localized epidemics. Plague infected fleas were scattered from low flying aircraft or by hand, and cholera and typhoid organisms were hand-sprayed onto the ground or into water supplies. One of the favorite tactics was to attack the Chinese at two points about a mile apart along a railroad. When the Chinese were driven back, the Japanese would tear up the track, spread the BW agent, and then stage a "strategic retreat." The Chinese would reoccupy the position, but within a few days an epidemic would be spreading through the area.

(e) The Japanese considered anthrax spores and plague-infected fleas to be the most effective BW agents. This was probably because of the difficulty encountered in maintaining the viability and virulence of other candidate pathogens. Methods had been developed for breeding fleas in kilogram quantities (3000 fleas weigh approximately one gram) and for infecting them by allowing them to feed on plague-infected rats. These fleas would survive for about 30 days and were infectious for that time. One flea bite would usually cause infection. The Japanese found that anthrax spores remained infectious for as long as ten years. This time period probably reflects the duration of the experiment.

(f) Crop destruction was conducted to study factors relating to the infectious process. Large-scale production of crop disease agents was attempted, and defensive countermeasures were ascertained. Targets for attack with agents causing plant diseases were Siberia and the US Pacific Northwest, Stinking smut of wheat and nematosis of wheat and rye were selected for the most intensive development even though plant varieties differ in their resistance to the diseases. Due to the wide-spread infection with these in Manchuria, it was felt that a ready supply of agent could be obtained as a by-product of milling operations.

(g) Dissemination of agents in aerosols was done experimentally in an octagonal chamber with a capacity of 28 cubic meters. A hand-operated atomizer was used to produce the aerosol. Only rough estimates of the number of organisms released were made. In field trials, organisms were sprayed at low altitude from airplanes or disseminated by stationary bombs that were exploded a few feet above the ground. Wearing helmets and body armor, human subjects were partially protected from the blast. A great deal of work went into developing bombs as delivery systems. Glazed porcelain bombs were considered preferable to metal ones because the former shattered into small pieces that were difficult to detect on the ground.

(2) The Heibo installation was burned by the Japanese ahead of the Russian advance into Manchuria in August 1945. Among many prisoners were twelve Japanese who were indicted and tried as war criminals at Khabarovsk in 1949 on the charge of "preparing and employing bacteriological weapons." The findings of the trial, as reported in a Soviet periodical,[8] agreed in general with the information acquired by the US investigators as far as the technical scope of the program was concerned. The Russian report claims that the Japanese testified to having used Soviet and Chinese citizens in the human experiments and that over 3000 died as a result. The US investigators were told that only Manchurian criminals were used in such experiments and that less than 1000 deaths resulted. Although the US authorities never granted documentary immunity from prosecution to those Japanese who were interviewed, none was brought to trial.

2. (U) Geographic and Political Factors

a. Geographic Factors. Present day Japan consists of four large islands, Hokkaido, Honshu, Shikoku, and Kyushu, and many small islands. Hokkaido, the northernmost, lies just south of the large Russian island of Sakhalin and is about 800 miles east of Vladivostok. Southern Japan is about 100 miles east of Korea. The islands are mountainous and only one-sixth of the land is cultivable. Japan is self-sufficient in rice production but has to import more than 70% of its other food. The population had reached over one hundred million by 1968, with more than 25% of the people living in the large industrial conurbations of Tokyo-Yokohama, Nagoya, Osaka-Kobe, and northern Kyushu.[2]

b. Political Factors.

(1) Domestic.

(a) The Allied Powers occupied Japan in 1945, and the Supreme Commander for the Allied Powers (SCAP) was the highest authority in the country for more

than 6 years. A new constitution was written in 1946 that established the country as a constitutional monarchy with the Emperor, who renounced his imperial sovereignty and divinity, as head of the state but without governing power. The constitution grants executive power to the Cabinet which consists of the Prime Minister and 11-16 Ministers of State. Legislative power was vested in the Diet, composed of the House of Representatives and the House of Councillors: delegates to each of which are elected. The Supreme Court and a series of lower courts comprise the Judiciary.[2/3]

(b) The Liberal Democratic party has maintained a working majority in both Houses for the past several years. This party is conservative and is supported by big business and rural populations. There are two Socialist parties, a right-wing and a left-wing, which have the support of the intelligentsia and many of the younger urban voters. The Communist party receives large support from the labor unions and from some students but it is split into pro-Russian and pro-Chinese factions. The "Clean Government" party is the political arm of the Nichiren Buddhist sect and is strongly nationalistic in character. Formed in 1964, it has benefited from popular disenchantment within the ranks of both the long-tenured conservatives and the radical left.[1/3]

(c) The Korean War marked the beginning of economic prosperity for Japan. The return to independence in 1952 found the economy rising and the people united in their goal of increased productivity. The gross national product (GNP) increased at an average annual rate of roughly 10% between 1958 and 1967, and in 1969 became the third largest in the world, ranking only behind the US and USSR. This phenomenal economic growth was accompanied by massive social changes. There was a great shift of population to urban areas, incomes rose providing a market for the wide range of consumer goods being produced, and the younger people in particular no longer accepted many of the traditional ideas of older generations. These factors have helped to create a society no longer united in its aims regarding national and international affairs.[3/4]

(2) International.

(a) At the end of the war, the US had occupied the Ryukyus and the Bonins and had taken over the mandated islands; the Soviets had occupied Manchuria, southern Sakhalin and the Kurils; and Taiwan was returned to China. North Korea was occupied by Soviet forces, and the US moved troops into South Korea. The subsequent outbreak of hostilities in Korea made it urgent that the Allies negotiate a peace treaty with Japan. Representatives of the Soviet Union attended the San Francisco Conference in 1951 when the treaty was signed, but the USSR was not a signatory.[1/4]

(b) At the time the peace treaty was signed, Japan and the US also signed a Security Treaty to the effect that US forces would remain in Japan and provide for external security until that country could assume responsibility for its own defense. As a result, Japan has enjoyed a relatively high degree of security at extremely low cost. The US was reluctant to return control of the Ryukyu Islands to Japan because of US defense commitments in the area, however, these islands were returned to Japan on 15 May 1972. Since Japan assumed administrative control, US military bases in the Ryukyus have the same status as those on mainland Japan.

(c) Japan resumed relations with other Asian nations in the mid-1950's through treaties covering reparations. Diplomatic relations with the Soviet Union were restored in 1956, and Japan was subsequently admitted to membership in the United Nations. For a number of years, Japan and Communist China have had unofficial trade agreements, but diplomatic relations have not been established.[1]

(d) Japan has not been considered an important political power in Asian politics because of her dependence on the United States. Japan, economically, is now the third strongest nation in the world. If progress continues at the present rate, within 10 to 15 years her economic strength will equal that of the Soviet Union. With less than 1% of the gross national product diverted into military programs, Japan is a minor military power. Although capable of defending herself for only a few weeks, Japan has tremendous potential to develop militarily. Within a short time (perhaps 1 year) she could become a formidable military power. Because of long standing Chinese-Japanese cultural influences, Japan feels no threat from China. Concern will increase as China's nuclear capability develops, and may hasten rearmament.[29] Added to Japan's concern for China, the withdrawal of US military protection may force her to take a military course.

3. (U) Public Health and Microbiology

a. (U) Public health standards in Japan are not consistently high. Some aspects of the public's health are well guarded by high standards while others are almost completely neglected. Japan still has a greater incidence of infectious diseases than do most advanced nations today. In the aftermath of World War II, infectious diseases were an acute problem; much effort went into vaccine and antibiotic production to combat this problem. As a result, a sound and modern technological base was established for the prophylaxis and chemotherapeusis against infectious diseases. However, sewage facilities remain antiquated and less than 10% of the homes have flush toilets. In addition, Japan has acute environmental pollution problems created by the burgeoning industrial growth. Some anti-pollution measures have been instituted and more are planned, but much remains to be done in this area.

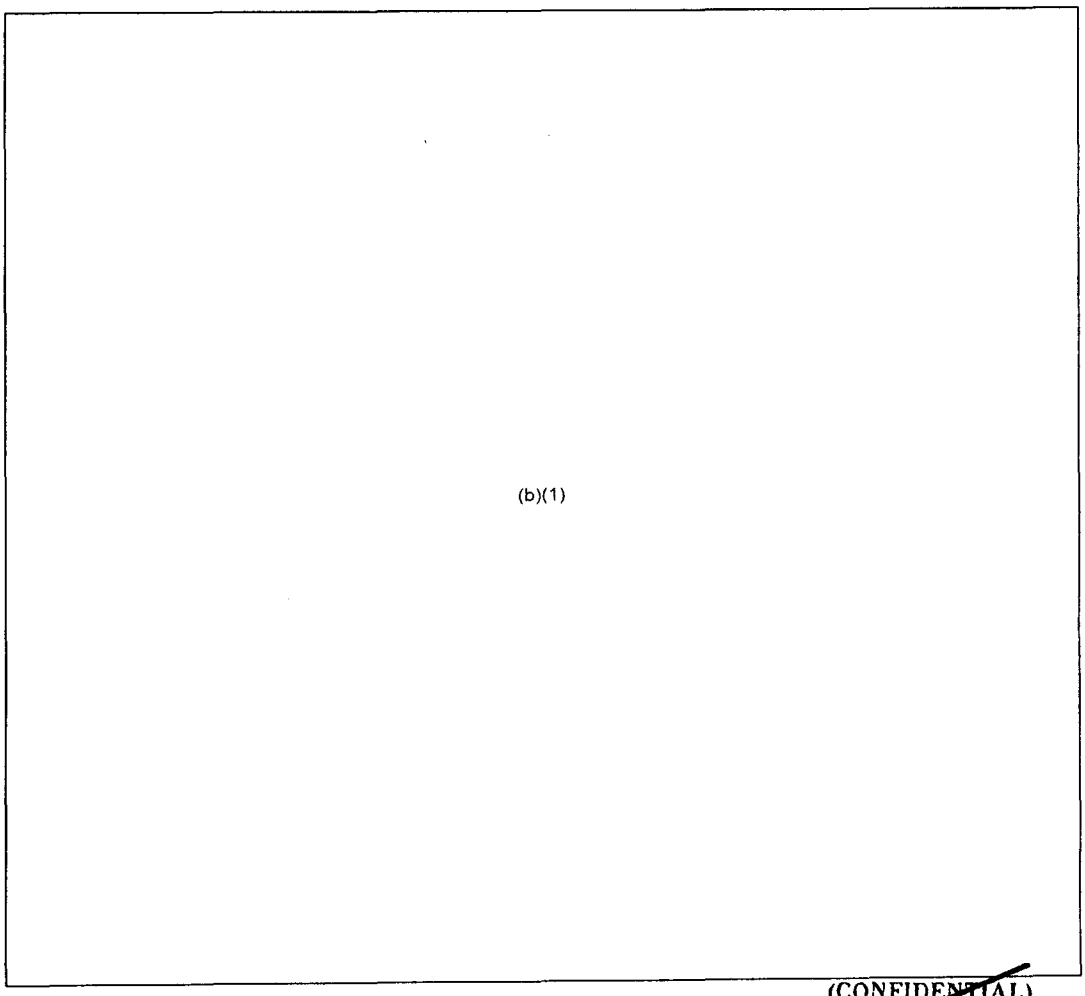
b. (U) The Ministry of Health and Welfare is responsible for public health research and has several research institutes under its jurisdiction that have primary responsibility for this work.[2] In addition to research, these institutes set quality and safety standards for items such as vaccines, antitoxins, diagnostic reagents, drugs, cosmetics, foods, and food additives. Ministry personnel also perform assays of these products to ensure that the standards are being met. The pharmaceutical industry in Japan has grown to be the second largest in the world, with antibiotics accounting for 13% of the total production. The Japan Antibiotics Research Association, acting in an advisory capacity to the National Board of Pharmacy, establishes minimum requirements for antibiotics and provides technical guidance to production companies. The Minister of Agriculture and Forestry is authorized by law to establish standards pertaining to the amount of active ingredients and to the maximum allowable amount of harmful ingredients for each kind of agricultural chemical produced. Manufacturers and importers must register their products before they can be sold. The law makes provisions for enforcement.

(b)(1)

d. (U) Microbiology is a flourishing science in Japan, and Japanese microbiologists have earned a world-wide reputation for the sophisticated quality of their research. They are leaders in the field of antibiotic research and have pioneered both in discovering new chemotherapeutic agents and in determining their spectra of activity and modes of action. They were among the first to initiate research on drug-resistance in bacteria, notably by defining the genetic determinants responsible for transmitting the resistance factor(s) to previously nonresistant bacteria. A prominent US microbiologist has stated that, in his opinion, significant progress on the prophylaxis, treatment, and diagnosis of bacterial diseases is certain to come from Japan in the next few years. Japanese researchers are active in numerous international scientific societies and host several congresses and symposia every year. The Japan-United States Cooperative Medical Science Program, initiated in 1961, has established advisory panels to coordinate research programs in microbiology and to arrange working visits between scientists of the two countries.

B. ORDER OF BATTLE

4. (NPD) Organization



(CONFIDENTIAL)

Figure 9. Organization of the Japan Defense Agency (U).

(b)(1)

5. ~~(C NFD)~~ Training

(b)(1)

(b)(1)

(b)(1)

C. BW MATERIEL

6. (C) Offensive Materiel

(b)(1)

7. (C-NFD) Defensive Materiel*

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Figure 10. Japanese military protective mask, Type M2 (U).

(b)(1)

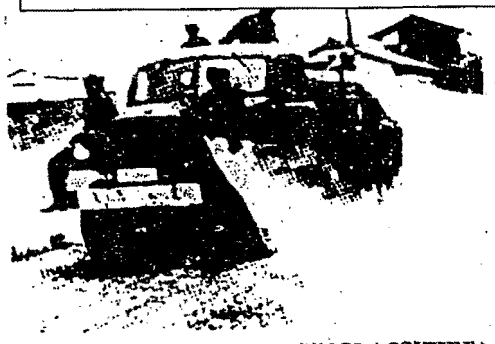

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Figure 11. Japanese truck-mounted decontamination apparatus (U).

*All tables are presented at the end of this section, beginning page 85.

D. DOCTRINE AND POLICY

8. (C/NFD) Doctrine

(b)(1)

9. (C/NFD) Policy

(b)(1)

E. PRODUCTION FACILITIES AND CAPABILITIES

10. (C) Offensive Items

(b)(1)

11. (C-NFD-CD) Defensive Items

(b)(1)

b. (U) Medical Defense. The Japanese pharmaceutical industry is well developed and is capable of producing BW defense-related antibiotics, sera, and vaccines in sufficient quantities for export and domestic needs and in sufficient quantities to permit stockpiling. Table III-6 lists producers of BW defense-related pharmaceuticals.

F. STOCKPILES AND STORAGE FACILITIES

12. (U) Stockpiles of Offensive Materiel

Japan has no known stockpiles of BW agents.

13. (U) Stockpiles of Defensive Materiel

(b)(1)

(b)(1)

G. RESEARCH, DEVELOPMENT, AND TESTING

14. (C-NFD) Introduction

(b)(1)

b. (U) Since the early 1950's there has been an enormous expansion of microbiological research facilities and programs in Japan. Some of these are directly supported by various ministries, some by universities, and some are affiliated with industry. Practically all, either directly or indirectly, receive some funding from the government. At those institutes that support research concerning the causative agents of infectious diseases the basic studies that are done are as applicable to a public health program as to a BW effort. Either purpose would require studies of virulence, nutrition, genetics, methods of rapid detection and identification, and therapy. Japanese law precludes the use of military funds to conduct research at state universities, thus the bulk of funds has gone to industrial groups

which have large basic science laboratories. Industry has begun to establish cross funding and information exchanges between basic and applied research groups, which should provide a renewed impetus to Japanese technology and the manufacture of new products.

c. (U) Several research facilities characterized below could support programs having a BW application. Sufficient information was available about these particular institutes to assess their capability to undertake a BW program. A small section is included which deals with agricultural research as it might apply to anticrop or antianimal BW programs. Brief mention will also be made of the Japanese technological base necessary for large scale agent production and testing. Table III-5 is a more extensive list of medical research facilities in Japan.

15. (U) Microbiological Research

a. Technical Research and Development Institute (TRDI). A subordinate organization of the Japan Defense Agency (JDA), this institute had its beginning in 1952 as an affiliated organization of the National Safety Agency (NSA). The NSA was reorganized into the JDA and the institute gradually expanded in size. The organizational structure as of 1966 is shown in figure 12. Personnel at the institute in Tokyo, and at its five research centers and five test centers, are responsible for the research, design, development, and testing of equipment to be used by Japan Self-Defense Forces. Other scientific study and research required for the accomplishment of their mission is also their responsibility. Each section maintains coordination in its special field with civilian research groups. The biological and medical research programs of the institute are done by the Second Research Center which is composed of two divisions. One conducts research on food, clothing, and other personal equipment, and the other performs research on medical equipment and supplies, hygiene, and human aptitude.[15] Included in the program is production of antitoxins for the serum therapy of tetanus and gas gangrene. Research is being done on immunization with staphylococcus toxoid as a means of preventing infection of wounds with this organism.[16] There are no facilities at the Second Research Institute that could safely handle highly infectious materials. The institute is housed in the same facilities as the TRDI Headquarters, and there are no special security measures in force. No information was found concerning other studies having possible BW applications, the number of personnel engaged or assessments of the adequacy of facilities and equipment for such work.

b. National Institute of Health (NIH). The National Institute of Health began operation in May 1947. It is under the jurisdiction of the Ministry of Health and Welfare and was created to help meet the urgent health problems that were an aftermath of World War II. One-half of the space, facilities, and personnel of the Institute of Infectious Diseases

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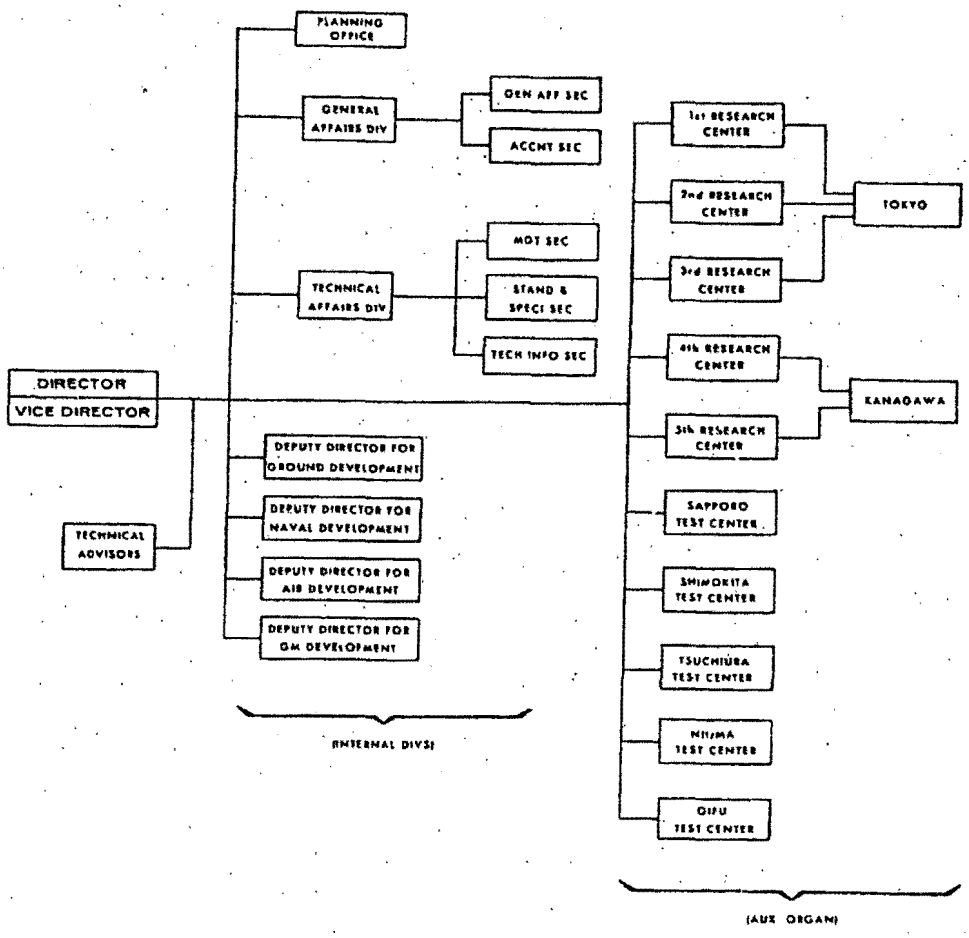
ORGANIZATION



AUTHORIZED PERSONNEL STRENGTH
1,258

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Figure 12. Organization of the Technical Research and Development Institute (TRDI) of the Japan Defense Agency (U).

of the University of Tokyo was transferred to the Ministry to form the NIH. The institute has expanded rapidly, especially in terms of budget and personnel, with additional laboratory space becoming available more slowly (see table III-7). In the legislation which established the NIH, responsibilities assigned were to conduct and coordinate research projects concerning the cause, prophylaxis and therapy of infectious diseases and other problems affecting the whole field of public health; to establish the official minimum requirements for vaccines, immune sera, and other biological products; and to produce and distribute vaccines and sera which are of importance but infrequently used, e.g., plague vaccine. There are 16 research departments, and in addition, a radiation laboratory, a library, and an administration section. The Nagasaki and the Hiroshima branches are also attached to the institute. These two branches were established to collect data concerning the effects on humans of the atomic bomb blasts. The main institute is in Tokyo while a third branch is at Murayama, about 40 km away. The "Japanese Journal of Medical Science and Biology" is published bimonthly in English by the NIH. The institute is the World Health Organization (WHO) Leptospira Reference Laboratory, the WHO National Shigella Center, the WHO Regional Center for Arthropod-borne Viruses, and the WHO Regional Center for Respiratory Viruses. It is also the National Center of Enteric Phage Typing for the International Association of Microbiological Sciences.[9]

c. The Institute of Medical Science, The University of Tokyo. The oldest and one of the most prestigious biomedical research institutes in Japan, this facility was originally called the Institute for Infectious Diseases. It had its origin in a private research institute founded in 1892 by the late Dr. Shibasaburo Kitasato who was its first director. In 1899, the institute became an affiliate of the Ministry of Home Affairs. In 1914 its administration was transferred to the Ministry of Education, and in 1916 it was incorporated into the University of Tokyo. Basic and applied research in the etiology, therapy, and control of infectious diseases received major emphasis until after World War II when the program was broadened to include studies of allergy, immunology, chemistry, cytology, and cancer. Presently, the institute is composed of 19 departments and four special laboratories and employs 359 personnel. There is a 170-bed hospital, and service sections for photography, culture media, and laboratory animals. The grounds and buildings occupy 68,450 square meters (fig 13).

(1) Bacterial research programs include the isolation and characterization of the toxic protein of *Shigella shiga*, classification of *Vibrio* species, studies of the transmission of the drug-resistance factor of dysentery bacilli, and the mode of action of diphtheria toxin. Improvement of the fluorescent antibody technique as a tool for identifying and typing microorganisms is being investigated. The mode of action and kinetics of various antimicrobial substances are also being studied, and research is underway to improve

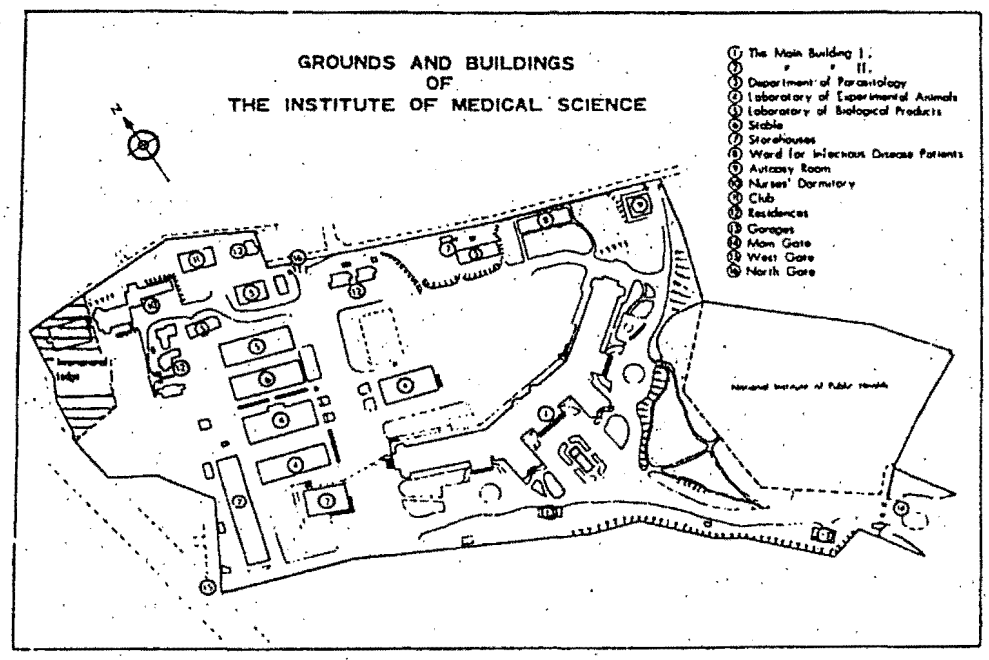

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Figure 13. The Institute of Medical Science, University of Tokyo (U).

vaccines, sera for both diagnostic and therapeutic use, and toxoids. The rickettsial agent that causes scrub typhus (tsutsugamushi disease) was identified by workers at this institute in 1930. Current studies with this organism include its antigenic analysis, mechanisms of its pathogenicity, and its identification by the fluorescent antibody technique. Isolation of the virus of Japanese encephalitis was made at the institute in 1935, and its transmission by mosquitoes was demonstrated. The pathogenesis of this agent and confirmation of its diagnosis by fluorescent antibody are under study at present. Growth of influenza and rubella viruses in newly established tissue cell lines, the investigation of neutralizing antibodies against various viruses, and the genetics of vaccinia virus comprise parts of the viral research program at the institute.[17]

(2) No information is available concerning equipment and laboratory furnishings at the institute. However, based on the sophistication of the research programs and the

world-wide recognition accorded to personnel at the facility, it is assumed that these are modern.

d. Research Institute for Microbial Diseases, Osaka University. This institute belongs to Osaka University and is supported by Japan's Ministry of Education. Established in 1934 at the Nakanoshima Campus of the university, the institute moved to new quarters on the Suita Campus in 1967. The head office, the administrative department, and the clinical department of the institute are located in Osaka. The research and development department, the production department, and the examination department are located at the Kan-onji Research Institute, Kan-onji City, in Kagawa Prefecture. Originally housed in a wooden one-story building, 4-story steel and concrete buildings were constructed in 1962, 1964, 1966, and 1968. In the research section there are 14 departments which support basic studies on microbial diseases and cancer. A hospital is attached where clinical medicine is practiced in association with the research programs.

(1) One of the unique facilities at this location is the Quarters for Experimentally Infected Animals. It is completely air-conditioned and provides many features for the safe handling of pathogenic organisms. Most of the building is sectioned off into small cubicles (2 x 6 m or 4 x 6 m in area). Each cubicle is equipped with one hood in which animal cages are held and another in which the animals are manipulated. Each cubicle also has an individual, pass-through autoclave so that all soiled materials may be sterilized before removal. Exhausted air is filtered. Experimentally infected animals can be handled in these facilities with minimum risk to laboratory personnel. There is little chance that other research animals or the external environment will become contaminated.

(2) The central laboratory is for the general use of all research personnel. There are special rooms where bacteria are grown on a large scale, while other rooms house special equipment, such as that used for high speed centrifugation, spectrophotometry, amino acid analysis, gas chromatography, electron microscopy, and in studies of cryogenics. Several full-time engineers take care of all equipment and regularly examine and adjust precision instruments. The radioisotope laboratory is in a separate building; for safety purposes, it has its own ventilating and waste disposal systems.

(3) Research programs include studies of food poisoning caused by such organizms as *Vibrio parahemolyticus* and by enterotoxin-producing staphylococci, studies of the experimental infection of animals with shigella and vibrio species, analysis of antigenic determinants of various pathogens, studies of the mechanism of action of antibiotics, and investigations of immunity and delayed hypersensitivity in tuberculosis. Live, attenuated viral vaccines against influenza, mumps, and measles have been developed

and are being field tested. Studies are underway on structural components of myxoviruses and arboviruses, and the causative agents of Thai haemorrhagic fever are being investigated in cooperation with other scientists situated at the Virus Research Institute, Bangkok, Thailand.[18]

(4) The Research Institute for Microbial Diseases is colloquially called "Biken," an abbreviation of its Japanese name. "Biken Journal" which is published quarterly in English is an official publication of the institute. A microbiologist who has visited a number of biomedical institutes in Japan has stated that the new facilities of this institute are probably the most modern and best equipped in that country, and that in his opinion the personnel are authorities in basic research.

c. The Kitasato Institute. The Kitasato Institute (fig 14) was founded at its present site in Tokyo in 1914 by Dr. Shibasaburo Kitasato following his resignation as Director of the Institute for Infectious Diseases. An affiliated research center for veterinary science was

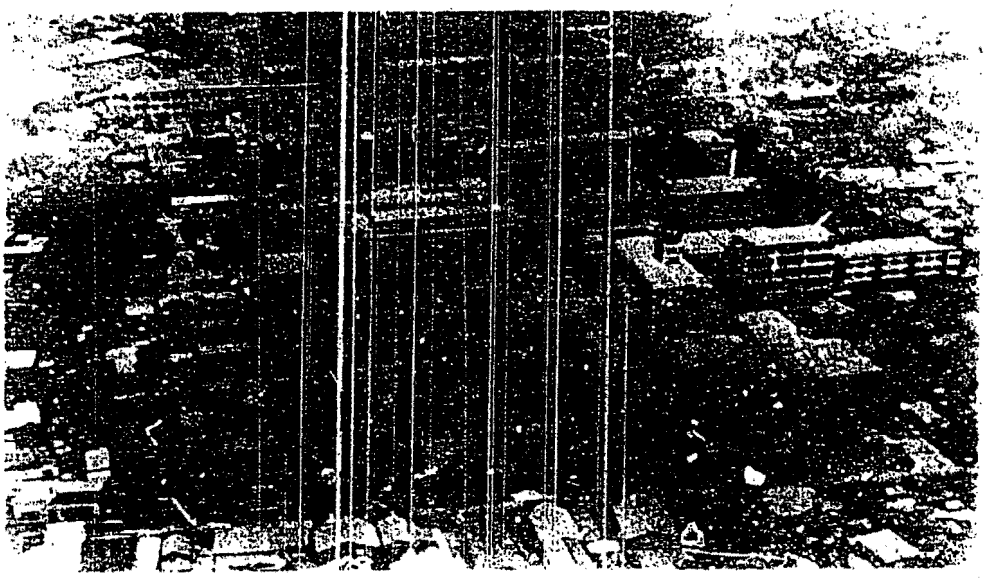

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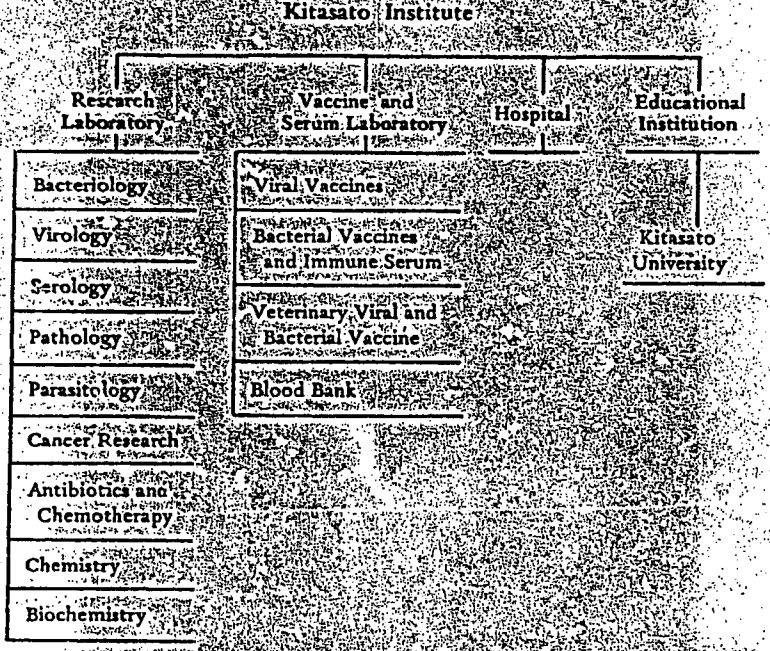
Figure 14. The Kitasato Institute, Tokyo (U).

established at Kiwasha, Chiba Prefecture in 1961. In 1962 a new vaccine and serum laboratory was constructed and the Kitasato University was established. The institute is nonprofit and autonomous in its administration and fiscal control. The major research effort is in the fields of human and veterinary medicine. The organization of the institute is shown below.



Tetanus, tuberculosis, streptococcal infections, dysentery, poliomyelitis, influenza, and Japanese encephalitis are among the infectious diseases under investigation. Vaccines for influenza, Japanese encephalitis, poliomyelitis, smallpox, cholera, typhoid fever, and pertussis are produced and sold for human use. Veterinary vaccines are produced for hog cholera, cattle influenza, fowl poxes, and canine distemper. Diagnostic reagents and culture media are also produced. Researchers at the Kitasato Institute discovered the antibacterial or anticancer drugs, Leucomycin, Carcinophillin, and Mitomycin. These are now produced by commercial firms.[19] Dr. Fujiki Hata, discoverer of the anticancer drugs, is the present director of the Kitasato Institute. Today the institute employs the most modern equipment

and technology for the research, development, and production of vaccines and sera. An incubator with a capacity of 60,000 eggs per week is used to supply embryonated eggs for growing viruses. A battery of devices used to study fermentation technologies are shown in figure 15. A production-type fermentor with an agitator drive assembly is shown in figures 16 and 17. Equipment for freeze drying vaccines and sera is also available.

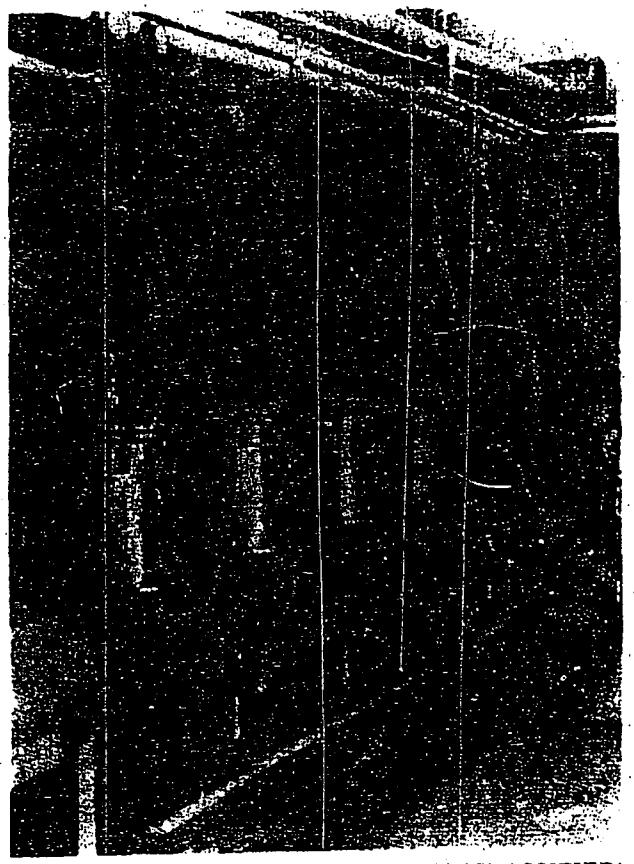


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Figure 15. Battery of fermentation devices (U).

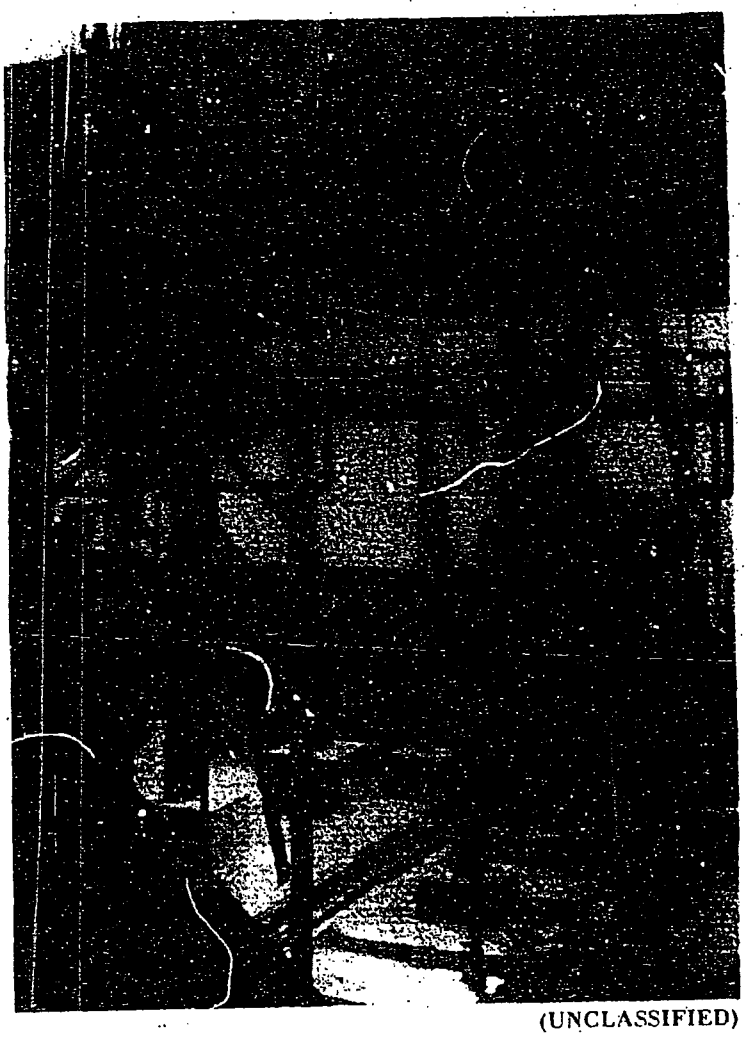

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Figure 16. Fermentor tank, Kitasato Institute (U).

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Figure 17. Impeller drive for mixing cultures (U).

f. Toshiba Chemical Industry Company, Ltd. This company is a subsidiary of the Tokyo Shibaura Electric Company, Ltd., (Toshiba) and produces vaccines and diagnostic reagents. In 1945 Toshiba acquired the facilities and staff of the "vaccine serum plant" of the ex-army Military Medical School at Sekiya, Miigata Prefecture. A few years later the operation was moved to Gosen City. The modern facility that it occupies was completed in 1968 and has the most up-to-date equipment (fig 18). Large volumes of infectious material can be handled with minimum hazard to personnel. The following vaccines and toxoids are produced:

Japanese Encephalitis Vaccine (Mouse brain, formalin inactivated).
Weil's Disease (Leptospirosis) Vaccine (killed bacteria).
Influenza Vaccine (embryonated egg, formalin inactivated).
Cholera Vaccine (Inaba and Ogawa strains, heat killed).
Epidemic Typhus Vaccine (*Rickettsia prowazekii*, formalin inactivated).
Diphtheria – Pertussis – Tetanus Vaccine.
Pertussis Vaccine (killed bacteria).
Tetanus, Toxoid.
Diphtheria Toxoid.
Measles Vaccine (Monkey liver tissue culture, inactivated virus).
Smallpox Vaccine (live vaccinia virus).
Poliomyelitis Vaccine (Monkey kidney tissue culture, formalin inactivated).
Typhoid – Paratyphoid Fever Vaccine (heat killed bacteria).

(UNCLASSIFIED)
Figure 18. Centrifuge room, Toshiba Chemical Industry Company, Ltd., Gosen City, Japan (U).

The company also produces immune sera to be used as diagnostic reagents for a number of bacterial and viral diseases. Bacterial and viral suspensions are also provided for diagnostic tests. Protective clothing (fig 19) is worn by personnel who handle infectious material. The same type of clothing is worn to help maintain sterility in the areas where the products are bottled (fig 20).

(UNCLASSIFIED)
Figure 19. Preparation of Japanese encephalitis vaccine, Toshiba Chemical Industry Co., Ltd. (U).

g. Serum Institute of Chiba Prefecture. This institute is under the jurisdiction of Chiba Prefecture and is located at Ichikawa, Chiba, while a veterinary branch is situated at Sakura, Chiba. The Serum Institute is financed through the sale of its products which are marketed through the Sankyo Co., Ltd. The institute was started in 1946 to manufacture biological products for the prevention and therapy of infectious diseases. The current technical staff includes 3 medical doctors, 20 veterinarians, and 15 chemists. The institute produces vaccines for human use that are effective against the following diseases: smallpox, diptheria, cholera, typhus, influenza, poliomyelitis, rabies, measles, tetanus, and Japanese encephalitis. Over 50,000 white mice are expended each week in the production of the Japanese encephalitis vaccine which is a formalin inactivated product. Antitoxins for diphtheria, tetanus, gas gangrene, and type E botulinum toxins are produced in horses and partially purified to remove extraneous proteins.

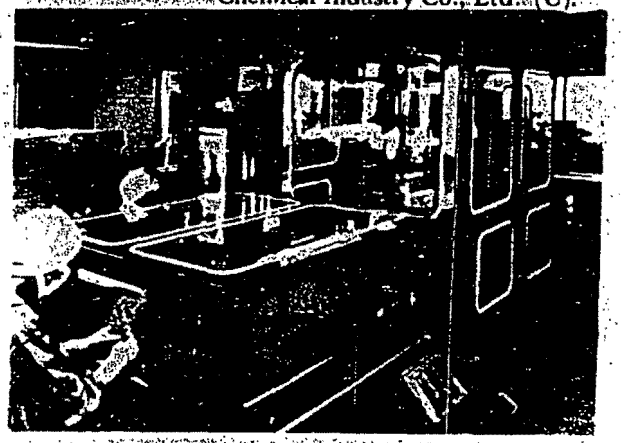

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Figure 20. Equipment for aseptic bottling of biological products, Toshiba Chemical Industry Co., Ltd. (U).

Vaccines are produced for the following animal diseases: Newcastle disease, Japanese encephalitis, swine erysipelas, rabies, swinepest, hen pox, poultry diphtheria, infectious pneumonia of swine, and black leg. Tetanus toxoid is produced for animal immunization and also an antitoxin for swine erysipelas. The institute has a modest research program which includes development of antitoxins for botulinum toxin types A, B, E, and F. Housed in modern buildings, the second of which was completed in April 1971, personnel work with the most modern scientific apparatus including some recently purchased from the United States and West Germany.

h. The Institute of Microbial Chemistry. The Institute of Microbial Chemistry was established in 1962 by the Microbial Chemistry Research Foundation. The foundation had been set up by the Japanese Government as a nonprofit organization financed by the royalties received from the sale of the antibiotic, Kanamycin. Kanamycin was isolated by Dr. Hamao Umezawa, an investigator at the National Institute of Health, who became the first director of the Institute of Microbial Chemistry. About 40 researchers are on the scientific staff. Although many of these are employed by pharmaceutical companies, they conduct research at the institute. Among the accomplishments at the institute are the discovery of several antibacterial and/or antitumor substances and the determination of their structures by X-ray analyses. Research is conducted on the chemical synthesis of these compounds, and studies are underway to elucidate their modes of action. Of particular note are studies of the mechanisms by which bacteria inactivate antibiotics, thus becoming drug-resistant. The buildings that house the institute are less than 10 years old and have the most modern equipment and facilities.

i. Institute of Low Temperature Science, Hokkaido University. This institute is affiliated with Hokkaido University, Sapporo, and was founded in 1941. Basic research is done on snow and ice formation under simulated antarctic conditions, on aspects of meteorology and oceanography, on the effects of low temperature on living organisms, and on freeze-drying of biologically active substances, foods, and microorganisms. The institute has 30 cold rooms, each of which is individually controlled from a centrally located systems control console. The cryogenic equipment was designed for the institute and manufactured in Tokyo. Several scientific papers dealing with factors affecting survival of freeze-dried microorganisms have been published by workers at the institute in both Japanese and English language journals.[20-22] In 1968 the institute was host to an international symposium on "Mechanisms of Cellular Injury by Freezing and Drying in Microorganisms." In 1969 it was reported that no infectious biologic material was handled at the institute.[2]

j. Fermentation Research Institute. This institute is a part of the Agency of Industrial Science and Technology which is an extra-ministerial office of the Japanese Ministry of Trade and Industry. It is located in Chiba City and employs 71 persons. Studies of continuous fermentation methods and the automatic control of these are an integral part of all research conducted by the institute. The research program includes studies of how hydrocarbons are metabolized by microorganisms, the biological treatment of industrial waste water, the production and utilization of enzymes by microorganisms, microbial decomposition of synthetic organic substances, research on sulfur-reducing bacteria, and the preservation of stock cultures of industrially useful microorganisms. At the institute there is a wide variety of fermentation vessels ranging in volume from 5 liters to 200 liters. These are frequently used in "strings" or rows for continuous fermentation processes. There is equipment for the automatic control of fermentations, several freeze-drying apparatuses, and an array of sophisticated instruments for physical-chemical determinations. In 1969 it was reported that no research was being conducted on continuous culture procedures for the production of either vaccines or tissue cells.

k. The Central Institute for Experimental Animals. The institute was established in 1952 to develop and produce uniform and disease-free animals for experimental use. In 1956 it was changed to a nonprofit foundation, and a research program was established. The animal production facility was moved to Kawasaki City in 1962, and in 1965 the Central Laboratory for Experimental Animals Japan Co., Ltd., was established to handle the mass production and sale of experimental animals. The Central Institute is the largest shareholder in the company, and in 1969 sales totaled 620,000,000 yen ($1.7 million). One of their specialties is the production of gnotobiotic (germ-free) mice which requires completely self-contained facilities to isolate the mice from the external atmosphere. Personnel at the two research divisions of the Central Institute conduct studies on genetics, breeding, microbiology, nutrition, animal care technology, pharmacology and toxicology.

16. (U) Agricultural Research

a. The Japanese government, through the Ministry of Agriculture and Forestry, has taken an active role in the development of a high level of agricultural productivity by designing various programs to encourage the spread of scientific farming methods. The actual organization and administration of these programs are done by the Agriculture, Forestry and Fisheries Research Council. There are 33 laboratories and experimental stations under the guidance of the council, and a number of regional and prefectural establishments have a peripheral association. Four of the research facilities under the Ministry of Agriculture and Forestry are characterized briefly below.

(1) The National Institute of Agricultural Science. This institute is located in Tokyo but maintains close contact with the experimental stations of each of the 46 prefectures. Principal emphasis is placed on the improvement of crop plant varieties, the establishment of standards for fertilizer application, the control of insect pests and plant pathogens, and the improvement of farm management.[23,24] The resistance of native, exotic, and derivatives of cross bred mutant varieties of rice to domestic and foreign strains of *Piricularia oryzae* (rice blast) was experimentally evaluated. Although this research was conducted to analyse the genetic resistance of rice varieties to various strains of *P. oryzae* the methodology employed duplicates that required for screening and testing anti-crop agents. Since procedures for mass producing spores of this fungus are well established, Japan has ample expertise to develop *P. oryzae* for anti-crop purposes, if she so desires.

(2) Central Agricultural Experiment Station. The station is located near Konosu in Saitama Prefecture. The Environment Division has five laboratories where insect pests and plant diseases are studied. Nematoda affecting crops, and viral diseases of rice and upland crops, are among the major investigative areas. Virus-free plants are grown by tissue culture methods.[2]

(3) The Institute for Plant Virus Research. Located at Chiba, this institute was founded in 1964 and has two research divisions. Personnel at one perform basic studies in physical chemistry, serology, and infection, while scientists at the other study taxonomy, pathology, and therapy as these disciplines apply to plant viruses.[2] Excellent basic research is conducted to improve understanding of the infectivity process and the genetic composition of plant viruses. Japanese scientists have separated the ribonucleic acid (RNA) and proteins of both tobacco mosaic virus (TMV) and cucumber green mottle mosaic virus (CGMMV) by treatment with phenol. They have not only recombined the RNA and protein to re-form the individual viruses, but have successfully combined TMV-RNA with CGMMV-proteins. Although the new virus had a CGMMV-protein coat, the biological characteristics were the same as the RNA material from TMV. Addition of both TMV and CGMMV-proteins inhibited recombination. The ability to separate and recombine viral RNA and protein of biologically different viruses could lead to the development of antiviral viruses for control of selected viral species, or could lead to the development of new plant pathogens with unique biological characteristics. It was found in studies concerning the role of ribosomes (centers of protein synthesis in the cell) that the removal of protein coats after viral entry into plant cells was largely inhibited in mid-process. No explanation is known for this phenomenon but these findings could lead to new methods for controlling viral infectivity. Protoplasts (cells without walls) have been successfully isolated from tobacco leaves after treatment with pectinase. These isolated cells provide an extremely simplified medium in which to study viral synthesis. Viral infection can be easily established and can

be easily monitored. Flourescent antibody staining techniques applied to follow viral development within these cells could permit rapid, specific identification of viral particles. In addition, these techniques may be extended to other plant species, for example rice and wheat.

(4) National Institute of Animal Health. In addition to a central laboratory in Tokyo there are five branch laboratories in various parts of the country. All support basic research on the causative agents of animal diseases in addition to providing diagnostic services and producing some vaccines. In 1957, this institute was designated as a Food and Agriculture Organization/World Health Organization (FAO/WHO) Brucellosis Center. Among the infectious diseases studied by investigators at the research divisions are brucellosis, pasteurellosis, diseases caused by enteric bacteria, hog cholera, and equine virus diseases.[25]

b. The production of agricultural chemical (herbicides, insecticides, and compounds active against the bacteria, viruses, and fungi affecting plants) has become a big business in Japan with gross receipts amounting to $290 million in 1970.[26] Approximately 13% of the national production is exported. These chemicals have been used extensively in Japan, and crop yields have improved spectacularly. Overuse has caused the accumulation of dangerous residual levels in several food crops and other agricultural products.[27] One of the means most extensively used to apply these compounds has been spraying from helicopters for wide coverage. Hand-operated sprayers and truck-mounted tanks are also used by individual farmers. Thus, Japan has the necessary equipment and expertise for defense against biological operations aimed at crop destruction, and the capability to use herbicides against crops for military purposes.

17. (U) Development and Testing

a. In order to conduct large-scale production and testing of BW agents, sophisticated technologies developed for other purposes could be utilized. Some examples are cited below.

b. The Yamatake-Honeywell Co., Ltd., has recently developed two versions of a minicomputer digital control system which can be used in conjunction with continuous fermentation processes.[28] Japan is a world leader in the field of automatic control of fermentation, and this development could facilitate large-scale production of agent materiel.

c. Several Japanese universities and industrial organizations actively support work in the fields of aerosol science and particle technology. Some of the research projects of recent

years include methods of particle sampling and particle deposition, characterization of filtration techniques, and studies concerning the effects of moisture on powder dispersion by blasts of air. No biological application of any of this research was reported, but mastery of these technologies would be useful to understand principles of both agent dispersion and agent detection.

d. A variety of air and liquid filters and filtering devices are manufactured by a number of companies in Japan. Most have an efficiency of 99% or greater when filtering particles of 00.5 micron in diameter, which would provide a high degree of protection from BW agents if incorporated into devices used for individual and/or collective protection. One company has produced an "Automatic Dust Counter" which might have application as an automatic BW detection device.

H. CONCLUSIONS

18. ~~(C)~~ Offensive Capability —

(b)(1)

19. ~~(C)~~ Defensive Capability —

(b)(1)

I. TRENDS AND FORECASTS

20. (U) Trends

(b)(1)

21. (C) Forecast:

(b)(1)

CONFIDENTIAL

(b)(1)

CONFIDENTIAL

Table III-1. Japanese Basis of Issue, BW Equipment - Nondivisional Units (U)

(b)(1)

CONFIDENTIAL

Table III-1. Japanese Basis of Issue, BW Equipment - Nondivisional Units (U) (Continued)

(CONFIDENTIAL-NFD)

(b)(1)

CONFIDENTIAL

(b)(1)

Table III-2. Japanese Basis of Issue, BW Equipment - 7000 Man Division (U)

(CONFIDENTIAL-NFD)

CONFIDENTIAL

(b)(1)

Table III-3. Japanese Basis of Issue, BW Equipment - 9000 Man Division and Airborne Division (U)

(CONFIDENTIAL-NFD)

Table III-4. BW Equipment on Japanese Naval Ships (U)

(b)(1)

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CONFIDENTIAL

Table III-5. Medical Laboratories, Japan, 1971 (U)

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Table III-5. Medical Laboratories, Japan, 1971 (U) (Continued)

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Table III-5. Medical Laboratories, Japan, 1971 (1) (2) ...

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Table III-5. Medical Laboratories, Japan, 1971 (U) (Continued)

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Table III-5. Medical Laboratories, Japan, 1971 (U) (Continued)

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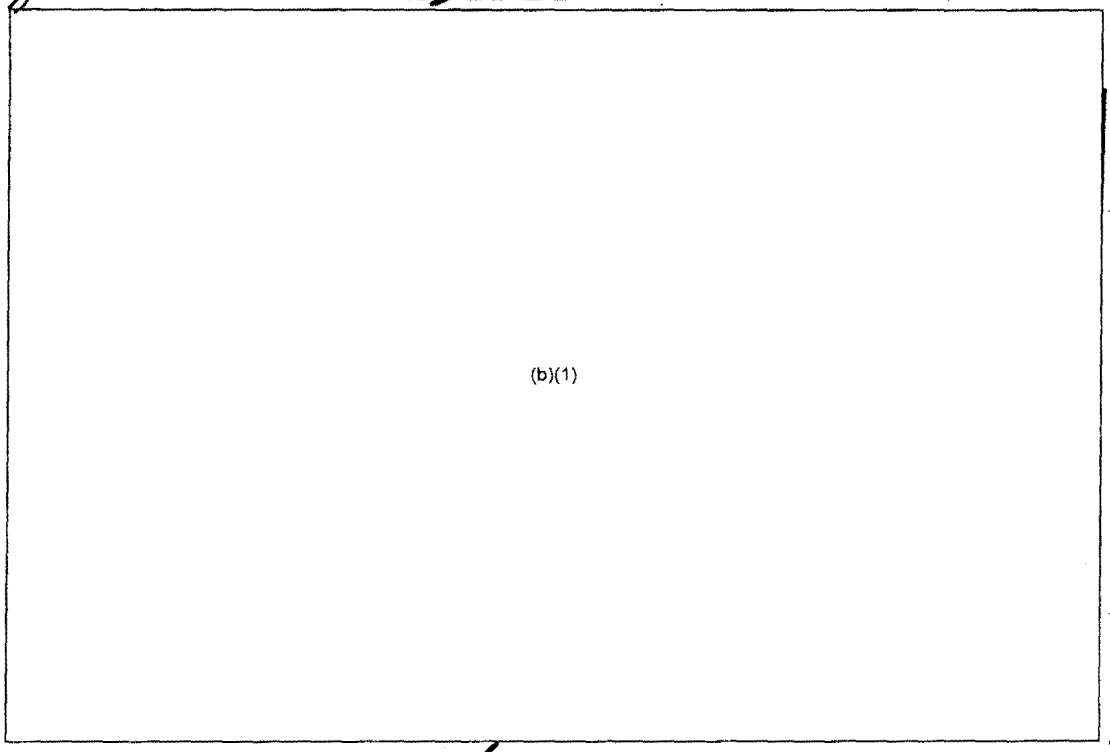

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Table III-5. Medical Laboratories, Japan, 1971 (S) (Continued)

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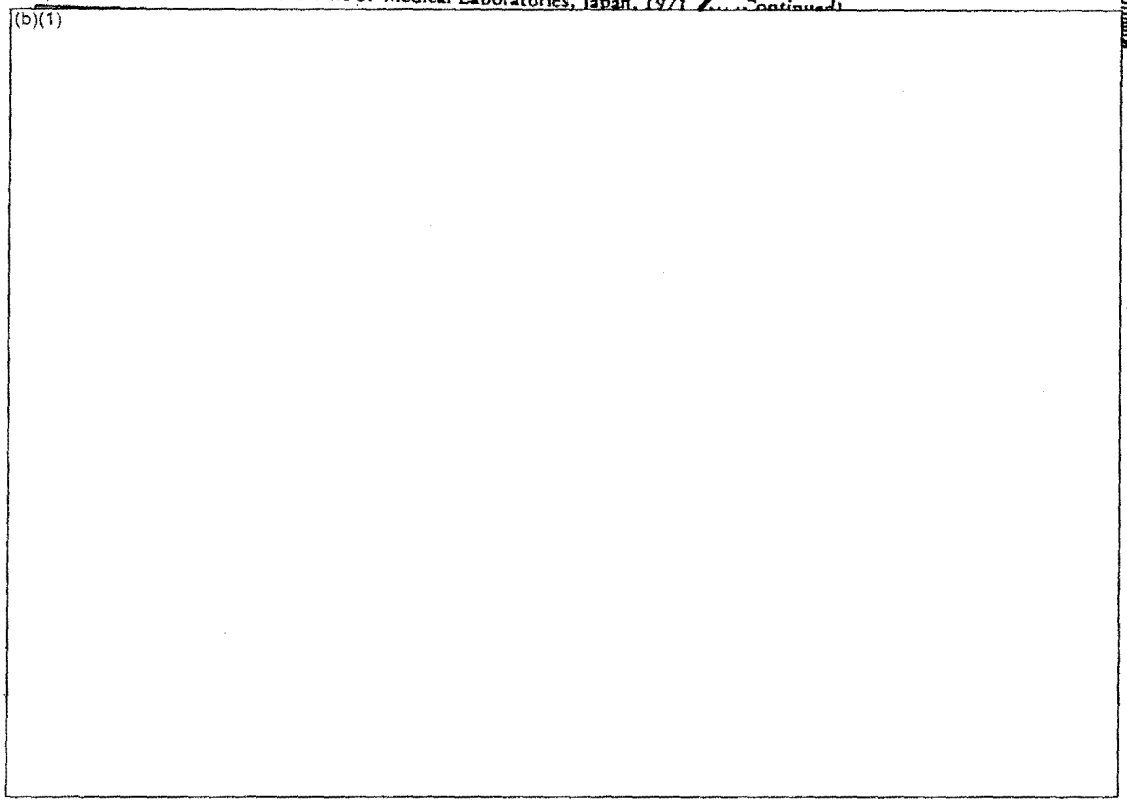

Table III-5. Medical Laboratories, Japan, 1971 (U) (Continued)

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Table III-6. Selected Manufacturers of Drugs, Antibiotics, and Biologicals, Japan, 1971 (U)

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Table III-6. Selected Manufacturers of Drugs, Antibiotics, and Biologicals, Japan, 1971 (U) (Continued)

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Table III-6. Selected Manufacturers of Drugs, Antibiotics, and Biologicals, Japan, 1971 (U) (Continued)

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Table III-6. Selected Manufacturers of Drugs, Antibiotics, and Biologicals, Japan, 1971 (U) (Continued)

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Table III-7. Growth of Japanese NIH Over a 20-Year Period (U)

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*330 yen = 1 US dollar

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LIST OF ABBREVIATIONS

AB	Company, enterprise, incorporated, etc. (Sweden)
BW	Biological warfare
C/B	Chemical and biological
CBR	Chemical, biological, and radiological
CERN	Centre Europeen des Recherches Nucleaires
CW	Chemical warfare
ESRO	European Space Research Organization
FAO	Food and Agricultural Organization
FDF	Finnish Defense Forces
Fmk	Finnish Mark; 1 mark = $0.025
FFV	Forenade Fabriksverksen (Defense Factory, Sweden)
FOA	Försvarets Förskningsanstalt, The Swedish Research Institute for National Defense
GSDF	Ground Self-Defense Force (Japan)
IAEA	International Atomic Energy Agency
ICSU	International Council of Scientific Unions
JDA	Japan Defense Agency
R and D	Research and development
S and T	Scientific and technical
S. Kr.	Swedish Kronor (pl), 1 krona = $0.27
UN	United Nations
UNESCO	United Nations Economic, Scientific, and Cultural Organization
WHO	World Health Organization

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13. ABSTRACT

The purpose of this study is to review on an individual basis the biological warfare capability of selected nonaligned countries that have advanced technologies. Included in this assessment are Sweden, Finland, and Japan. (U)

Sources of information were information reports, intelligence publications, abstract publications, and the open scientific literature. The study was organized under the following topics: order of battle for BW; BW materiel; doctrine, policy, and procedures; production facilities and capabilities; stockpiles and storage facilities; BW research, development, and testing. Pertinent historical, geographic, and political considerations were included as background for making the current analyses. (U)

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Aerosol						
Agent prophylaxis						
Biological warfare						
Biological warfare agents						
Biological warfare development programs						
Biological warfare doctrine						
Biological warfare materiel						
Biological warfare procedures						
Biological warfare protective clothing						
Biological warfare protective equipment						
Biomedical research institutes						
Decontamination						
Disease therapy						
Order of battle for biological warfare						
Vaccine						

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10 JUN 2013

This is in further response to your Freedom of Information Act (FOIA) request of October 23, 2008, and supplements our electronic message of May 12, 2010.

Coordination has been completed with another element of our command and other government agencies and records returned to this office for our review and direct response to you. We have reviewed the records and determined the records are partially releaseable to you. A copy of the records are enclosed for your use.

We have completed a mandatory declassification review in accordance with Executive Order (EO) 13526. As a result of our review information has been sanitized and 4 pages have been withheld in their entirety as the information is currently and properly classified TOP SECRET, SECRET and CONFIDENTIAL according to Sections 1.2(a)(1), 1.2(a)(2), 1.2(a)(3) and 1.4(c) of EO 13526. This information is exempt from the public disclosure provisions of the FOIA pursuant to Title 5 U.S. Code 552 (b)(1). It is not possible to reasonably segregate meaningful portions of the withheld pages for release. The records are enclosed for your use. A brief explanation of the applicable sections follows:

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You have received all Army intelligence investigative records pertaining to this request.

There are no assessable FOIA fees.

If you have any questions regarding this action, feel free to contact this office at 1-866-548-5651, or email the INSCOM FOIA office at: INSCOM_FOIA_ServiceCenter@mi.army.mil and refer to case #57F-09.

Sincerely,

Brad S. Dorris
Director
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Enclosure

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DEFENSE INTELLIGENCE AGENCY

BIOLOGICAL WARFARE CAPABILITIES -- EUROPEAN COMMUNIST COUNTRIES (U)

73-92467

(b)(3):10 U.S.C 424 DIA

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SAO/ST-SS-03-37-73

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DIA

March 1973

Information cutoff date: 3 January 1973

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PREFACE

(U) The purpose of this study is to assess the many facets of biological warfare information available on Czechoslovakia, East Germany, Poland, Hungary, Romania, Bulgaria, and Yugoslavia. For each of these nations, information is treated concerning: order of battle for biological warfare; identifications and descriptions of biological warfare materiel; production installations and capabilities; stockpiles and storage facilities; doctrine and procedures which would govern the use of biological warfare; defensive measures to be taken in the event biological warfare was initiated; and applicable research, development, and testing programs. Albania will be included in scheduled updates of this study. The biological warfare capability of the USSR is reviewed in a separate study (ST-CS-03-34A-71).

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(U) Throughout this product, titles of illustrations and tables are followed by the appropriate security marking symbol indicating the classification of titles only. Unclassified titles are indicated by the symbol (U). For headings (such as section, subsection, appendix, paragraph, etc.), the security marking symbol is given only for titles that are classified. Unclassified headings are indicated by the absence of any symbol.

(U) Constructive criticisms, comments, or suggested changes are solicited, and should be forwarded to the Defense Intelligence Agency, Washington, D. C. 20301, ATTN: DT-1A.

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LIST OF EFFECTIVE PAGES

SUBJECT MATTER	PAGE NUMBERS	DATE
Title Page	None	March 1973
Preface	iii and iv	Original
List of Effective Pages	v and vi	Original
Record of Changes	vii and viii	Original
Table of Contents	ix thru xxiv	Original
List of Illustrations	xxv and xxvi	Original
List of Tables	xxvi	Original
Summary	xxvii thru xxx	Original
Section I	1 thru 76	Original
Section II	77 thru 140	Original
Section III	141 thru 194	Original
Section IV	195 thru 218	Original
Section V	219 thru 240	Original
Section VI	241 thru 262	Original
Section VII	263 thru 282	Original
Appendix I	I-1 thru I-6	Original
Appendix II	II-1 thru II-4	Original
Bibliography	A-1 thru A-66	Original
DD Form 1473	B-1 and B-2	Original
Distribution List	C-1 and C-2	Original

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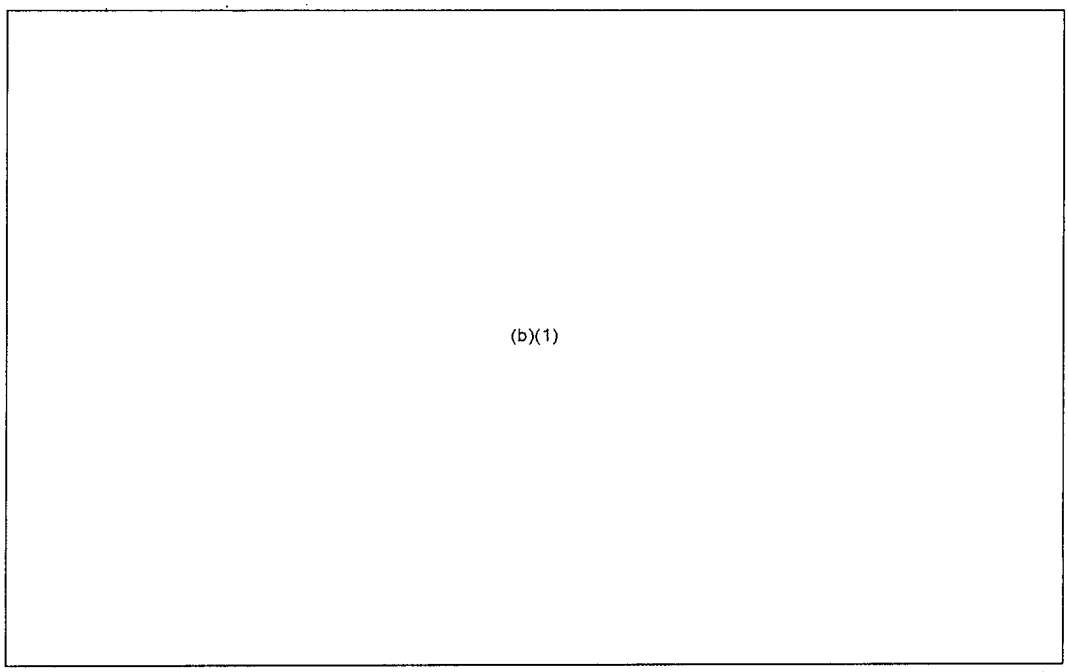

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Section I.

CZECHOSLOVAKIA

A. INTRODUCTION

1. (S) Historical Background

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(S)

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3. (U) Geography

Czechoslovakia is located on the Central European plateau, and its borders are generally situated on mountainous terrain. It is a long narrow country measuring approximately 500 by 175 miles. It is bordered on the north by Poland, on the east by the Soviet Union, on the south by Hungary and Austria, and on the west by West and East Germany. Most of the industrial and population centers, such as Prague, Plzen, and Ceske Budejovice, are located in the western part of the country. Bratislava, in the south central portion of the country, is about 35 miles from Vienna. The eastern part of the country would seem to be the most likely site for resting and producing agents for BW since this area is the most sparsely populated portion of the country, farthest from West Germany where the greatest threat to its security lies, and lies closest to the Soviet Union.

4. (U) Political Factors

(b)(1) Per CIA,(b)(3):50 U.S.C. 403

(b)(1)

B. ORDER OF BATTLE FOR BW

5. (U) Biological Warfare Program

(b)(1)

b. Organization and Strength

(b)(1)

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c. Training

(b)(1)

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6. (S) Organization for CBR Defense in Ground Forces

(b)(1)

b. (S) Army and Military District Level

(b)(1)

(4) (S) Organization and strength

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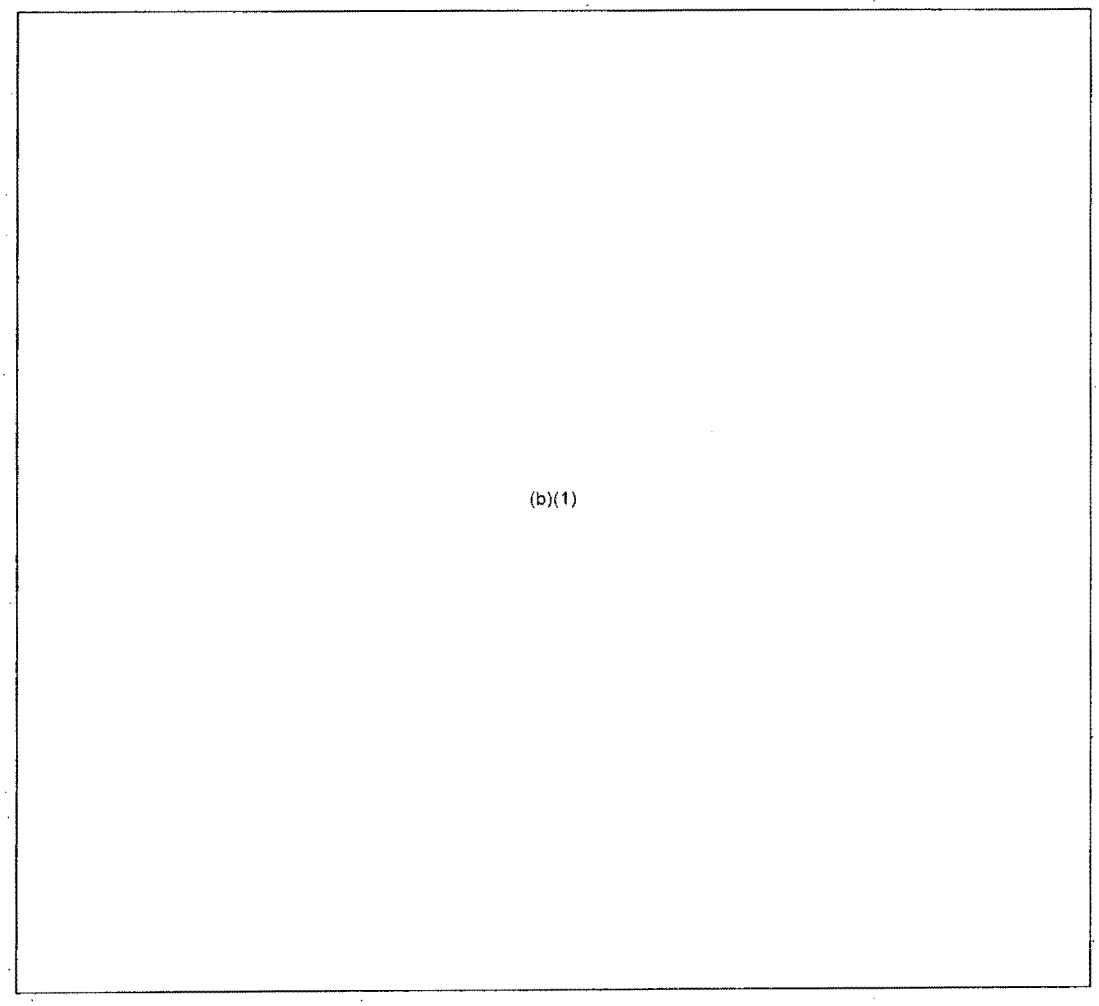

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(6) (S) Training

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c. (S) Division Level

(b)(1)

(b)(1)

d. (S) Regimental Chemical Reconnaissance Platoon

(b)(1)

(2) (S) Mission

(b)(1)

e. (C) Battalion Level

(b)(1)

(2) (C) (b)(1) Per CIA,(b)(3):50 U.S.C. 403

(b)(1) Per CIA,(b)(3):50 U.S.C. 403 (b)(1)

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7. (U) Medical Units Concerned With CBR Defense

a. (S) Hygiene and Epidemiology Detachment

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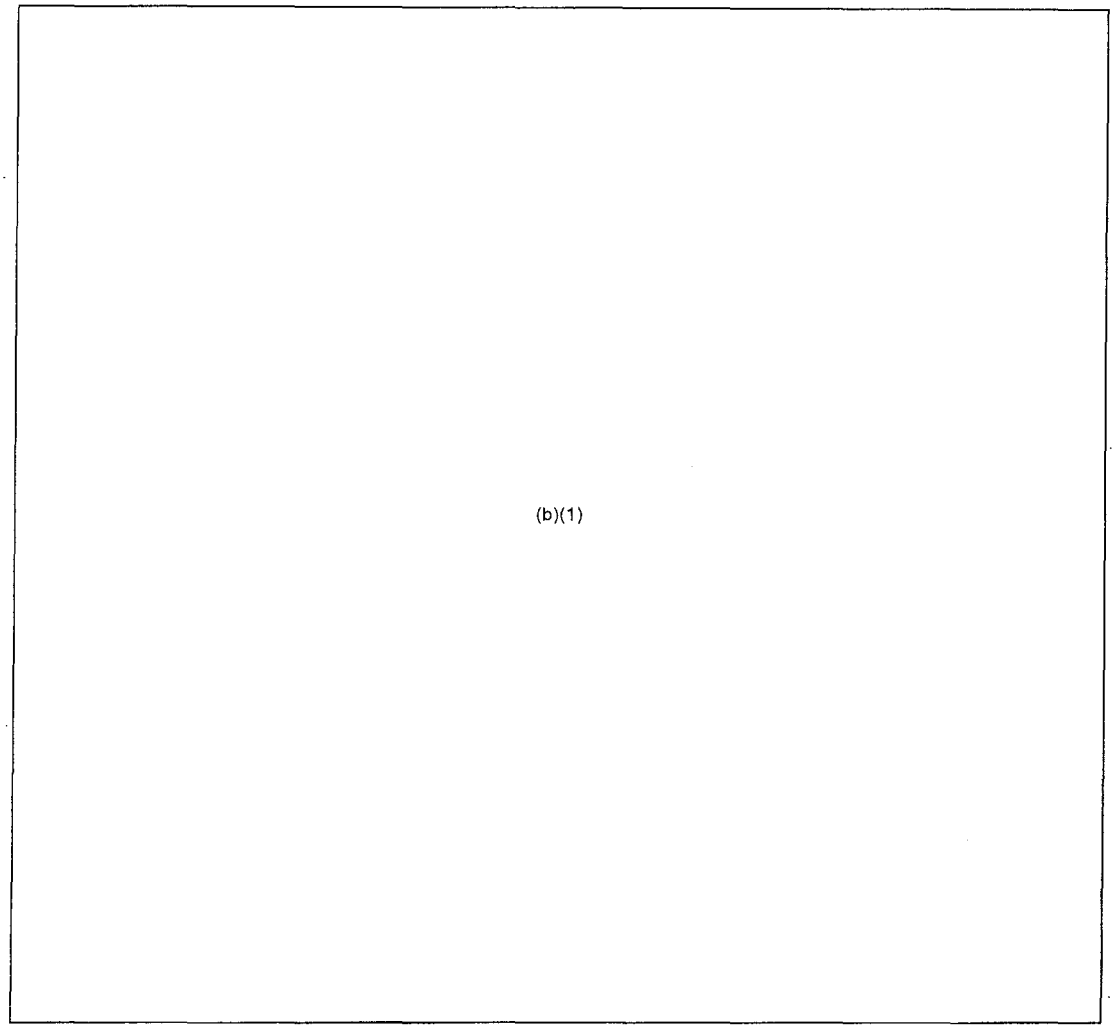

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b. (C) Hygiene-Epidemiology Platoon

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8. (C) CBR in Civil Defense Units and Programs

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C. DOCTRINES AND PROCEDURES GOVERNING USE OF BW WEAPONS

9. (S) General

(b)(1)

(b)(1)

10. (S) Secrecy Concerning Employment of Biological Weapons

(b)(1) Per CIA,(b)(3):50 U.S.C. 403

(b)(1),(b)(3):50 U.

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11. (S) Czechoslovak Plans for the Use of Biological Weapons

(b)(1) Per CIA,(b)(3)

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12. (S) BW Technical Troops

(b)(1)

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13. (C) Classified CBR Instructions

(b)(1)

D. DOCTRINES AND PROCEDURES FOR DEFENSE AGAINST BW

14. (U) Introduction

a. (U) Throughout the Czechoslovak Military organization there is ample evidence that the Czechoslovak Army is patterned after its Soviet counterpart. A Soviet publication on biological warfare and means of protection has been translated and published in Czechoslovakia.[141] It is not unreasonable to assume that Soviet doctrines and procedures for defense against BW, as published in the above book, have been adopted by the Czechoslovaks.

b. (U) Defense against BW consists of a complex of measures aimed at preparing the military and civilian population to ward off and eradicate disease infection in the event of an enemy biological attack. As discussed in detail below, these measures have been broken down into steps to be taken before the outbreak of hostilities, after the outbreak of hostilities but before an overt BW attack, and countermeasures which must be initiated during and after a BW attack.[141/142]

15. (U) Preparation

a. (U) Immunization. The use of vaccines is one of the most effective means of preventing infections by biological agents, but it is not practical to depend on this measure alone for several reasons. The number of possible BW agents is large, and protection against each agent usually requires immunization with a specific vaccine. Effective vaccines are not

available for all the possible BW agents, and concomitantly the duration of artificial immunity conferred by certain vaccines may be relatively short. Furthermore, a massive dose of the agent can usually overwhelm any degree of immunity.

b. (C) Compulsory Inoculations.[143]

(b)(1)

d. (U) Immunization Techniques

(1) (U) General. Any intent to immunize as a means of defense against BW requires the availability of effective vaccines against potential agents, ready accessibility to these vaccines in sufficient quantity, and the means to administer these vaccines quickly to large numbers of people. The task is simplest if the biological agents to be used are known. In the absence of this knowledge, the best action is to inoculate against as many likely candidate agents as possible. Mixed vaccines are convenient for this purpose.[144]

(2) (U) Mixed vaccines. The Soviets have published numerous papers on mixed vaccines which are effective against a variety of candidate biological warfare agents, including those causing anthrax, plague, brucellosis, tularemia, viral encephalitides, Q-fever, smallpox, yellow fever, cholera, and botulism. Soviet work on the development of mixed vaccines is considered to be primarily intended for BW defense.[144] The Czechoslovaks, however, appear to have done little or nothing to develop mixed vaccines.

e. (U) Sanitary Measures. The following sanitary-hygienic precautions are advocated[141/142] to prevent the spread of infectious diseases among the troops:

(1) (U) Observance by every serviceman of rules of personal hygiene.

(2) (U) Maintenance of proper sanitary hygiene conditions in areas where troops are located.

(3) (U) A supply of potable water and uncontaminated food for all personnel should be maintained.

f. (U) Training. Both troops and civilian populations are taught the nature and effectiveness of biological weapons, the need to recognize a biological attack, the use of defensive materiel to ward off and decontaminate biological agents, rules of personal hygiene, the procedures for maintaining cleanliness, the need to protect supplies, and clues to aid in the timely detection of infected personnel.[141/142]

16. (U) BW Intelligence and Agent Warning

Both overt and covert means are employed by the Soviets to obtain information on enemy preparations for BW. The defense system must anticipate a rapid exposure of personnel to biological agents and devise for rapid dissemination an appropriate warning in case of this eventuality. Foreknowledge of enemy intent is essential to take appropriate countermeasures and to initiate defensive precautions.[141/142] As there are no special devices yet developed by which all pathogenic microorganisms and toxins can be recognized immediately and precisely in real time, criteria have been set up for the observation and recognition of all clues indicating the employment of BW agents.[141/142] These signs have been described as being the dull explosion of an aerial bomb, artillery shell, or mine in the absence of indications that radioactive or poisonous substances have been released. Another sign would be the presence of powder-like substances and drops of liquid on the soil and vegetation near points of detonation. By observation, data can be collected about the scattering and impacting of various objects dropped from airplanes, about the presence of

insects, ticks, and rodents, and about the identity of insects and rodents foreign to the given locality. Finally, the explosive appearance of animal disease among livestock and the sudden outbreak of human illnesses can be due to infection by biological agents.[141/142] According to Soviet doctrine, observation posts are established everywhere, whether a unit is on the fighting front or in the rear, to insure security round-the-clock. The observer watches for sabotage infection; for the dissemination of bacterial agents from enemy aircraft or from special machines, sprayers, or other apparatus used for this purpose; and for the appearance of exotic biological vectors, etc. It has been emphasized that the appearance of unknown faces and any unusual activity in the surveyed district should always attract the attention of the observer.[141/142] To report a biological attack, alarm signals have been worked out and established in advance. These have been made known to all personnel, military and civilian alike. These signals are solely for an alarm in the event of either a chemical or biological attack. They are given a priority for dispatch by all possible means of communication.[141/142] When there is a positive indication that the enemy has applied BW agents, a so-called biological survey should be performed. Organization of the biological survey is the fixed responsibility of all commanding officers and their staffs. Both officers and soldiers can be utilized. In order that this duty can be successfully performed, officers and soldiers should always be well grounded in the fundamentals of biological warfare.[141/142] A biological survey is conducted constantly upon the initiation of military action, and, for this purpose, certain equipment is required: topographical maps, writing paper, pencils, protective clothing and gas masks, together with a set of small boxes, jars, and instruments for taking samples. A detailed procedure for conducting the survey has been established.[141/142]

17. (U) Rules of Conduct on Ground Contaminated by Bacterial Agents

a. In the event of biological warfare, every Soviet soldier, sailor, and officer is expected to exhibit unusual stamina, initiative, and dauntless determination for victory over the enemy. A BW attack cannot be the reason to cease fighting.[141/142]

b. The fundamental obligation of a soldier is the successful completion of his mission. For the successful completion of military missions under conditions of biological warfare, every serviceman must know how to protect himself and his arms from contamination; for these purposes, he must know how to use the fortified installations, topographical formations, field expediencies, and naval accommodations which may be available.[141/142]

c. To avoid contamination, every soldier must be able to use individual items issued for antibiological defense and to operate in them for extended periods. He must be able to

perform sanitary treatment, disinfection, and insecticidal procedures, and he must keep in working order the various items of individual protective equipment. When these items are not available, he must be able to improvise suitable substitutes.[141/142]

d. Provisions, water, and personal equipment must be kept free from contamination, and the sanitary-hygiene rules must be strictly observed. Every serviceman must know that terrain contaminated by biological agents is considered accessible for combat action. To minimize the contamination of the individual soldier by bacterial agents, precautionary measures have been prescribed. Contaminated terrain is best traversed in vehicles.[141/142]

18. (U) Antiepidemic Measures Employed Following a BW Attack

a. Sanitary Measures

(1) Partial sanitary treatment. Partial sanitary treatment and disinfection are to be accomplished immediately after the biological attack. These actions will be taken by each individual soldier. This treatment is limited to washing the exposed parts of the body and the surface of all military equipment which has to be touched for fulfillment of the military mission.[141/142]

(2) Complete sanitary treatment. Complete sanitary treatment is to be accomplished in an unpolluted place after the withdrawal of each unit or ship from combat. Complete treatment is also to be made available either in field or station hospitals for infected personnel who have been wounded. Special treatment points are planned for this complete sanitary and disinfecting treatment which consists of thorough scrubdown in a shower while personal clothing and equipment are being decontaminated.[141/142]

b. Organization of Observation and Quarantine

(1) General rule. All personnel of the Army exposed directly to biological agents or using food and water thought to be polluted by bacterial agents must be considered contaminated. In order to prevent the spread of infectious diseases, observation and follow-up procedures are to be instituted.[141/142]

(2) Observation. Observation is a system of measures for providing isolation and confinement as well as therapeutic and prophylactic treatment to prevent the spread of infectious diseases. The units under observation continue combat activities while maximal restrictions are placed on their contacts with persons who have not been exposed to the biological agents. Removal from the contaminated area of materiel which has not been

disinfected is prohibited. Special routes are set up for passage through the area. All exposed personnel are to be given emergency treatment, and every effort will be made to determine precisely which personnel have been infected. Departure of personnel from the contaminated area will be strictly controlled.[141/142]

(3) Quarantine. When it has been determined that microbial agents of especially dangerous diseases such as plague and cholera have been used, the protocol above must be replaced by quarantine. Quarantine is a system of control measures aimed at the complete isolation of the focus of each infection and the liquidation of infectious disease within it. With the consent of proper authorities, a quarantined unit may be withdrawn from combat. An armed guard for the contaminated area will be posted, departures are to be forbidden, and admissions will be restricted. In order to limit potential epidemics, exposed personnel will be divided into small groups. Special decontamination procedures will be followed.[141/142]

c. Decontamination Measures

(1) Boundaries. The boundaries of the contaminated area are determined as soon as possible after the biological attack. All efforts will be exerted to contain agent materiel within the area. After establishing the boundaries, a directive is issued for the behavior of personnel on the contaminated terrain; for the use of road, water supply, shelters, living, and agricultural premises; for the disinfection of combat equipment, transportation facilities, and arms; and for the sanitary treatment of personnel and animals. The decision whether or not to completely disinfect the contaminated area is to be made by the commanding officer.[141/142]

(2) Procedures. Decontamination machines are usually used for the disinfection of terrain, defense installations, combat equipment, and structures. Individual equipment will be disinfected with hand sprayers, manpack decontamination sprayers, hydraulic pumps, etc. Detailed decontamination procedures have been established.[141/142]

E. BW MATERIEL (OFFENSIVE)

19. (S) BW Weapons

(b)(1) Per CIA,(b)(3):50 U.S.C. 403

(b)(1)

569

(b)(1)

20. (S) BW Agents

(b)(1) Per CIA,(b)(3):50 U.S.C. 403

(b)(1)

F. BW MATERIEL (DEFENSIVE)

21. (C) General

(b)(1)

22. (C) Individual Protective Equipment

(b)(1)

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Original

(b)(1) Per CIA,(b)(3):50 U.S.C. 403

(b)(1) Per CIA,(b)(3):50 U.S.C. 403

(b)(1)

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TALENT-KEYHOLE (b)(1)
control systems jointly

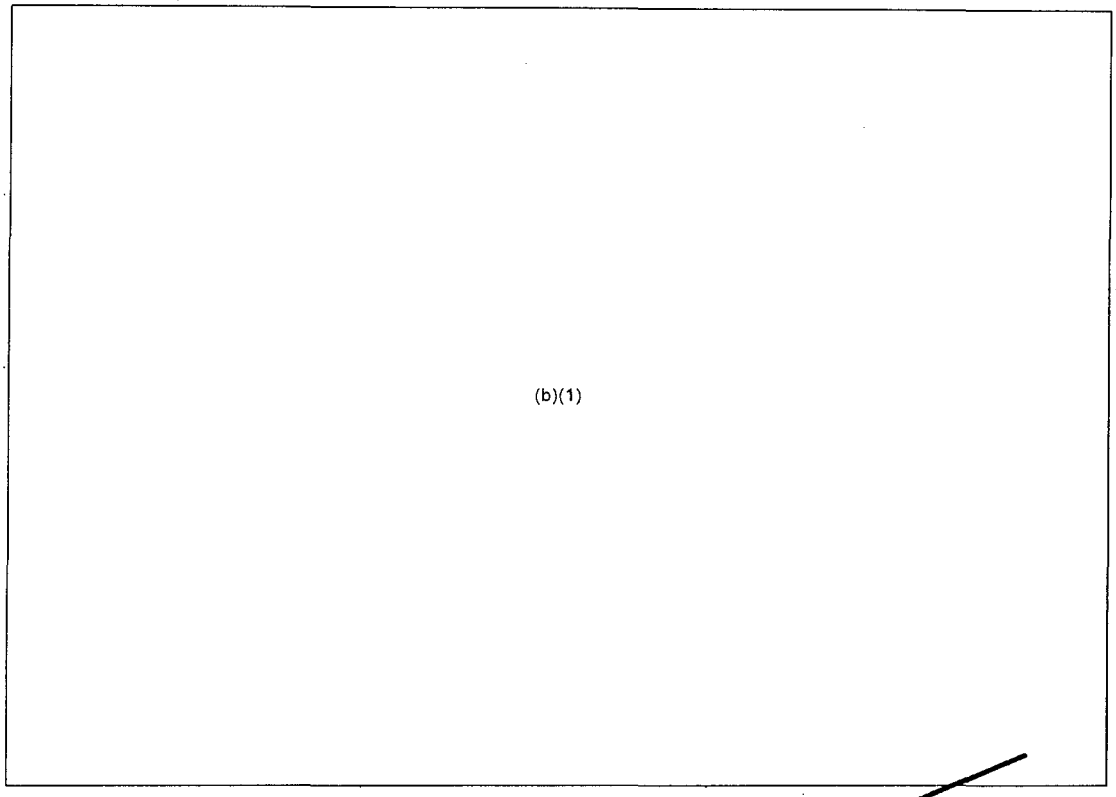

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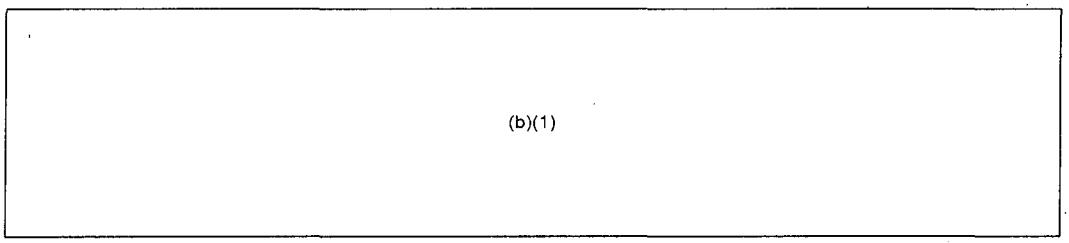
Figure 10. New Czechoslovak protective mask (U).



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Description of document:	Defense Intelligence Agency report, Biological Warfare Capabilities -Asian Communist Countries, 30 June 1974
Requested date:	23-October-2008
Released date:	10-June-2013
Posted date:	13-August-2013
Source of document:	Commander US Army Intelligence & Security Command Freedom of Information/Privacy Office ATTN: IAMG-C-FOI 4552 Pike Road Fort George G. Meade, MD 20755-5995 Fax: (301) 677-2956 Email: FOIA/Privacy Office Online FOIA Request Form
Note:	This report is one of 16 reports released under Mandatory Declassification Review by the US Army Intelligence & Security Command. All of these reports may be accessed here: http://www/governmentattic.org/inscomBWCW.html

DEPARTMENT OF THE ARMY
UNITED STATES ARMY INTELLIGENCE AND SECURITY COMMAND
FREEDOM OF INFORMATION/PRIVACY OFFICE
FORT GEORGE G. MEADE, MARYLAND 20755-5995

REPLY TO
ATTENTION OF:

Freedom of Information/
Privacy Office

10 JUN 2013

This is in further response to your Freedom of Information Act (FOIA) request of October 23, 2008, and supplements our electronic message of May 12, 2010.

Coordination has been completed with another element of our command and other government agencies and records returned to this office for our review and direct response to you. We have reviewed the records and determined the records are partially releaseable to you. A copy of the records are enclosed for your use.

We have completed a mandatory declassification review in accordance with Executive Order (EO) 13526. As a result of our review information has been sanitized and 4 pages have been withheld in their entirety as the information is currently and properly classified TOP SECRET, SECRET and CONFIDENTIAL according to Sections 1.2(a)(1), 1.2(a)(2), 1.2(a)(3) and 1.4(c) of EO 13526. This information is exempt from the public disclosure provisions of the FOIA pursuant to Title 5 U.S. Code 552 (b)(1). It is not possible to reasonably segregate meaningful portions of the withheld pages for release. The records are enclosed for your use. A brief explanation of the applicable sections follows:

Section 1.2(a)(1) of EO 13526, provides that information shall be classified TOP SECRET if its unauthorized disclosure reasonably could be expected to cause exceptionally grave damage to the national security.

Section 1.2(a)(2) of EO 13526, provides that information shall be classified SECRET if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

Section 1.2(a)(3) of EO 13526, provides that information shall be classified CONFIDENTIAL if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

Section 1.4(c) of EO 13526, provides that information pertaining to intelligence activities, intelligence sources or methods, and cryptologic information shall be considered for classification protection.

In addition, information has been sanitized from the records and 4 pages have been withheld in their entirety as the release of the information would reveal sensitive intelligence methods. This information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(7)(E) of the FOIA. The significant and legitimate governmental purpose to be served by withholding is that a viable and effective intelligence investigative capability is dependent upon protection of sensitive investigative methodologies. It is not possible to reasonably segregate meaningful portions of the withheld pages for release.

The withholding of the information described above is a partial denial of your request. This denial is made on behalf of Major General Stephen G. Fogarty, the Commanding General, U.S. Army Intelligence and Security Command, who is the Initial Denial Authority for Army intelligence investigative and security records under the FOIA. You have the right to appeal this decision to the Secretary of the Army. Your appeal must be postmarked no later than 60 calendar days from the date of this letter. After the 60-day period, the case may be considered closed; however, such closure does not preclude you from filing litigation in the courts. You should state the basis of your disagreement with the response and provide justification for a reconsideration of the denial. An appeal may not serve as a request for additional or new information. An appeal may only address information denied in this response. Your appeal is to be made to this office, for forwarding, as appropriate to the Secretary of the Army, Office of the General Counsel.

Coordination has been completed and we have been informed by the Central Intelligence Agency (CIA) that information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(1) and (b)(3) of the FOIA.

The withholding of the information by the CIA constitutes a denial of your request and you have the right to appeal this decision to the Agency Release Panel within 45 days from the date of this letter. If you decide to file an appeal, it should be forwarded to this office and we will coordinate with the CIA on your behalf. Please cite CIA #F-2010-01292/Army #57F-09 assigned to your request so that it may be easily identified.

Coordination has been completed and we have been informed by the Defense Intelligence Agency (DIA) that their information is exempt from public disclosure pursuant to Title 5 U.S. Code § 552 (b)(1), (b)(2) (b)(3) and (b)(4) of the Freedom of Information Act and Executive Order (EO) 13,526 § 1.4 (c) (d) and (h). The statute invoked under Title 5 U.S. Code 552 (b)(3) is 10 U.S.C. §424, which allows for the protection of organizational and personnel information for DIA.

The withholding of the information by the DIA constitutes a partial denial of your request and you have the right to appeal this decision directly to the DIA. If you decide to file an appeal, it should be forwarded to the Director, Defense Intelligence Agency, ATTN: DAN-1A-FOIA, Washington, DC 20340-5100. Please cite MDR #0155-2010 assigned to your request so that it may be easily identified.

You have received all Army intelligence investigative records pertaining to this request.

There are no assessable FOIA fees.

If you have any questions regarding this action, feel free to contact this office at 1-866-548-5651, or email the INSCOM FOIA office at: INSCOM_FOIA_ServiceCenter@mi.army.mil and refer to case #57F-09.

Sincerely,

Brad S. Dorris
Director
Freedom of Information/Privacy Office
Investigative Records Repository

Enclosure

AUG 30 1974

CIRC.

28 AUG 1974

ST-CS-03-148-75

FC74-027287
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SECRET

DEFENSE INTELLIGENCE AGENCY

BIOLOGICAL WARFARE CAPABILITIES— ASIAN COMMUNIST COUNTRIES (U)

NO FOREIGN DISSEM

Cy
ST-S-4-2704
SECRET

CLASSIFIED BY CDR, USAFSTC
EXEMPT FROM GDS OF EO 11652
EXEMPTION CATEGORY: 1,2,3
DECLASSIFY ON: RDPDET

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BIOLOGICAL WARFARE CAPABILITIES– ASIAN COMMUNIST COUNTRIES (U)

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ST-CS-03-148-75

(b)(3):10 U.S.C. 424

DATE OF PUBLICATION
July 1974
Information Cutoff Date
30 June 1974

This study supersedes ST-CS-03-148-72, dated March 1972, Amendment A, dated October 1972, and Amendment B, dated July 1973.

NATIONAL SECURITY INFORMATION
Unauthorized disclosure subject to criminal sanctions

This is a Department of Defense Intelligence Document prepared by the Foreign Science and Technology Center of the US Army Materiel Command with contributions from the Defense Intelligence Agency, the Naval Intelligence Support Center, the Foreign Technology Division of the US Air Force Systems Command, and the US Army Medical Intelligence and Information Agency, and approved by the Directorate for Scientific and Technical Intelligence of the Defense Intelligence Agency.

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Classified by Cdr, USAFSTC
Exempt from GDS of EO 11652
Exemption Category 1, 2, 3
Declassify on IMPDET

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PREFACE

(U) The purpose of this publication is to assess all information concerning the biological warfare capabilities of the People's Republic of China, North Vietnam, North Korea, and Mongolia. For each of these countries information is included concerning: order of battle for biological warfare; identification and description of biological warfare materiel; production installations and capabilities; stockpiles and storage facilities; doctrine and procedures that would govern the use of biological warfare; defensive measures to be taken in the event biological warfare were initiated; and applicable research, development, and testing programs.

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

(b)(3):10 U.S.C. 424

575

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Original

ST-CS-03-148-75

LIST OF EFFECTIVE PAGES

SUBJECT MATTER	PAGE NUMBERS	DATE
Title Page	None	July 1974
Preface	iii (Reverse Blank)	Original
List of Effective Pages	v (Reverse Blank)	Original
Record of Changes	vii (Reverse Blank)	Original
Table of Contents	ix thru xiii	Original
List of Illustrations	xiv	Original
List of Tables	xv	Original
List of Abbreviations	xv (Reverse Blank)	Original
Summary	xvii thru xx	Original
Section I	1 thru 60	Original
Section II	61 thru 72	Original
Section III	73 thru 86	Original
Section IV	87 thru 92	Original
Appendix I	93 thru 106	Original
Appendix II	107 thru 126	Original
Appendix III	127 thru 133 (Reverse Blank)	Original
Appendix IV	135 thru 140	Original
Appendix V	141 thru 150	Original
Appendix VI	151 thru 154	Original
Appendix VII	155 and 156	Original
DD Form 1473	157 and 158	Original
Distribution List	159 (Reverse Blank)	Original

Original

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RECORD OF CHANGES

CHANGE NUMBER	DATE OF CHANGE	DATE ENTERED	SIGNATURE, RANK/RATE AND ORGANIZATION OF INDIVIDUAL ENTERING CHANGE

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LIST OF ILLUSTRATIONS

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LIST OF ABBREVIATIONS

ASM	air-to-surface missile
BHC	benzene hexachloride
BW	biological warfare
CAMS	Chinese Academy of Medical Sciences
CAS	Chinese Academy of Sciences
CBR	chemical, biological, and radiological
CCP	Chinese Communist Party
CPLA	Chinese People's Liberation Army
CW	chemical warfare
DNA	deoxyribonucleic acid
DRV	Democratic Republic of Vietnam
GSD	General Staff Department
ICBM	intercontinental ballistic missile
IRBM	intermediate range ballistic missile
JBE	Japanese B encephalitis
MAC	Military Affairs Committee
MOD	Ministry of National Defense
MPH	Ministry of Public Health
MRBM	medium range ballistic missile
NKA	North Korean Army
NKN	North Korean Navy
NVA	North Vietnamese Army
PLA	People's Liberation Army
PRC	People's Republic of China
PRCN	People's Republic of China Navy
RNA	ribonucleic acid
VC	Viet Cong

SUMMARY

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Section I.

PEOPLE'S REPUBLIC OF CHINA

A. INTRODUCTION

1. Historical Background

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2. (C) Competence in Microbiology and Public Health

(b)(1)

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3. (C) Geographical and Political Factors (U)

a. (U) The PRC is the third largest country in the world, occupying about 3.7 million square miles, and the population comprises about one-fifth that of the world. To the north and west, an extensive boundary is shared with the Soviet Union, a boundary which separates the two most powerful Communist countries. To the south, China borders on several weak, unstable countries, one being North Vietnam. She has used North Vietnam as a base for Communist operations against neighboring countries. China also shares common borders with North Korea, Mongolia, Afghanistan, India, Nepal, Bhutan, Burma, and Laos. The mainland is within 2500 nautical miles of every major target in Asia as well as European USSR. Two-thirds of China's area is mountainous or desert-like, and 90% of the population live in one-sixth of the country, primarily in the fertile plains and deltas of the east.[15]

(b)(1)

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c. (U) The PRC has not signed the United Nations agreement entitled "Convention of the Prohibition of the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons and Their Destruction," which was signed simultaneously in Washington, London, and Moscow on April 10, 1972. To date, 109 nations have signed, and 34 nations have ratified the Convention. The PRC has not signed because the government did not participate in the Convention and is opposed to the separation of controls on CW and BW. What future action may be taken regarding the Convention is unknown.

B. ORDER OF BATTLE

4. (S) Military Organization

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Freedom of Information Act/Privacy Act
Deleted Page(s) Information Sheet

Indicated below are one or more statements which provide a brief rationale for the deletion of this page.

☒ Information has been withheld in its entirety in accordance with the following exemption(s):

Title 5 USC (b)(1)

It is not reasonable to segregate meaningful portions of the record for release.

☐ Information pertains solely to another individual with no reference to you and/or the subject of your request.

☐ Information originated with another government agency. It has been referred to them for review and direct response to you.

☐ Information originated with one or more government agencies. We are coordinating to determine the releasability of the information under their purview. Upon completion of our coordination, we will advise you of their decision.

☐ Other:

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NO DUPLICATION FEE
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Page(s) 596-597

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5. (C) Military Equipment

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Table I. Location of Chemical Units in the PRC (U)[1-2]

(b)(1)

Original

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Figure 2. CBR reconnaissance troops in light protective clothing (U).

*See appendix I.

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Table II. Basis of Issue for CBR Equipment—PRC Army (U)[3]

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6. (C) Military Training

(b)(1)

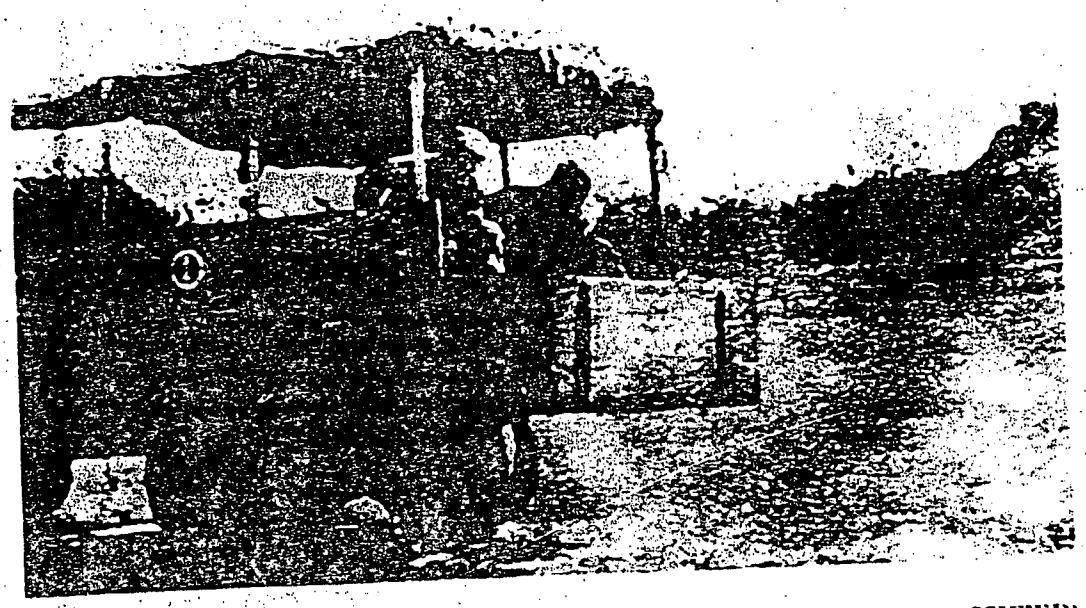

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Figure 3. Vehicle ground decontamination exercises (U).

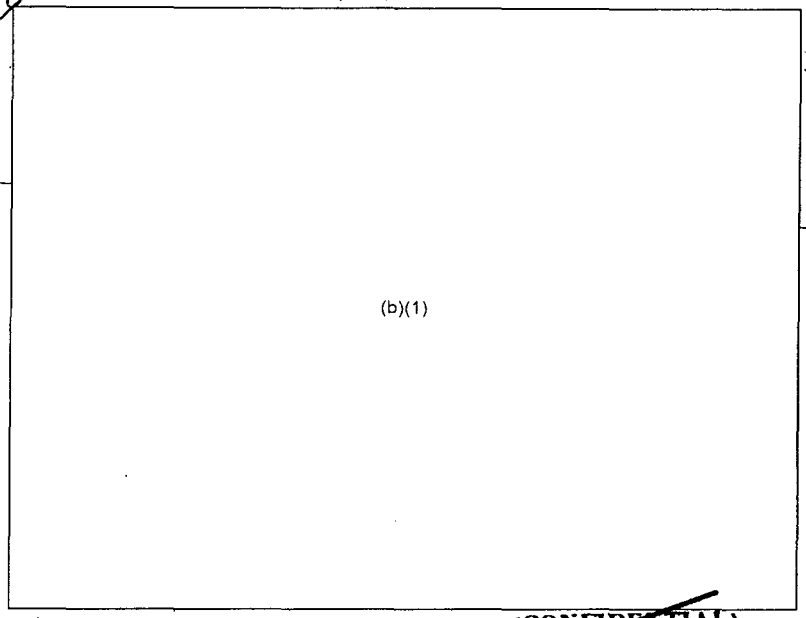

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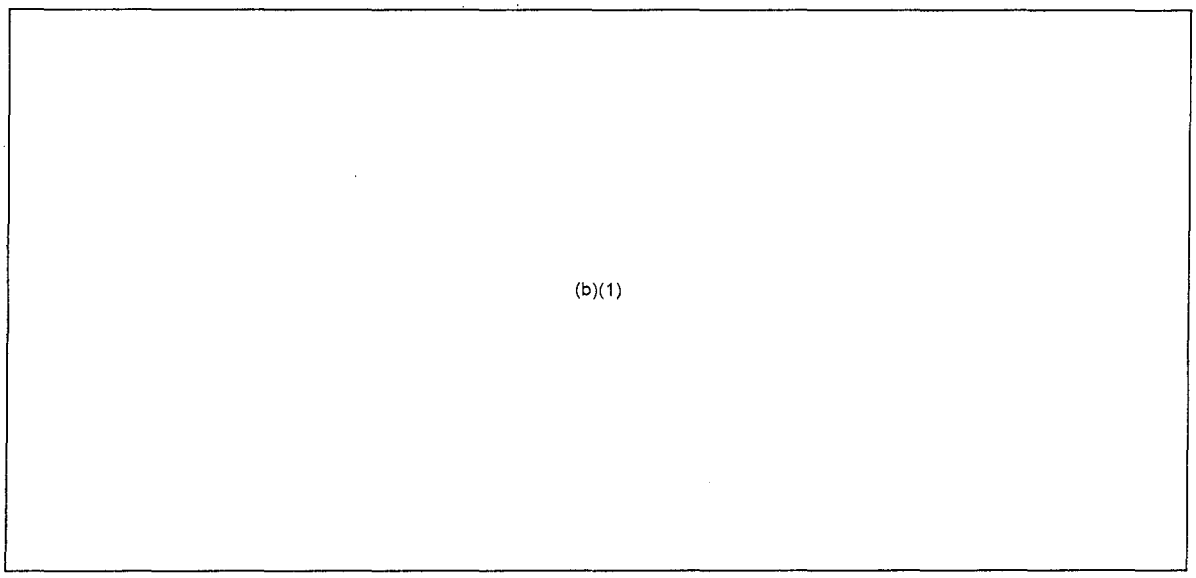
Figure 4. Troops preparing to ford stream in full protective clothing (U).



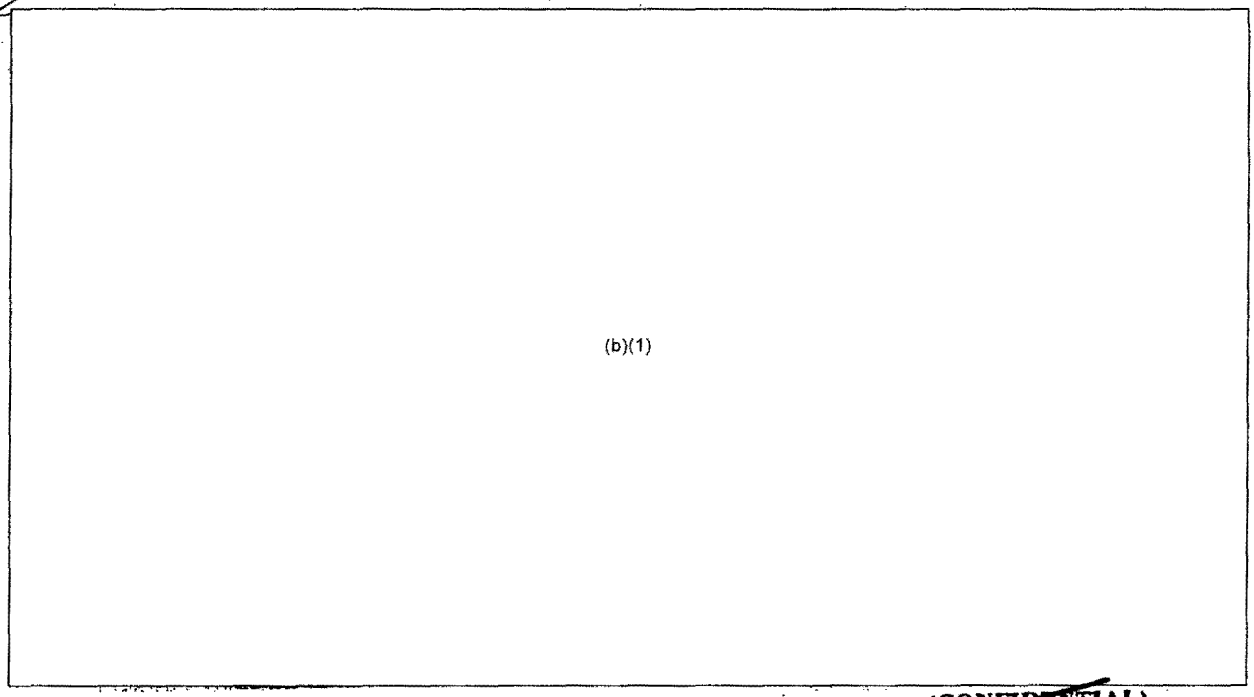


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Figure 5. CW school and research station at Ch'ang-p'ing (U).

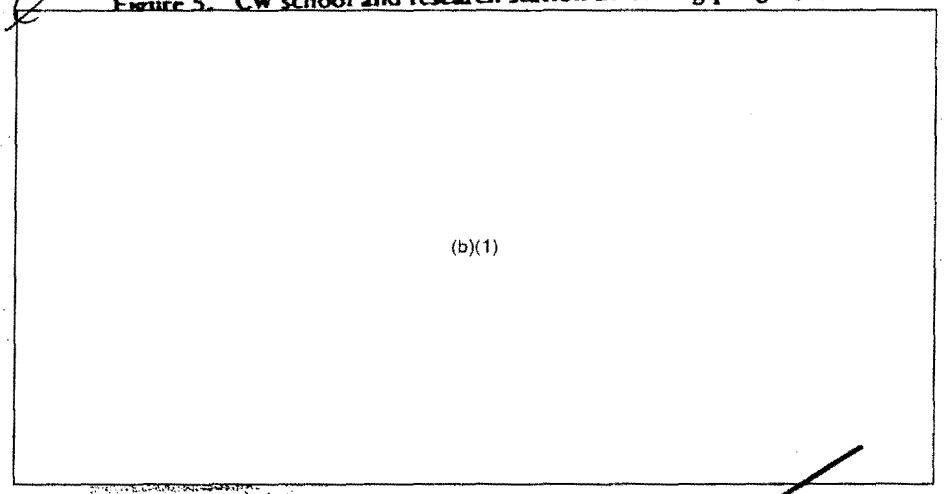

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Figure 6. Decontamination exercise at CW school at Ch'ang-p'ing (U).

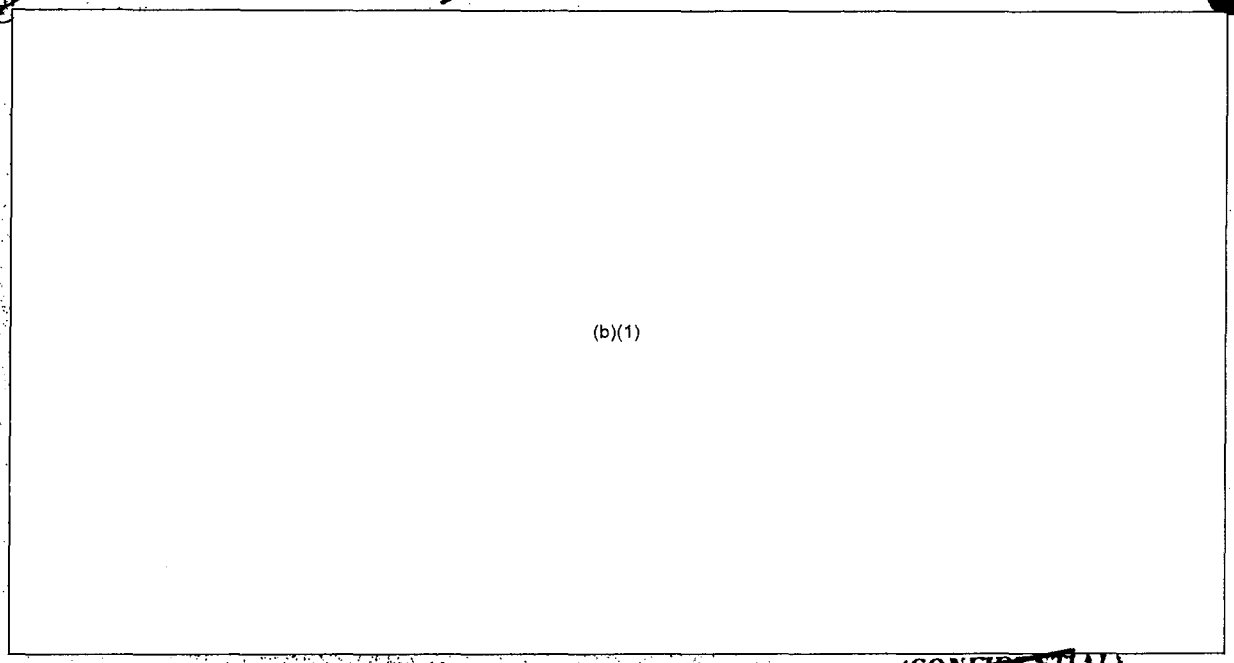

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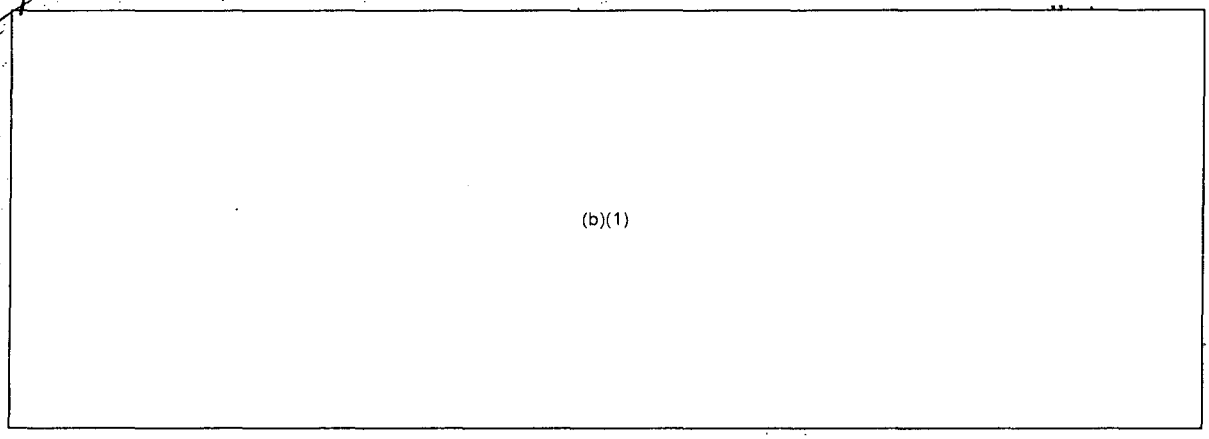
Figure 7. Troops in full protective clothing training with detector kits at CW school (U).



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7. (C-NFD) Naval BW Operational Capabilities

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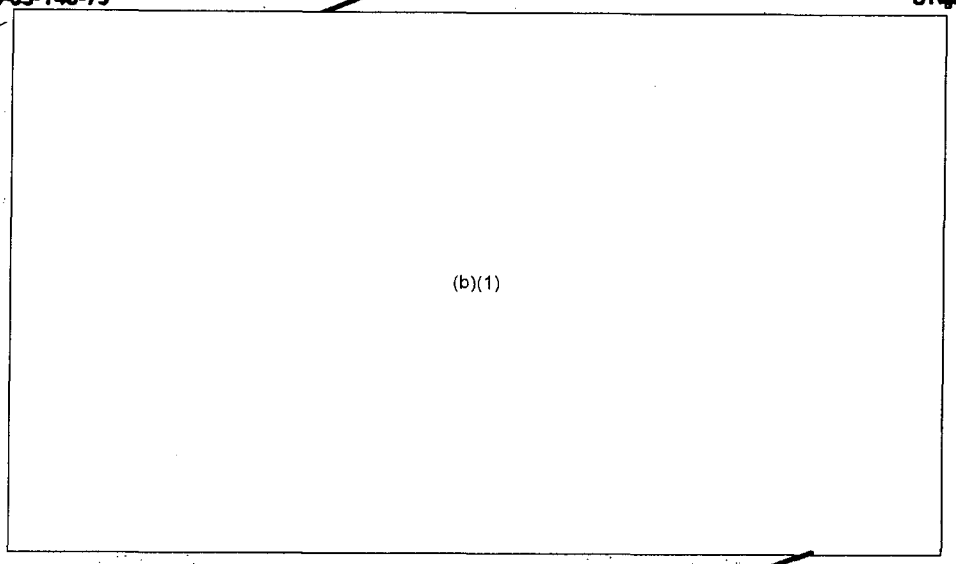

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Figure 8. Battle training at sea (U).

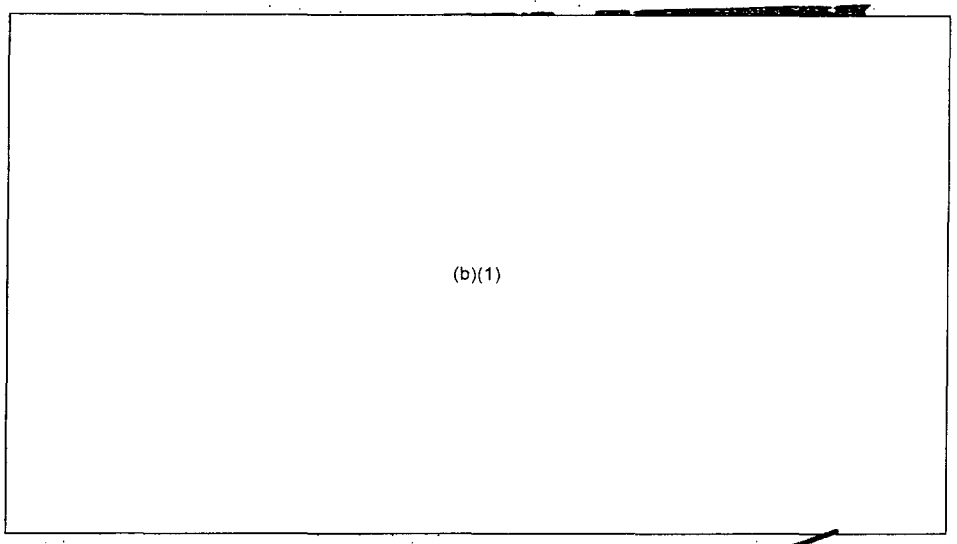

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Figure 9. Decontamination exercise aboard ship (U).

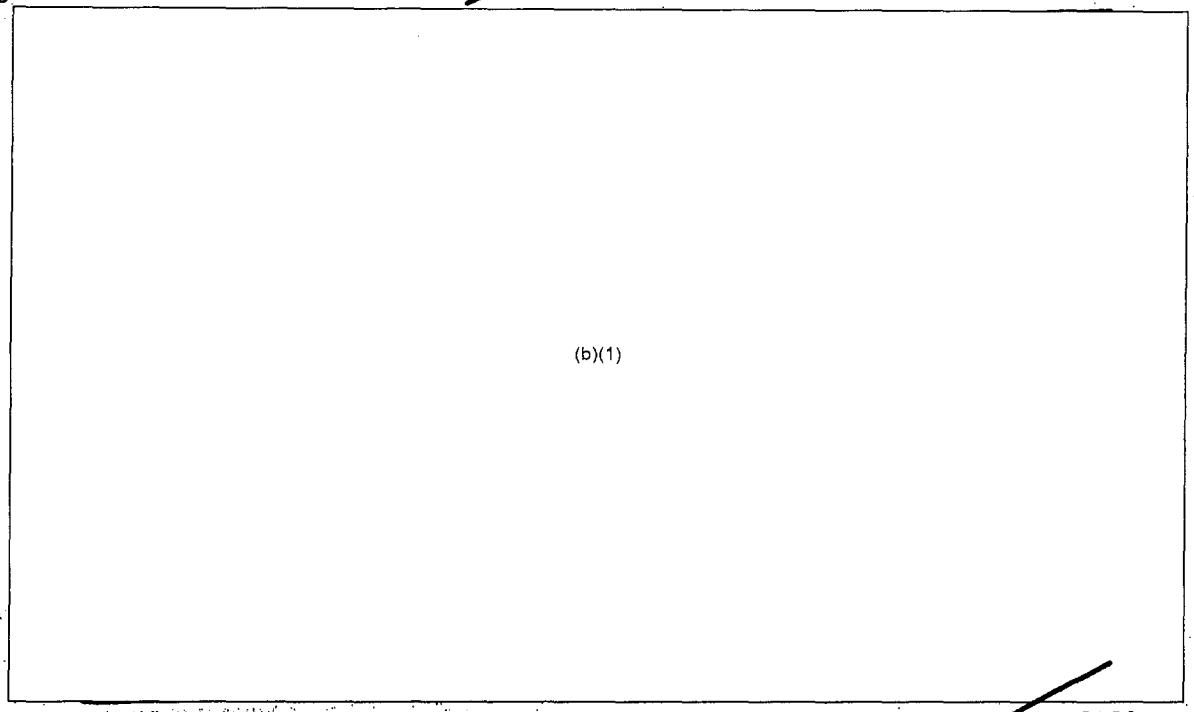

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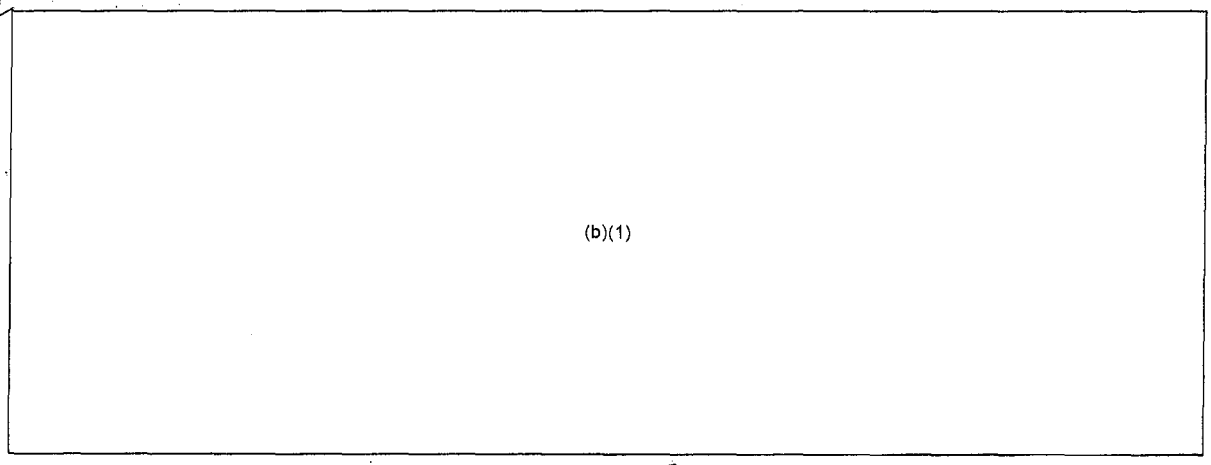
Figure 10. CBR exercise aboard Chinese ship (U).



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8. (C-NFD) Aerospace BW Operational Capabilities

(b)(1)

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C. POLICY, STRATEGY, AND TACTICS REGARDING USE OF BW

9. ~~(C)~~ Policy a

(b)(1)

10. ~~(U)~~ Procedures

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D. POLICY, STRATEGY, AND TACTICS REGARDING DEFENSE AGAINST BW

11. (C) Policy

(b)(1)

12. (C) Procedures

(b)(1)

(b)(1)

E. BW MATERIEL (OFFENSIVE)

13. (C) Agents

(b)(1)

14. (C) Delivery Systems

(b)(1)

(b)(1)

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d. (U) The Chinese have studied the transovarian transmission of *Rickettsia tsutsugamushi* by two types of *Trombicella deliensis*, which provides basic information for establishing vector colonies and their subsequent infection for possible use in a vector-agent system.[67] A 1966 publication urged that extensive studies of insect culture be undertaken in order to remain abreast of foreign developments.[68]

e. (U) The Institute of Genetics, Chinese Academy of Sciences (CAS), studies special topics in "microbacteriology" and entomology, areas of research considered the "vanguard for future bacteriological warfare."[69] Allegedly, discoveries in the field of bacteriology made by this institute have had profound effects on the entire mainland, but these discoveries have not been disclosed.

F. BW MATERIEL (DEFENSIVE)

15. (S) Decontamination

(b)(1)

*See appendix I.

(b)(1)

16. (U) Detection and Identification

a. (U) There is little indication that the Chinese have conducted research to develop means of detecting and identifying biological agents. The results of some related research could be exploited for such a purpose. The Wuhan Army General Hospital obtained rapid results in identifying 55 different species of bacteria by their biochemical reactions. The time required to identify bacteria by this technique was 20 to 24 hours as opposed to 4 to 5 days by conventional means.[73] In 1964, an unknown author summarized a method for determining the generation time of *Bacillus anthracis*.[74] The following year a broth method was compared with the agar method to demonstrate the "string-of-pearls" reaction for *B. anthracis*. Details of the test were not given, but the author claimed that results were identical. Possibly the modified reaction would have contributed to more rapid identification of *B. anthracis*.[75] Other studies suggestive of rapid identification described experiments with incomplete antibodies for the diagnosis of brucellosis[76] and compared various methods for identifying Brucella.[77]

(b)(1)

17. (C) Medical Protection

(b)(1)

b. (U) Chinese military cadres are inoculated with a combined cholera and typhoid vaccine once a year. Claims have been made that all people have received vaccinations for smallpox and that the disease has been eradicated. Vaccines or antisera for typhoid, paratyphoid, typhus, diptheria, tetanus, rabies, plague, cholera, yellow fever, and Japanese B encephaliris have been developed, but the scale of use is not known. The use of live vaccines has been exploited in China; live vaccines for brucellosis, plague, and anthrax are available.[3] Vaccines for the more serious animal diseases, such as swine plague, hog cholera, rinderpest, and foot-and-mouth disease, have been developed. In 1964, a method of aerosol immunization was introduced into veterinary practice. The vaccine material was sprayed or dusted into a room where animals were exposed and immunized.[8 7] Immunization of humans by the aerosol route with live vaccines of brucella, influenza, and upper respiratory infectious agents is under investigation.[4 9] Continued efforts in aerosol research could provide means for the mass immunization of the human population and of animals in the event biological agents are used.

(b)(1)

G. PRODUCTION FACILITIES

18. (C) Agents and Munition

(b)(1)

19. (C) Defensive Equipment

(b)(1)

(b)(1)

H. BW RESEARCH, DEVELOPMENT, AND TESTING

20. ~~(C)~~ General

(b)(1)

21. (U) ~~(C)~~ Military Facilities

a. ~~(C)~~ The China Science and Agricultural Scientific Research Institute, Hainan Island.

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c. (U) The CPLA Veterinary University of China. The location of this institute and its true military afficiation cannot be verified. It could be part of the China People's University in Peking, or it might be misnamed because of incorrect translation.[103] An investigator reportedly associated with the University has studied the various types of *Pasteurella* isolated from 11 species of animals and fowl.[104] His observations of morphological, physiological, and biochemical properties indicated that there were no consistent host/bacterial specificities that could be reliably used to classify the 62 types of *Pasteurella* isolated. In general, although one strain of *Pasteurella* might attack many species of domestic animals and fowl, a single species of animal might be infected by several strains of the bacteria. All strains isolated in nature could give rise to variant types when grown in artificial media. Although this study was apparently conducted to advance veterinary immunology, the basic data concerning susceptibility of animals to this disease and the genetic selection of mutant strains could be applied to other infectious diseases.

(b)(1)

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22. Non-Military Facilities

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(3) (U) Ch'en Po-ch'uan and others studied the infectivity of JBE virus in 1963.[127] They concluded that a plaque assay could be used for the routine titration of viral infectivity. A similar study, which concerned the plaque-forming characteristics of several different strains of this pathogen, was conducted.[128]

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(5) (U) Liu has published reports of his work with JBE virus.[131] He attempted to relate aspects of the molecular structure of the viral RNA to various biological properties

possessed by the intact virus. Liu and coworkers at the Laboratory of Biochemistry of the Institute of Virology published two studies concerned with the infectious RNA of JBE virus, noting a change in RNase activity in mouse brain tissue during the course of an infection.[132,133] He worked on the purification of Type B infectious encephalitis virus and established the effect of pH on the maintenance of viral infectivity.[134] Liu later described the effect of Type B infectious encephalitis virus multiplication on xanthine oxidase activity in host tissue and also participated in several studies concerned with the influenza virus.[135]

(6) (U) Mao studied the effect of temperature and pH on the production of JBE virus and the effect of those parameters on interferon subsequently synthesized in chick embryo cell cultures.[136] The optimal temperature for virus growth was found to be 33.5°C, although interferon production increased as higher temperatures were reached. The optimal pH for interferon production ranged between 7.1 and 7.6, while the optimal pH for production of the infective virus was 7.8. These data suggest, therefore, that at pH7.8 and at 34.5°C, the Peking strain of JBE virus would propagate to maximum titers under conditions severely inhibiting the production of interferon. The Peking strain of JBE virus is the most virulent of those known.

(7) (U) Many other investigators at this institute have contributed also to general knowledge of the JBE virus. Included are reported observations made with an electron microscope of JBE virus developing in chick embryo fibroblasts and in hamster kidney cells.[137] In 1960 Wang studied comparatively the growth of JBE virus in the brain and in the extracentral nervous tissues of white mice.[138,139] Other studies involved the use of mice in determining the mechanism of immunization against JBE,[140] and the enzymatic activity and effects of ribonucleic acid (RNA) extracts of JBE on mouse brain tissue.[141] Much of the data obtained from these studies relative to the growth characteristics of the JBE virus would be essential to support any effort to mass produce this virus as a potential BW agent.

c. (U) Institute of Epidemiology and Microbiology, Peking.

(1) (U) This institute is subordinate to the CAMS. Research appears to be oriented toward the detection and identification of organisms causing infectious diseases, with emphasis on brucella species. Reports were published on the *in vitro* survival and multiplication of brucella in monocytic culture.[142] These studies were carried out primarily to explore the possibility of using a cellular reaction as a parameter of immunity against brucellosis.

(2) (U) Other work on brucella involved the agar diffusion reaction.[143] This interest in brucellosis and research to develop a live vaccine for aerosol immunization

suggest that China is not free of the consequence of this chronic disease. Attempts to resolve problems affecting public health and the practice of veterinary medicine will generate a great deal of data, some of which will be applicable to the development of brucella pathogens for BW.

(3) (U) The institute has investigated the susceptibility of human embryonic kidney and lung tissue cell cultures and monkey kidney cells to Coxsackie and Echo viruses. Monkey kidney cells were more susceptible to polio viruses, while the human kidney and lung cells were more susceptible to other viruses studied.[144] A new method to prepare virus-infected cells for electron microscopy was devised by placing a fine plastic tube in the center of the condensor of a light microscope. The condensor is gradually elevated until the plastic tube touches cells that have been previously fixed on a cover slip. This technique is simple and timesaving, and may allow easier selection of cell groups in their early stages of infection.[145] This work gives an indication of the level of expertise achieved by members of the institute.

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(3) (U) In 1962, studies were conducted on induced allergic encephalomyelitis in guinea pigs, albino rats, white mice, rabbits, and monkeys.[153] The pathological changes observed in monkeys were found to be much more complex than in the other animals, a result which might have been used as a parameter to determine similar effects in man.

(4) (U) A paper presented at the 1963 Symposium sponsored by the Microbiology Society of China[154] described the finding of an interferon-like substance in chick embryo cultures infected with either type B epidemic encephalitis virus or yellow fever virus. Effective inhibitory concentrations were present even after a dilution of 1:160, a fact that indicated a need to make further adjustments in concentration to reduce the plaque count to 50%. In a follow-up study (1964), JBE virus culture was investigated. The nutritional aspects of viral growth using monolayer tissue cultures were elucidated.[155]

(5) (U) Other notable research conducted at the institute included a study of the activation of botulinum type E toxin by trypsin.[156] This study confirmed the previous observations of others. Available published research on the incidence of botulism in China is scarce, and the extent of research on the toxin is not apparent. Research on botulism would probably be consonant with similar studies in other countries to combat its incidence, but might also aid any effort to develop this potential BW agent.

f. (U) Chengtu Institute of Biological Products (Chengtu Vaccine and Serum Institute), Chengtu (30-40N 104-04E).

(1) (U) Wei characterized an interferon-like substance found in the supernatant fluid of a suspension of mouse lung tissue infected with a virulent strain of *Rickettsia prowazekii*.[157/158] The substance exhibited some properties quite distinct from other interferons. Wei and his coworkers were subsequently able to propagate *R. prowazekii* in monolayer cultures of embryonic mouse lung cells. From 1946 to 1951, Wei engaged in research at the Pasteur Research Institute in France. In 1952, he was a member of the Chinese Committee to Investigate Alleged US use of Bacterial Warfare in Korea.

(2) (U) Several original studies were conducted on *Salmonella typhosa*, the causative agent of typhoid fever.[159] Original work also was done on isolating new subtypes of *Shigella flexneri*, the causative agent of dysentery.[160] Studies on the rickettsiae and on the enteric pathogens make up much of the Chinese efforts in microbiology. Work in these areas probably enjoys an emphasis second only to that given to JBE. The endemicity and epidemicity of these diseases demand that such work be performed primarily to eradicate these diseases from the environment, and to upgrade public health. The studies performed and the data gathered therefrom could be used to support related R&D efforts.

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h. (U) Institute of Microbiology, Wuhan. The Institute, which is subordinate to the CAS, was reportedly headed by Dr. Kao Shang-yin. Under Kao, who was educated in the United States, this institute appeared to specialize in virus research and insect tissue cell culture. At the Second Symposium of Czechoslovak Virologists, in 1958, Kao discussed two key problems in virology. The first problem addressed some basic questions concerning viral infection of cells and their altered resistance, and the second discussion concerned the application of new methods for studying viruses. Other articles gave a comprehensive outline of Chinese progress in virology, epidemiology, and immunology, as well as advances made affecting plant viruses and pest control.[162-164] Research has included studies descriptive of

*The use of the genus name *Yersinia* is consistent with current taxonomic practice; however, because of past common usage and the greater familiarity of investigators with the genus name *Pasteurella*, the latter term will be used throughout this report.

morphological and structural characteristics of tobacco mosaic virus[165] and a virus found in the army worm.[166] Problems associated with the pathogenesis of typhoid fever have also been investigated.[167] Although virology is emphasized, competence in the general field of microbiology seems to be at an acceptable level.

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j. (U) Other Institutes of Interest.

(1) (U) Investigators at the Fukien Institute of Epidemiology, Foochow, have studied the vectors of *Rickettsia tsutsugamushi*,[174/175] the detection of Leptospira,[176-179] and immunological methods for identifying *Coxiella burnetii*. An Infectious Diseases Hospital at Foochow and the Fukien Provincial Hospital have also been mentioned. Studies on antibiotic resistant dysentery bacilli[180] and the serological variability of *Shigella flexneri*[181/182] were conducted here.

(2) (U) Ch'en, China Medical College, studied the antibiotic resistance of a large number of strains of Shigella.[183] The Inner Mongolia Medical College, Huhekot, published results of efforts to isolate drug-resistant variants of *Shigella flexneri*.[184] The Institute of Antibiotics, Peking, has evaluated various nitrogen sources for growth of Shigella species,[185] and the effect of additives on growth has been determined.[186] These studies might have some application in a BW program, although the enteric diseases are prevalent public health problems.

23. (U) Potential Agent Development

a. (U) PRC investigators have studied those pathogenic microorganisms endemic in China and particularly those that cause epidemics. They have made the eradication of these diseases a primary propaganda subject, and it is evident that considerable research effort has been expended to fulfill stated objectives. Studies have been directed toward the isolation, identification, production of antigen, development of vaccines, and methods of immunization. Possible vectors of these diseases were evaluated, and artificial infection of laboratory animals by vector transmission has been studied.

(b)(1)

Table III. Potential BW Agents (U)

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Table IV. Suspected Chinese BW Agent Production Facilities (U)

(b)(1)

[1] May be same as Central Biological Products Institute, which is currently the Institute for Biological Products Research.

Table IV. Suspected Chinese BW Agent Production Facilities (U) (Continued)

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(CONFIDENTIAL)

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years.

25. (U) Biofermentation/Bioengineering as Related to BW Agent Developments

a. (U) If a successful BW program is ever to be established, fundamental data derived from R&D efforts must first be scaled-up, through process research, so that large

volumes of precisely defined biological materiel ultimately can be produced at will. Unfortunately for those who are working very hard to identify this effort, equipment and facilities used for these purposes are simply not unique. For instance, processes by which biological agent fills are produced need differ only slightly from those schedules that are used to manufacture bulk volumes of vaccine materiel; and fermentors already in use to cultivate yeasts and actinomycetes for established commercial purposes could be adapted easily to produce pathogenic organisms with appropriate modifications for safety purposes. The facilities used for this research in China appear to be under civilian control, but presumably could be used to support military needs for the development of BW agents.

b. (U) An investigator at the Institute of Plant Physiology, CAS, spoke at the 1963 Symposium on Progress in Microbiology held at Wuhan University and pointed out that although current emphasis had been placed on developing the antibiotics industry, outstanding progress had also been made on developing biochemical engineering and industrial fermentation.[191] By isolating mutant strains of selected molds, by carefully determining critical parameters of their metabolism, and by modifying their nutritional requirements, notable increases in antibiotic yields had been made possible.

c. (U) At the Third All-China Scientific and Technical Conference on Antibiotics held in Dairen, September 1964, Chiang of the Institute of Antibiotics, CAMS, outlined the conditions found necessary for the optimal culture in chicken embryos of cowpox and fowl plague viruses.[192]

d. (U) At this same symposium, Ma of the Hua-tung Chemical Engineering College, Shanghai, noted the debt that biological engineering owed to chemical engineering.[193] The author forecast the continued development and greater application of biological engineering; he also stressed the need of specialized training in order to develop competent biological engineers.

e. (U) Lu, at the 20th annual symposium of the Entomology Society of China held in Peking in 1964, reviewed progress made and elucidated major problems still facing those who were interested in medical insect culture.[194] He noted the work on the fertilization of Chinese mosquitoes (*A. Sinenses*) by forced mating using fermented culture media to stimulate hatching; he also stressed the homogeneity of insect quality and emphasized the importance of controlling culture conditions and population densities in order to increase breeding efficiency. He urged extensive studies in order to keep abreast of foreign developments in insect culture.

f. (U) Original work was done in 1961-1962 at the Institute of Medical Biology, CMAS, Kung-ming, on the isolation of latent cytopathogenic viruses from uninoculated

tissue cultures.[195] The viruses were not named, but data were obtained on the effects associated with regrowth of these viruses in monkey kidney cells.

g. (U) Ts'ao Chen-ch'in designed a continuous sterilizer for use in the fermentation industry.[196] In his report, the author evaluated various parameters related to the design, namely the time of continuous sterilization, the reaction speed constant, and the absolute temperature of sterilization.

h. (U) Another significant accomplishment has been the development of an automatic defoaming method for use in the fermentation industry.[197] Shen Yung-hsing described details of this development which compared in quality to the work of the Czechoslovaks, who have recently acquired equipment that controls automatically pH, foam, etc.

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26. (C) Preservation of Microorganisms as Related to BW Agent Development

a. (U) Another prerequisite for the militarization of biological materiel is an appreciation of the technology needed to stockpile agents in a viable state, so as to assure their availability for offensive use when required. The Chinese have conducted various studies that increased their knowledge of the applicable technology, mainly laboratory techniques associated with lyophilization (freeze-drying).

b. (U) In 1959, an improved method of lyophilization was described in studies from the Second Military Medical College, Shanghai, CPLA Academy of Medical Science.[199] Many strains of fungi and influenza viruses, together with strains of bacteria which cause anthrax, cholera, brucellosis, and plague, were maintained in a lyophilized state without loss of cultural or physiological properties. These studies demonstrated the competence of Chinese investigators to control the stability, viability, and virulence of potential agents for BW purposes.

c. (U) The Hungshan Sanitation and Antiepidemic Experimental Institute, Wuchang, studied the survival of lyophilized *Rickettsia tsutsugamushi orientialis*.[200] The results indicated that the rickettsiae retained their viability up to 9 years when stored at -10° to -20°C in sucrose solutions.

d. (U) The Institute for Biological Products Research, Ministry of Public Health, Peking, studied survival rates of *Vibrio cholerae* after lyophilization.[201] *V. cholerae* was chosen as a model because of its marked sensitivity to physical and chemical factors associated with biological decay. The investigators found that after 10 years in the lyophilized state, cholera organisms survived without significant changes in morphological, biochemical, or serological properties.

e. (U) In 1965, investigators in the laboratory of the Wuhan Municipal Contagious Disease Hospital reported on a "simple and practical way of preserving bacteria" that allowed them to keep their cultures either in a refrigerator or at room temperature.[202] This method was used for 3 years and proved effective.

f. (U) The Shanghai Institute of Medical Industry, Ministry of Chemical Industry, Shanghai, has also conducted studies of microbial preservation by refrigeration and disiccation.[203]

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I. ANTICROP RESEARCH

28. ~~(C NFD)~~ General

a. (U) The PRC, the world's third largest country, with an area of 3.7 million square miles, is the world's second largest agricultural producing country after the United

States. With only 7.8% of the world's cultivated area, it supports almost one-fourth of the world's population.

b. (U) This unfavorable population-land balance, which provides less than 0.4 acre of cultivated land per person, has been a major deterrent to the country's economic progress. Between 80% and 85% of the population are engaged in farming, and agriculture currently supplies one-third to one-half of the national income. Agriculture also supplies the bulk of the raw material base. Farm products and the finished agricultural products constitute 60% to 70% of total exports.

c. (U) During the first decade of Communist rule, gains in agricultural production were registered almost every year. Then 4 years of devastating reverses in agriculture, because of the reckless adventure of the Great Leap Forward (1958-60) and unfavorable weather during 1959-61, dropped farm output to a dangerously low level and resulted in a near collapse of the economy.

d. (U) Under the guise of central planning during the Great Leap Forward, officials had ignored traditional farming culture—thereby badly upsetting one of the most intricate farming systems in history. Because of the successive crop reverses, the regime beat a hasty retreat and announced a new policy of giving priority to agriculture. Since that time, gains have occurred in numerous industries designated to support agriculture.

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f. (U) Although exports of agricultural commodities have increased significantly since 1962, they apparently have not regained their 1959 level. Thus, a decade after the Great Leap Forward that was to solve China's economic problems within a few years, the country's agriculture is still in a state of stagnation. As one authority observed, "It may turn out that the Great Leap Forward will have cost the Chinese economy roughly a decade of growth."

29. (U) Major Crops

Rice is by far the most important crop in China. The production of rice is more than three times that of all the other major crops combined; wheat is next in acreage and production. Other principal crops are soybeans, peanuts, rapeseed, and cotton. Acreage and production figures of the major crops grown in the PRC are listed in table V.

Table V. Acreage and Production of Major Crops in the PRC (U)

Crops	Acres	Production (tons)
Rice	62,114,000	91,800,000
Wheat	20,433,000	22,927,000
Soybeans	4,339,000	8,100,000
Peanuts	2,830,000	2,209,000
Rapeseed	10,950,000	965,000
Cotton		1,241,000

(UNCLASSIFIED)

30. (U) R&D Against Naturally Occurring Crop Pests and Anticrop Warfare Agents

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b. (U) Research on Rice Diseases and Insects. Since rice is the most important source of food in China, its diseases would be expected to receive the greatest attention. This opinion seems to have no basis in fact, however, since the rust diseases of wheat apparently are the object of much more research.

(1) (U) Investigations on rice diseases. Rice blast is a serious disease in China, especially in the northeast, but only one article since the beginning of 1965—concerning the application of kasugamycin, a Japanese antibiotic, for the control of rice blast—has been noted in a Chinese publication.[209] The study on which the article was based was conducted by a Japanese scientist. During the same time period, three papers on other rice diseases appeared:

- The Mycelial Activities of the Rice Sheath Blight Fungus in Relation to the Disease Development.[210]

- Studies on the Spore Dispersal of Helminthosporium oryzae.[211]

- Field Control of Bacterial Leaf Streak (Xanthomonas oryzicola) of Rice in Kwangtung.[212]

(2) (U) Rice insects. The following two papers on rice insects have been noted; both concern research on the control of the paddy borer:

- Outbreak, Rhythm, and Control Technique of Paddy Borer (Tryporyza incertellus Walker) in Huang, Hsin, Hsi, and Demonstration Regions in Hopeh Province.[213]

- Forecasting the Third Generation Paddy Borer (Tryporyza incertellus Walker) and Chemical Control Techniques.[214]

c. (U) Research on Wheat Disease and Insects.

(1) (U) Races of wheat stem rust. The physiological races of the fungus causing stem rust of wheat were analyzed in 1964. Stem rust was epiphytotic in all areas of China in 1964, being generally more serious in the north than in the south. In 1964 a total of 2835 samples of stem rust spores was collected from 229 cities and districts within 26 provinces; 2006 of them have been identified. The identifications were conducted from November 1964 to March 1965 according to the usual international procedure and rules. The races and types found were: 17, 19, 21, 21C1, 21C2, 21C3, 34 34C1, 34C2, 40, and 194. The predominance of race 21 has been gradually decreasing, whereas race 34 has been increasing in occurence, as seen from the analyses of the physiological races found from

1962 to 1964. This survey was conducted by personnel from the Mukden Agricultural College, Heilungkiang Agricultural Research Institute, and the Kirin Agricultural Research Institute, all in Northeast China.[215] Reportedly, scientists at the Institute of Genetics of the Academy of Sciences have grown complete rice and wheat plants, directly from pollen, using tissue culture techniques. Offspring of plants initiated from pollen grains, grown in Northeast China's Heilungkiang Province and in the outskirts of Peking, apparently gave good yields.[64] Providing this is a practical procedure, it could revolutionize methods and drastically reduce the time required for the selection of stable, hybrid strains of plants. In addition to economic benefits realized from more rapid development of high-yields, pest- and herbicide-resistant strains of plant species, defensive anticrop warfare capabilities would be enhanced since a great variety of plant strains, each resistant to selected strains of crop diseases and crop pests, would become available.

(2) (U) Control of wheat diseases. Four effective means of stripe rust control have been developed in China: breeding of rust-resistant varieties, postponing the sowing time from 100 days to 80 days before the winter solstice, destroying disease-infested plants, and applying fungicides like sodium fluorosilicate and sulfanilamide.[216] According to available statistics, 6 million acres were sown with about 100 varieties of good rust-resistant strains of wheat in Shansi, Hopeh, Shantung, Honan, Shensi, Kansu, and Northern Kiangsu in the autum of 1964.[217] The variety Nei-hsiang 36 was reportedly immune to stripe rust be susceptible to leaf and stem rusts. A second variety, Hopeh Agriculture University 3, is almost immune to stripe rust and is resistant to stem rust, while a third variety, Hsu-chou 4, is almost immune to all three types of rust.[218]

(3) (U) Development of chemical rust fungicides. Sulfonic acid, a systemic fungicide against wheat rust, has been tested in the field. The optimum concentration found was 6.5 to 13 pounds of 65% acid per acre. Methods for producing the acid have been developed.[219,220]

(4) (U) Development of antibiotic fungicides. During 1965, seven papers were published on antibiotic fungicides. All but one concerned the fungicide "Nung-K'ang-101," an isocyclohexinide isolated from *Streptomyces aureus*, by the Pharmacology Institute, CAS, Shanghai. Nung-K'ang-101 was tested and found effective against wheat rust and Gibberella disease of wheat.[221-227]

(5) (U) Research on control of wheat insect pests. The oriental army worm, *Leucania separata* Walker, is the pest most destructive of cereal crops in Krin Province, Northeast China. Studies have been conducted on its life history and the effects of microclimate on its population density. The wheat stem fly, *Meromyza saltatrix* Linn, is a serious pest of wheat in Shensi. Differences in varietal susceptibility have been noted: plants

growing in fertile soils sustain less injury. Benzene hexachloride (BHC) or parathion provide very effective control of the adult fly. One paper describes the development of the aphid *Macrosiphum granarium*—the chief wheat pest in the province of Hsi-Nan.[228-232]

d. (U) Research on Soybean Diseases and Pests. Although the soybean is a major crop in China, research on its diseases and pests is sketchy. Only three papers have been noted: one on the analysis of the soybean mosaic virus, and two on the soybean pod borer. The latter is a serious pest of soybeans in Northeast China. Recommended control methods are the use of resistant varieties of soybean, proper agricultural practices, and insecticides like BHC together with DDT.[233-235]

e. (U) Research on Rape Disease and Pests. The Institute of Microbiology has conducted an intensive study of the rape mosaic viruses. The Chinese have identified and characterized 40 strains of the virus. A partial purification of the virus has been accomplished, and its properties have been described. Another institute has studied the epidemic relations between the vector aphid, *Myzus persicae* Salz, and the virus.[236-238]

f. (U) Research on Cotton Disease and Pests. Analysis of the published research papers indicates that the principal diseases and insects of cotton are: fusarium wilt, verticillium wilt, and pink bollworm. Stopping the spread of fusarium wilt and verticillium wilt appears to be the principal difficulty. Use of BHC and DDT is recommended to control the bollworm.[239-241]

g. (U) Insect Pest Control Research.

(1) (U) Chemosterilants. Two forestry institutes have been investigating the use of the chemosterilants to control *Dendrolimus punctatus* Walker, *Bombyx mori*, and other insects. Chemosterilants selected experimentally included Thio-TEPA, 5-fluorouracil, 5-fluorourotic acid, colchicine, nitrogen mustards, and thiocarbamide. The effects of the various chemosterilants on the different insects were described.[242-245]

(2) (U) Organic insecticides. Research on chemical insecticides in China appears to concern chiefly the testing of Western-developed organophosphorus and organochloro insecticides on Chinese crops. The development of synthetic processes for producing the desired insecticides for Chinese crops also is of concern.

(3) (U) Biological control. Spores of the bacteria *B. bassiana* and *B. thuringiensis* are used to control such insects as *D. punctatus* Walker, and the pine caterpillar *Grapholitha glycinivosella*, and *Cylas formicarius*. Applications of the insect fungus, *Spicaria fumoso-rosea*, have been considered for the control of a wide range of insects, including *L.*

separata Walker and *Pyrausta nubilalis* Huebner. The use of Chinese bees and the insect *Trichogramma australicum* to control the sugar cane borer has been investigated and has produced satisfactory results.[246-249]

(4) (U) Insect hormones. China apparently has a limited capability for controlling insect pests. Control primarily has been done with insecticides, the most common being DDT. Aware of the dangers of introducing harmful chemicals into the environment, the Chinese are seeking new methods of control. The Institute of Zoology has reported research on the sex attractant (pheromone) of pine caterpillar moths[250] and is attempting to identify the pheromone.[251] Work at the Chinese Academy of Agricultural and Forestry Sciences is directed toward the pheromones of pine caterpillar, locust, and corn borer. The pheromone of the silk-worm is being used to increase silk production. If applied at the proper time and in the right concentration, it prolongs rather than disrupts the life cycle. Larger pupae result, thus increasing silk production.[207] Apparently, the Chinese have not reached the field-trial stage of research, and any actual application of insect hormones to control economic pests is still some distance in the future.

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J. CONCLUSIONS

32. (C) Offensive Posture

(b)(1)

33. (C) Defensive Posture

(b)(1)

K. TRENDS AND FORECASTS

34. (C-NFD) Trends

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35. (C) Forecasts:

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b. Midrange (5-10 Year Projection).

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Section II.

NORTH VIETNAM

A. INTRODUCTION

1. (C) Historical Background and Competence in Microbiology

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b. (U) When the Communists assumed control of North Vietnam in 1954, there was no central public health group capable of effectively instructing the people and instituting disease control procedures. Modern sanitation and public health facilities were essentially nonexistent. An MPH on the pattern of that of the PRC was established in Hanoi that year. The health organization extends down to interzonal and provincial levels, each having its own hospital or health center, along with its own medical and provincial administrators.[6] Little attempt was made to control scientific activities until 1958 when the State Science Committee was formed to aid the government in the organization and direction of scientific activities.[7] In 1960, the first attempt was made to draft a comprehensive scientific and technical program, which evidenced the attempt to plan for the orderly development of scientific effort by the State Science Committee.[8] The government has claimed improvement in public health and sanitation, but the number of medical personnel is inadequate, and most of them are poorly trained. After 1960, the

Bacteriological Institute was made responsible for the production of vaccines against diseases of an epidemic nature. Vaccines against smallpox, tetanus, polio, and cholera have been produced, but the institute and other production facilities could not manufacture sufficient quantities to immunize all the population.[9] Since 1965, eastern European countries have significantly increased assistance to North Vietnam in the medical field, including construction of new hospitals and medical facilities, most of which probably serve military needs.

2. (U) Geographical and Political Factors

a. North Vietnam lies in the northeastern part of the Indochina Peninsula, bordering the Gulf of Tonkin. This relatively small and irregular-shaped country narrows from a maximum width of 375 miles in the north to about 30 miles in the south. The maximum north-south axis is about 450 miles. Its size approximates that of the state of Washington. The population of about 18.5 million is concentrated chiefly in the Red River Delta and along the coastal plains. Of the 1850 miles of land boundaries, about 800 miles border on China and about 1000 miles on Laos. Two rail routes and a number of highways connect North Vietnam with China. Two selected routes from Laos contain a road suitable for vehicular movement, but are poor access routes because of the mountainous terrain and inferior roads. The best air approaches are from the east, over the South China Sea.

b. The DRV government is a highly centralized structure paralleled by the Lao Dong (Communist Party) organization, composed of more than half a million members. Civil obedience is maintained by an elaborate police and security service backed up by the military service. The economy is tightly controlled and the people are held to an austere level of living. The position of North Vietnam in the Communist world was greatly enhanced by the personal stature of Ho Chi Minh. The Soviet Union and the PRC have each actively sought the support of the DRV in their contention for leadership in the Communist world. This has been done partly by making competitive grants of both military and economic assistance. North Vietnam, although heavily dependent on the larger and more advanced Communist countries for military and economic aid, has remained largely independent in the formulation of its domestic and foreign policies. The DRV controls its own territory through the usual Communist machinery and methods.[1]

c. The eleven-man Politburo of the Lao Dong (Communist) Party (LDP) is the sole decision-making body in North Vietnam. This group determines the strategy of North Vietnam's military, political, and economic affairs, and issues appropriate directives through LDP's Central Committee. The DRV's highly centralized governmental apparatus implements Politburo decisions throughout the country. LDP members hold positions at all

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b. The DRV government is a highly centralized structure paralleled by the Lao Dong (Communist Party) organization, composed of more than half a million members. Civil obedience is maintained by an elaborate police and security service backed up by the military service. The economy is tightly controlled and the people are held to an austere level of living. The position of North Vietnam in the Communist world was greatly enhanced by the personal stature of Ho Chi Minh. The Soviet Union and the PRC have each actively sought the support of the DRV in their contention for leadership in the Communist world. This has been done partly by making competitive grants of both military and economic assistance. North Vietnam, although heavily dependent on the larger and more advanced Communist countries for military and economic aid, has remained largely independent in the formulation of its domestic and foreign policies. The DRV controls its own territory through the usual Communist machinery and methods.[1]

c. The eleven-man Politburo of the Lao Dong (Communist) Party (LDP) is the sole decision-making body in North Vietnam. This group determines the strategy of North Vietnam's military, political, and economic affairs, and issues appropriate directives through LDP's Central Committee. The DRV's highly centralized governmental apparatus implements Politburo decisions throughout the country. LDP members hold positions at all

levels within the bureaucracy and insure that the government functions as the party desires. The constitution was modeled extensively on the Chinese constitution and serves as an organic law for the government as well as a propaganda document for the Lao Dong. Like all Communist constitutions, it ascribes considerably more responsibility and authority to the governmental organization than exists in actual practice. The most important centers of power within the government are the executive agencies—the President of the Republic, the Premier, the Council of Ministers, and the administrative committees of the local governments. The Council of Ministers is the organization closest to the policy-making process, and the most important ministries of the Council are the Ministries of National Defense, Foreign Affairs, and Public Security. Each of these Ministries is headed by Politburo members. The Communist regime has continued to reshuffle local government organizations and generally has developed a unified, nationwide system of local administration, dominated by LDP members.[1]

B. ASSESSMENT

3. (C) Order of Battle

(b)(1)

ST-CS-03-148-75

Original

(b)(1)

(b)(1)

d. (U) There is no indication that the Viet Cong (VC) receive formal unit training in CBR defense as do the NVA personnel. Instruction in CBR decontamination and protection is given to the VC, and some captured training documents provide instruction for the fabrication of protective equipment. Much of the instructional material, however, is of limited practical value; it appears to be based on incomplete understanding of CBR warfare and/or to be designed for propaganda purposes.

4. (C) Doctrine and Procedures

(b)(1)

(b)(1)

b. Defense.

(b)(1)

(b)(1)

5. (C) BW Equipment

(b)(1)

* See appendix I.
** See appendix III.

6. ~~(C)~~ Production and Stockpiling

(b)(1)

7. ~~(C)~~ Research, Development, and Testing

(b)(1)

(b)(1)

d. (U) The Hygiene and Epidemiology Institute, MPH, Hanoi, was formed in 1961 to prevent and control epidemics, and to train hygiene and epidemiological workers.[49] Studies concerning cholera, dengue, typhoid and paratyphoid fevers, louse-borne typhus, scrub typhus, and plague have been conducted. These studies are primarily directed toward the improvement of public health conditions, but also could have an application in a BW program.

(b)(1)

(b)(1)

8. Conclusions

(b)(1)

9. Trends and Forecasts

(b)(1)

(b)(1)

b. Forecasts

(b)(1)

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Section III.

NORTH KOREA

A. INTRODUCTION

1. (C) Historical Background and Competence in Microbiology (b)(1)

(b)(1)

2. (U) Geographical and Political Factors

a. North Korea is a rugged land occupying the northern part of the Korean peninsula between the Yellow Sea on the west and the Sea of Japan on the east. It adjoins the PRC and the USSR on the north and South Korea on the south. North Korea has an area of about 47,000 square miles, approximately the size of Pennsylvania. Because of the rugged mountainous terrain, North Korea is poorly suited for ground or air operations. Pyongyang

is the political, commerical, and cultural center of the country. The Hambung-Wonsan area is the largest industrial center and includes nonferrous metal plants, chemical works, a munition plant, and an industrial machinery plant. There are also army and navy installations in the area.[3]

b. North Korea is a Communist Party state dominated by a closely knit clique under Premier Kim Il-sung. Occupation of the northern part of the country by the USSR in 1945 set the conditions for this political development. Initially a figurehead under Soviet direction, Kim has moved to consolidate his position by eliminating rivals and has sought to establish independence from both the USSR and the PRC. The strongest priority of the regime is directed toward the reunification of Korea. An aggressive policy of reunification was announced at a Labor Party Conference in October 1966. Subsequent propaganda campaigns were reinforced with incidents created along the demilitarized zone and terrorist attacks throughout South Korea. Another strong objective of the regime is to enhance North Korea's international position. Almost all domestic policies are integrated to establish a highly unified, self-supporting economy under state control. Some progress has been made in this effort, but North Korea has not yet attained economic and scientific self-sufficiency.[3] Very limited scientific effort could be diverted into a BW program.

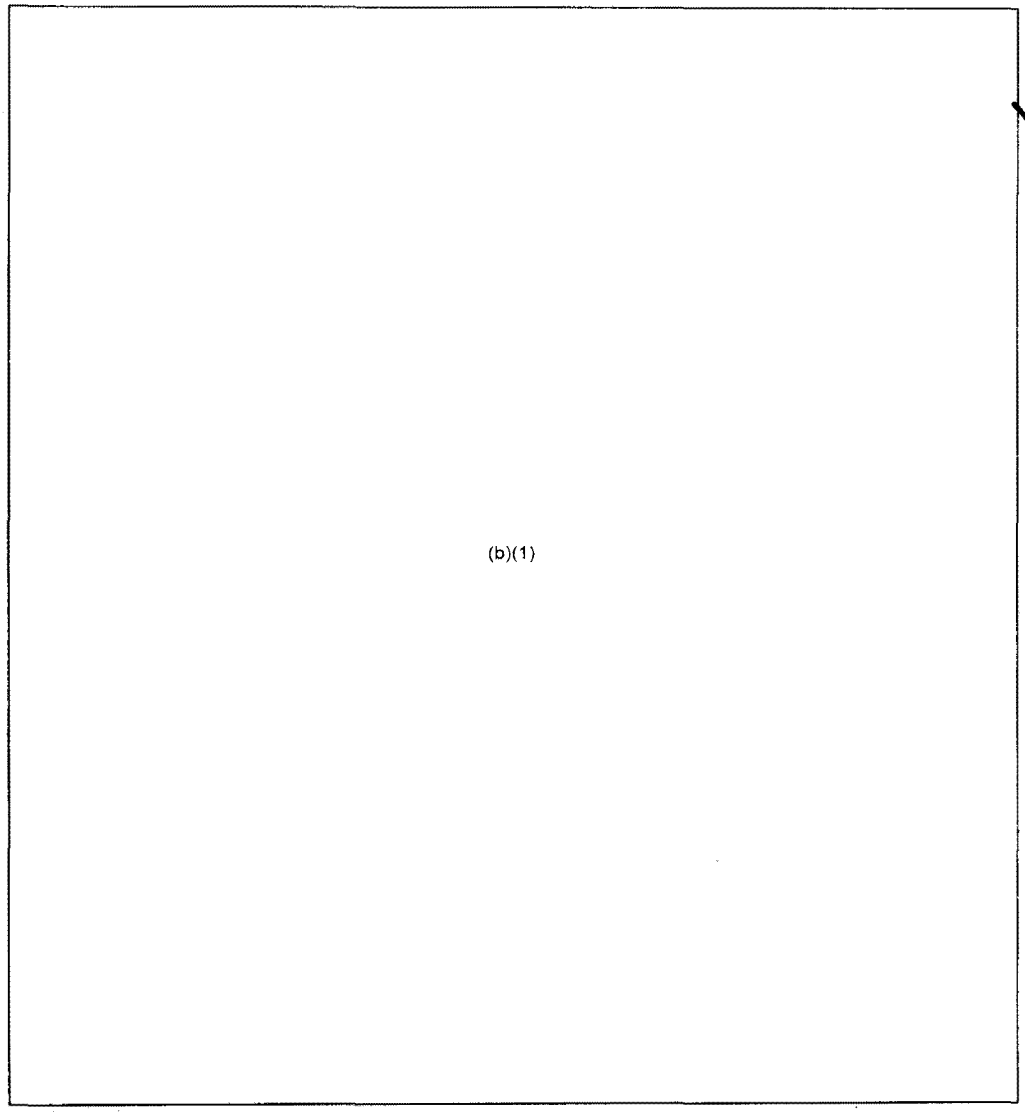
B. ASSESSMENT

3. (S-NFD) Order of Battle

(b)(1)

NO FOREIGN DISSEM

5



(SECRET)

Figure 12. CBR organization within the North Korean Army (U).[4]

A

(b)(1)

Table VI. Location of North Korean Chemical Units (U)[3,9]

(b)(1)

Table VI. Location of North Korean Chemical Units (Ii) (Continued)

(b)(1)

(CONFIDENTIAL-NFD)

NO FOREIGN DISSEM

668

C

(b)(1)

4. (C) Doctrine and Procedures

(b)(1)

5. (C) BW Equipment

(b)(1)

6. (C) Production and Stockpiling

(b)(1)

* See appendix I.
** See appendix III.
*** See appendix V.

Original

(b)(1)

7. (C-NFD) Naval BW Operational Capability

(b)(1)

(b)(1)

4

(b)(1)

8. (S-NFD) Research, Development, and Testing

(b)(1)

NO FOREIGN DISSEM

(b)(1)

9. (C) Conclusions

(b)(1)

(b)(1)

10. (C) Trends and Forecasts

(b)(1)

e

(b)(1)

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Section IV.

THE MONGOLIAN PEOPLES REPUBLIC

A. INTRODUCTION

1. (U) Historical Background and Competence in Microbiology

a. (U) Prior to 1921, medical services in the Mongolian Peoples Republic were provided by Lamaists. In 1921, the Soviet army furnished medical aid to Mongolia's army, which resulted in the adoption of modern methods of health and sanitation throughout Mongolia. Additional advancements in public health services have occurred since the country asserted its independence in 1924. The Soviet Union has provided technical assistance in the development of health and sanitation programs and has helped to train medical personnel. Assistance is also provided by the United Nations organization and by the East European Communist countries. With this aid, the public health standards have become comparable with those in most other Asian countries.[1] Evidence does not show that any research in progress is associated with a BW program.

(b)(1)

(b)(1)

2. (U) Geographical and Political Factors

a. Mongolia's proximity to the Trans-Siberian Railroad in the Soviet Union and its position between the USSR and the PRC lend it a unique strategic significance. It provides

road and rail routes from the USSR to the coast of the PRC. The main strategic area is Ulan Bator, the capitol city. A single-track railroad links Ulan Bator with the Trans-Siberian Railroad in Russia and extends southeast to connect with the Chinese system at Erk-lien. Of Mongolia's boundaries, 2600 miles border the PRC and 1850 miles border the Soviet Union. Since tensions arose between the USSR and the PRC, Mongolia has been used as an advanced position for the Soviet Army. Soviet units reportedly are stationed in Mongolia, and the Chinese border is constantly under observation.[3] Geographically, Mongolia includes vast desert plains in the south and east, long mountain ranges in the west, and hills and mountains with broad valleys in the north. The climate is continental, with great daily and seasonal extremes of temperature.

b. The Mongolian Peoples Republic is governed by a Communist dictatorship, which maintains control through a centralized system modeled on that of the USSR. The Politburo is the center of power and the source of all executive, legislative, and judicial authority in the country. Soviet influence dominates public health planning and activities in Mongolia. The USSR has provided technical assistance since 1925 in establishing a public health program, epidemiological systems, and laboratory facilities for investigating diseases. In 1931 the Soviet Union established at Ulan Bator the first antiplague laboratory, which became the Central Antiplague Station in 1936. Prophylaxis is the basic philosophy in Mongolia, and all health care and medical research units are owned and maintained by the state. The MPH is responsible for all health and medical services. The political reliability and loyalty to the Communist party often outweigh professional skill and ability in the selection of scientific administrators. For this reason, the effectiveness of the public health services and the advancement of scientific programs are often hampered.[1]

B. ASSESSMENT

3. (C) Order of Battle

(b)(1)

4. (U) Doctrine and Procedures

The Mongolians are not known to have policies or procedures for conducting biological warfare.

5. (C) BW Equipment

a. (U) The Mongolians do not have BW agents or munitions. Some vaccines, antibiotics, and sera are available for defense.

(b)(1)

6. (C) Production and Stockpiling

(b)(1)

7. (C) Research, Development, and Testing

a. (U) Mongolia's limited capability to conduct biological R&D has been directed toward an improvement of public health practices and has made possible the production of some vaccines and therapeutic compounds in country. There is no apparent interest in the development of BW agents, and efforts directed toward defense-related studies are not apparent.

b. (U) A Bacteriological Research Office was formed in 1932 by combining several small laboratories in Ulan Bator. This was the first facility under the MPH to conduct microbiological research. Diseases for which vaccines have been prepared at this facility include typhus, rabies, smallpox, dysentery, typhoid fever, and brucellosis.[6] A Soviet specialist, L. S. Reziniokova, assisted in directing research programs for the development of vaccines and medicines during the late fifties.

c. (U) The Office for Studying and Combating Especially Dangerous Infectious Diseases, an outgrowth of the Anti-Epidemic Office, now has five substations under its jurisdiction. It is probably the largest Mongolian organization that supports studies of measures for preventing diseases, such as anthrax, glanders, plague, poliomyelitis, and tularemia. During 1966, the organization prepared and administered vaccines to an estimated 150,000 persons.[6]

(b)(1)

8. Conclusions

(b)(1)

9. Trends and Forecasts

(b)(1)

(b)(1)

b. **Forecasts.**

(b)(1)

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APPENDIX I.

FOMCAT ILLUSTRATIONS AND DESCRIPTIONS OF PROTECTIVE EQUIPMENT, PEOPLE'S REPUBLIC OF CHINA

(b)(1)

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Original

CONFIDENTIAL

ST-CS-03-148-75

POM-4240-2-1-1

NOMEN: MASK, PROTECTIVE, MODEL SMH (U) *1

(OLD 2-4240-1-1)

NATIVE DES: [redacted]

COUNTRY: USSR

PRODUCED/ADOPTED: /1950

DATE UPDATED: 01AUG73

(b)(1)

(b)(1)

CONFIDENTIAL

ST-CS-83-148-75
POM-4240-2-1-1
CONFIDENTIAL
Original
NOMEN: MASK, PROTECTIVE, MODEL SHM (U) *1
(OLD 2-4240-1-1)
COUNTRY: USSR
PRODUCED/ADOPTED: /1950
DATE UPDATED: 01AUG73

(b)(1)

686

DATE CATALOGED: 01NOV69
96
XGDS/2/NA
CONFIDENTIAL

CONFIDENTIAL

ST-CS-03-148-75

Original
FOM-4240-5-1-1
NOMEN: MASK, PROTECTIVE, MODEL PK-1 (RESPIRATOR AND GOGGLES) (U)

(OLD 5-4240-1-1)

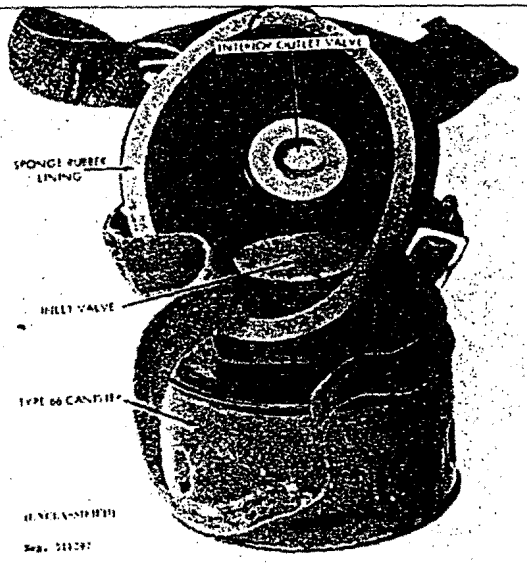
COUNTRY: PRC
DATE UPDATED: 23JUL73

(b)(1)

(b)(1)

(b)(1)

(UNCLASSIFIED)



XGDS/Z/NA

DATE CATALOGED: 01NOV69

97

CONFIDENTIAL

687

ST-CS-03-148-75
FOM-4240-S-I-1

~~CONFIDENTIAL~~

Original

NOMEN: MASK, PROTECTIVE, MODEL PK-1 (RESPIRATOR AND GOGGLES) (U)

(OLD 5-4240-1-1)
COUNTRY: PRC
DATE UPDATED: 23JUL7?

(b)(1)

(b)(1)

REMARKS:
1/ HEIGHT, 11.2 CM; WIDTH, 9.4 CM; DEPTH, 9.7 CM (APPROXIMATE)

2/ RESPIRATOR, 142 GRAMS, GOGGLES, 95.1 GRAMS

DATE CATALOGED: 01NOV69

XGDS/2/NA

~~CONFIDENTIAL~~

Original

CONFIDENTIAL

ST-CS-03-148-75

FOM-4240-5-1-1

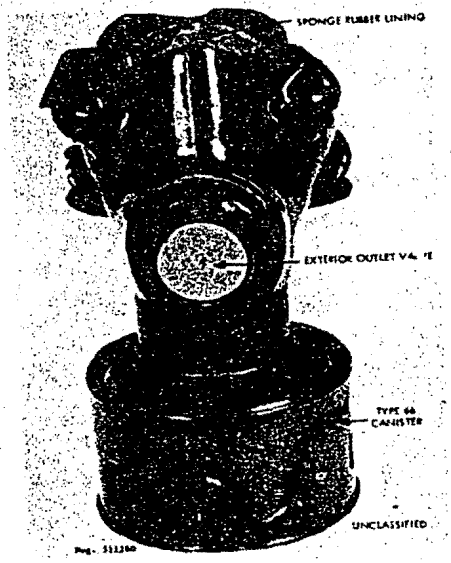
(OLD 5-4240-1-1)

NOMEN: MASK, PROTECTIVE, MODEL PK-1 (RESPIRATOR AND GOGGLES) (U)

COUNTRY: PRC

DATE UPDATED: 23JUL73

PRODUCED/ADOPTED: /1967 ?



DATE CATALOGED: 01NOV69

XGDS/2/NA

CONFIDENTIAL

ST-CS-03-148-75
FOM-4240-5-1-1

CONFIDENTIAL

Original

NOMEN: MASK, PROTECTIVE, MODEL PK-1 (RESPIRATOR AND GOGGLES) (U)
(OLD S-4240-1-17
COUNTRY: PRC
PRODUCED/ADOPTED: /1967 ?
DATE UPDATED: 23JUL73

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DATE CATALOGED: 01NOV69

XGDS/2/NA

Original

FOM-8415-2-4-3

NOMENCLATURE: Suit, Protective, Lightweight, Model L-1 (U)

NATIVE DESIGNATION: ЛЕГКИЙ ЗАЩИТНЫЙ КОСТЮМ, Л-1

COUNTRY: USSR

ADOPTED: 1955 or earlier

(b)(1)

DATE CATEGORIZED: 01SEP66

EGDS/3

ST-CS-03-148-75

FOM-8415-2-4-3

NOMENCLATURE: Suit, Protective, Lightweight, Model L-1 (U)

e

(b)(1)

EDGS/3

DATE CATEGORIZED: 01SEP66

Original
FOM-4230-2-2-1

ST-CS-03-148-75

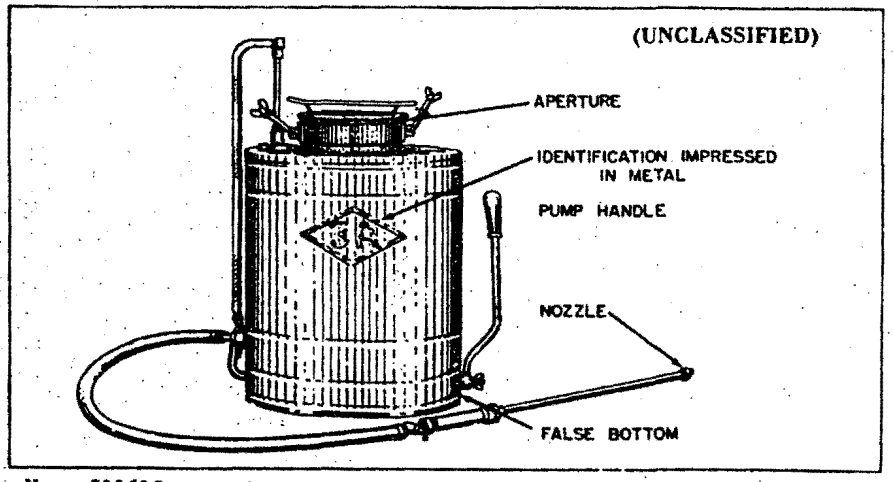
NOMEN: DECONTAMINATION APPARATUS, MANPACK, MODEL RDP-3 (U) (OLD 2-4230-2-1)

NATIVE DES: РАНЦЕВЫЙ ДЕГАЗАЦИОННЫЙ ПРИБОР, РДП-3 COUNTRY: U.S.S.R.
PRODUCED/ADOPTED: /1940 ? DATE UPDATED: 28AUG73

(U)THE MODEL RDP-3 IS A HAND-OPERATED, BACKPACK, SPRAY APPARATUS FOR DECONTAMINATING BUILDINGS, TERRAIN, VEHICLES, AND SUCH SMALLER OBJECTS AS PERSONAL WEAPONS. BASICALLY, THE APPARATUS CONSISTS OF A TANK WITH A LARGE FILLING APERATURE, A CLAMP-ON LID, AND SHOULDER AND WAIST STRAPS; A PISTON-TYPE AIR PUMP MOUNTED INSIDE THE TANK; AND A RUBBER DISCHARGE HOSE CONNECTED TO THE BOTTOM OF THE TANK AND EQUIPPED WITH A CUTOFF VALVE, A CONTROL VALVE, AND A NOZZLE. THE PUMP IS OPERATED BY A HANDLE THAT ROTATES A HORIZONTAL SHAFT EXTENDING THROUGH THE TANK'S FALSE BOTTOM; THE HORIZONTAL SHAFT, IN TURN, ACTIVATES A VERTICAL SHAFT THAT IS CONNECTED TO THE PUMP'S PISTON ROD.

(U)THE PUMP, BECAUSE OF ITS INTERNAL MOUNTING, IS SUBJECT TO IMMERSION IN CORROSIVE LIQUIDS, IS INACCESSIBLE FOR SERVICING, AND OCCUPIES SPACE THAT COULD OTHERWISE BE USED FOR THE DECONTAMINANT. ANOTHER SHORTCOMING OF THE RDP-3 IS THE RIGHT-HAND LOCATION OF THE PUMP HANDLE, REQUIRING USE OF THE LEFT HAND TO DIRECT THE DISCHARGE HOSE. THE MODEL RDP-4 (FOM-4230-2-2-2), WHICH SUPERSEDES THIS APPARATUS, INCORPORATES FEATURES THAT WILL ELIMINATE THESE PROBLEMS.

(U)COMPOUNDS COMMONLY USED IN THE RDP-3 ARE DICHLORAMINE-B OR -T IN DICHLOROETHANE (FOR REMOVING MUSTARD AND LEWISITE FROM WOOD AND METAL), AND BLEACH SLURRY (FOR NEUTRALIZING MUSTARD AND NERVE AGENTS ON TERRAIN AND VEHICLES). BECAUSE BLEACH SLURRY CORRODES METAL, THE APPARATUS MUST BE THOROUGHLY WASHED AFTER USE WITH THIS DECONTAMINANT.



Neg. 511612

DATE CATALOGED: 01NOV69

NOMEN: DECONTAMINATION APPARATUS, MANPACK, MODEL ROP-3 (U) (OLD 2-4230-2-1)
COUNTRY: U.S.S.R.
DATE UPDATED: 28AUG73

PRODUCED/ADOPTED: /1960 ?

CURRENT STATUS: OBSOLETE

MAJOR COMPONENTS:
- TANK ---------- METAL
- PUMP
  - -POWER DRIVEN ----- N/A
  - -HAND OPERATED ---- METAL
- HOSE ---------- RUBBER
- STRAPS ---------- WEBBING

PHYSICAL DATA:
- CAPACITY
  - -MAXIMUM ---------- 12.1 LTR
  - -WORKING ---------- 9.5 LTR
- WEIGHT
  - -FILLED ---------- *1
  - -EMPTY ---------- 7.3 KG
- DIMENSIONS
  - -LENGTH ---------- 34.9 CM
  - -WIDTH ---------- 18 CM
  - -HEIGHT ---------- 40.0 CM

DECONTAMINANTS: ------ SEE TEXT

PERFORMANCE:
- COVERAGE ---------- 5.11 SQ METERS
- DISCHARGE RATE ------ *2
- DISCHARGE TIME ------ 9 MINUTES
- OPERATING PRESSURE -- ?

PLUMBING SYSTEM: ------ SEE TEXT

GENERAL DATA:
- CARRIER
  - -TYPE ---------- PERSON
  - -CAPACITY ---------- N/A
- CREW ---------- 1
- MISC EQUIPMENT ------ N/A

REMARKS:
1/ 20.4 KG OR LESS, DEPENDING ON THE TYPE OF FILLING.

2/ 0.95 LITER PER MINUTE AT 25 TO 30 STROKES PER MINUTE

DATE CATALOGED: 01NOV69

Original
FOM-4230-2-2-2-1
NOMEN: DECONTAMINATION APPARATUS, MANPACK, MODEL RDP-4V (U) (OLD Z-4230-Z-2-1)

NATIVE DES: [illegible]
PRODUCED/ADOPTED: /1968

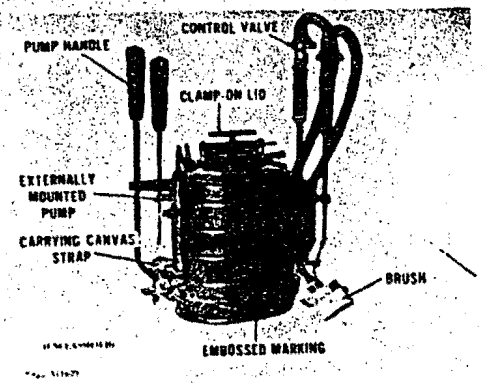
COUNTRY: U.S.S.R.
DATE UPDATED: 13AUG73

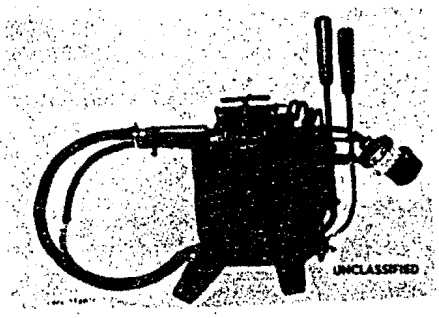
(U)THE MODEL RDP-4V DECONTAMINATION APPARATUS, DESIGNED PRIMARILY FOR BACKPACK OPERATION, FEATURES AN EXTERNALLY MOUNTED HAND PUMP THAT ELIMINATES THE PROBLEMS ARISING FROM THE LOCATION OF THE PUMP IN THE MODEL RDP-3 SPRAY APPARATUS (FOM-4230-2-2-1). OTHER COMPONENTS OF THE RDP-4V ARE: (1) A TANK, WHICH HAS A LARGE FILLING APERTURE FITTED WITH A SCREW-DOWN LID AND A FILTER SCREEN; (2) A FLEXIBLE HOSE THROUGH WHICH THE PUMP DELIVERS AIR TO THE TANK; (3) A SCREEN OVER THE OUTLET POINT TO REDUCE THE DANGER OF CLOGGING IN THE DISCHARGE LINE AND NOZZLE; (4) A CUTOFF VALVE ON THE DISCHARGE LINE; AND (5) A CIRCULAR SCRUBBING BRUSH THAT MAY BE FITTED TO THE NOZZLE.

(U)THE DECONTAMINANTS PRESCRIBED FOR USE IN THE RDP-4V ARE DICHLORAMINE-B OR -T IN DICHLOROETHANE, AND BLEACH SLURRY, WHICH IS CORROSIVE TO METAL AND THEREFORE REQUIRES THOROUGH CLEANING OF THE COMPONENTS IMMEDIATELY AFTER THE DECONTAMINATION PROCEDURE IS CARRIED OUT.

(U)THE MODEL RDP-4V IS REPLACING THE RDP-3 AND IS STANDARD EQUIPMENT ON CERTAIN TRUCK-MOUNTED DECONTAMINATION APPARATUS. THE [illegible] 4-48D (FOM-4230-2-3-3) IS FITTED WITH SIX; THE ADM-750, AS WELL AS THE ARS-12U (FOM-4230-2-3-1), CARRIES FOUR TO SIX FOR REMOTE OPERATIONS.

(U)THE MODEL RDP-4V HAS BEEN OBSERVED IN A NUMBER OF COMMUNIST COUNTRIES. A SPECIMEN WAS CAPTURED DURING US OPERATIONS IN THE REPUBLIC OF VIETNAM IN 1969.





DATE CATALOGED: 01AUG69

NOMEN: DECONTAMINATION APPARATUS, MANPACK, MODEL RDP-4V (U) (OLD 2-4230-2-2-1)
COUNTRY: U.S.S.R.
PRODUCED/ACCEPTED: /1968 DATE UPDATED: 13AUG73

CURRENT STATUS: STANDARD

MAJOR COMPONENTS:
- TANK ---------- METAL
- PUMP
  - -POWER DRIVEN ---- N/A
  - -HAND OPERATED --- METAL
- HOSE ---------- RUBBER
- STRAPS ---------- WEBBING

PHYSICAL DATA:
- CAPACITY
  - -MAXIMUM ---------- 11.4 L
  - -WORKING ---------- 8.3 L
- WEIGHT
  - -FILLED ---------- 20.0 KG
  - -EMPTY ---------- 8.2 KG
- DIMENSIONS
  - -LENGTH ---------- 29.2 CM
  - -WIDTH ---------- 19.0 CM
  - -HEIGHT ---------- 36 CM

DECONTAMINANTS: ------ *1

PERFORMANCE:
- COVERAGE ---------- *2
- DISCHARGE RATE ------ .7 TO .80 LTR PER MIN @ 25 TO 30 STROKES PER MIN
- DISCHARGE TIME ------
- OPERATING PRESSURE -- ?

PLUMBING SYSTEM: ------ SEE TEXT

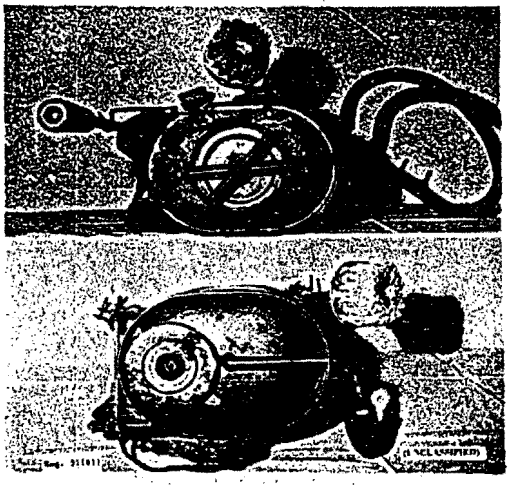
GENERAL DATA:
- CARRIER
  - -TYPE ---------- PERSON
  - -CAPACITY ---------- N/A
- CREW ---------- 1
- MISC EQUIPMENT ------ SEE TEXT

REMARKS:
1/ CW AGENTS

MUSTARD AND LEWISITE (ON WOOD AND METAL) — DECONTAMINANTS DICHLORAMINE-B OR -T IN DICHLOROETHANE

MUSTARD AND NERVE AGENTS (ON TERRAIN AND VEHICLES) — BLEACH SLURRY

2/ THE SOVIETS CLAIM THAT ONE FILLING WILL DECONTAMINATE 40 RIFLES, OR 40 LIGHT MACHINEGUNS, OR 15 HEAVY MACHINEGUNS, OR 2 CANNONS, OR 1 TANK.



DATE CATALOGED: 01AUG69

APPENDIX II.

SELECTED MEDICAL MATERIEL MANUFACTURERS AND MEDICAL LABORATORIES, PEOPLE'S REPUBLIC OF CHINA (1971)

Annexes

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ANNEX A.

MANUFACTURERS OF MEDICAL MATERIEL

(b)(1)

Classified by Cdr, USAFSTC
Exempt from GDS of EO 11652
Exemption Category 1
Declassify on IMPDET

(b)(1)

E

MANUFACTURERS OF MEDICAL MATERIEL (Continued)

(b)(1)

e

MANUFACTURERS OF MEDICAL MATERIEL (Continued)

(b)(1)

MANUFACTURERS OF MEDICAL MATERIEL (Continued)

(b)(1)

MANUFACTURERS OF MEDICAL MATERIEL (Continued)

(b)(1)

MANUFACTURERS OF MEDICAL MATERIEL (Continued)

(b)(1)

MANUFACTURERS OF MEDICAL MATERIEL (Continued)

(b)(1)

(CONFIDENTIAL)

ANNEX B.

MEDICAL LABORATORIES

(b)(1)

MEDICAL LABORATORIES (Continued)

(b)(1)

Original

ST-CS-03-148-75

MEDICAL LABORATORIES (Continued)

(b)(1)

MEDICAL LABORATORIES (Continued)

(b)(1)

Original

ST-CS-03-148-75

MEDICAL LABORATORIES (Continued)

(b)(1)

ST-CS-03-148-75

Original

MEDICAL LABORATORIES (Continued)

(b)(1)

Original

ST-CS-03-148-75

MEDICAL LABORATORIES (Continued)

(b)(1)

MEDICAL LABORATORIES (Continued)

(b)(1)

(CONFIDENTIAL)

MEDICAL LABORATORIES (Continued)

(b)(1)

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APPENDIX III.

FOMCAT ILLUSTRATIONS AND DESCRIPTIONS OF PROTECTIVE EQUIPMENT, NORTH VIETNAM

Original

POM-4230-2-3-2 (OLD 2-4230-3-2)

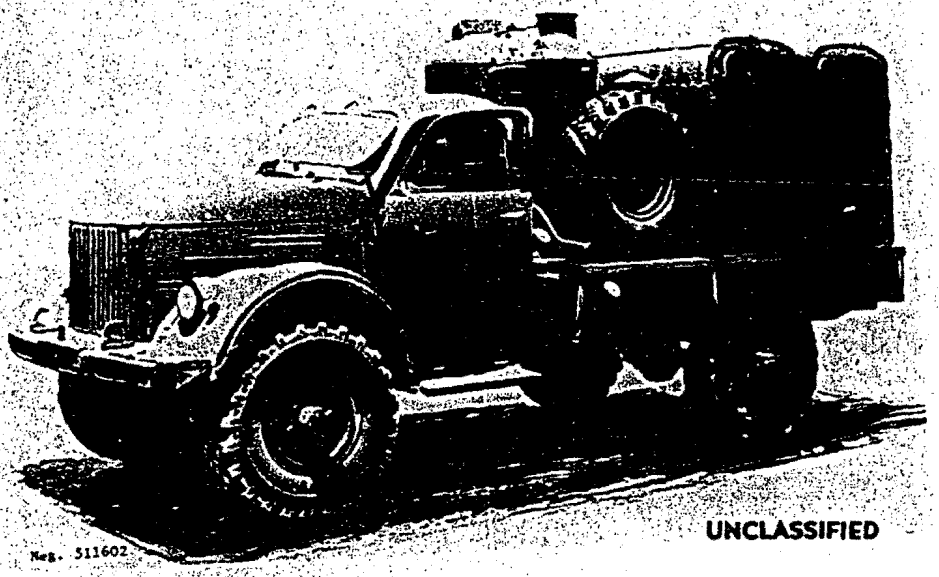
NOMEN: DECONTAMINATION APPARATUS, TRUCK-MOUNTED, MODEL ODA-53 (U) COUNTRY: U.S.S.R.

NATIVE DES: ДЕЗИНФЕКЦИОННО – ДУШЕВАЯ УСТАНОВКА, ДДА-53 DATE UPDATED: 28AUG73

PRODUCED/ADOPTED: /1958

(U)THE MODEL ODA-53 TRUCK-MOUNTED DECONTAMINATION APPARATUS, ALSO REFERRED TO AS THE ADA, CONSISTS OF TWO STEAM CHAMBERS, EACH WITH TWO PRESSURE-TIGHT DOORS; AN RI-3 VERTICAL BOILER (ABOUT 200 TO 300 LITERS CAPACITY) THAT HEATS WATER AND GENERATES STEAM; A FUEL-OIL TANK (57 LITERS ESTIMATED CAPACITY, FOR 8 TO 10 HOURS' OPERATION); A PUMP FOR FILLING THE SYSTEM OR DELIVERING WATER TO POINTS OF USE; A FORMALDEHYDE TANK; A 12-HEAD PORTABLE SHOWER UNIT; AND ACCESSORIES. A SHOWER TENT IS TRANSPORTED ON A CARGO TRUCK.

(U)THIS APPARATUS CAN BE USED TO STEAM-DECONTAMINATE CLOTHING AND EQUIPMENT CONTAMINATED WITH CW AND BW AGENTS, AND TO SUPPLY HOT WATER FOR SHOWER BATHS AND FOR WASHING CONTAMINATED EQUIPMENT. FOR THE STEAM-DECONTAMINATION PROCESS, CLOTHING AND EQUIPMENT ARE SUSPENDED FROM HANGERS IN THE CHAMBERS, AND PRESSURIZED STEAM IS ADMITTED THROUGH PIPES IN THE FLOOR. AMMONIA (PARTICULARLY FOR NEUTRALIZING NERVE AGENTS), OR FORMALDEHYDE (FOR BW DECONTAMINATION), MAY BE ADDED TO THE STEAM THROUGH A VESSEL ON TOP OF EACH CHAMBER. NONSPORE-FORMING MICROBES ARE DESTROYED WHEN EXPOSED TO STEAM AT 180 DEGREES F FOR 30 MINUTES, OR TO STEAM AND 73.9 ML OF FORMALDEHYDE AT 138 DEGREES F FOR 45 MINUTES; SPORE-FORMING ORGANISMS ARE EXPOSED TO STEAM AT 208 DEGREES F FOR 3 1/2 HOURS OR TO A MIXTURE OF STEAM AND 47.3 ML OF FORMALDEHYDE AT 138 DEGREES F FOR 2 HOURS 45 MINUTES. THE CHAMBERS CAN ATTAIN A MAXIMUM OF 212 DEGREES F.



Neg. 511602

UNCLASSIFIED

DATE CATALOGED: 01NOV69

NOMEN: DECONTAMINATION APPARATUS, TRUCK-MOUNTED, MODEL DDA-53 (U) (OLD 2-4230-3-2)
COUNTRY: U.S.S.R.
DATE UPDATED: 28AUG73

PRODUCED/ADOPTED: /1958

CURRENT STATUS: STANDARD

MAJOR COMPONENTS:
- TANK ---------- N/A
- PUMP
  - -POWER DRIVEN ----- N/A
  - -HAND OPERATED ---- #1
- HOSE ---------- RUBBER
- STRAPS ---------- N/A

PHYSICAL DATA:
- CAPACITY
  - -MAXIMUM ---------- #2
  - -WORKING ---------- #2
- WEIGHT
  - -FILLED ---------- N/A
  - -EMPTY ---------- N/A
- DIMENSIONS
  - -LENGTH ---------- N/A
  - -WIDTH ---------- N/A
  - -HEIGHT ---------- N/A

DECONTAMINANTS: ------ SEE TEXT

PERFORMANCE:
- COVERAGE ---------- #2
- DISCHARGE RATE ------ N/A
- DISCHARGE TIME ------ N/A
- OPERATING PRESSURE -- IN CHAMBERS 40.1 KG/SQ CM

PLUMBING SYSTEM: ------ #3

GENERAL DATA:
- CARRIER
  - -TYPE ---------- GAZ-51 AND GAZ-63
  - -CAPACITY ---------- ?
- CREW ---------- 3 ENLISTED MEN ?
- MISC EQUIPMENT ------ SMOKE STACK, STEAM INJECTORS, TENTAGE, HOSES, AND PROTECTIVE CLOTHING

REMARKS:
1/ PISTON-TYPE WATER PUMP (MODEL BFK)

2/ THIS MODEL IS NOT EQUIPPED WITH WATER STORAGE TANKS, BUT IS SUPPLIED DIRECTLY FROM PONDS, STREAMS, OR MOBILE EQUIPMENT SUCH AS THE ARS-12U DECONTAMINATION APPARATUS (FOM-4230-2-3-1)

3/ THE 1.8 CU-METER-VOLUME STEAM CHAMBER HOLDS APPROXIMATELY 25 TO 30 SUMMER UNIFORMS, OR 20 WINTER UNIFORMS, OR 12 SHORT SHEEPSKIN COATS. BY USING DIESEL FUEL TO SUPPLY HEAT TO THE BOILER, THE DDA-53 CAN WASH AND DISINFECT HOURLY, IN SUMMER, 80 UNIFORMS CONTAMINATED WITH NONSPORE FORMING MICROBES, AND IN WINTER 48; OR IT CAN PROVIDE ENOUGH HOT WATER PER HOUR IN SUMMER FOR 90 TO 100 SHOWERS, AND IN WINTER FOR 70 TO 72. THE RATES AT WHICH CW-CONTAMINATED ITEMS ARE DECONTAMINATED ARE NOT KNOWN.

3/ METAL PIPES CONDUCT STEAM FROM THE BOILER TO THE BOTTOMS OF THE TWO STEAM CHAMBERS. RUBBER HOSES CONVEY STEAM FROM THE BOILER TO WASHING FACILITIES AND HOT WATER TO THE SHOWER FACILITIES.

DATE CATALOGED: 01NOV69

Original
FOM-4230-2-3-1

ST-CS-03-148-75

NOMEN: DECONTAMINATION APPARATUS, TRUCK-MOUNTED, MODEL ARS-12U (U) (OLD 2-4230-3-1)

NATIVE DES: АВТОМОБИЛЬ РАЗГРУЗИВАТЕЛЬНОЙ СИСТЕМЫ, АРС-12У
PRODUCED/ADOPTED: /1962 ?
COUNTRY: U.S.S.R.
DATE UPDATED: 28AUG73

(U)THE VERSATILE MODEL ARS-12U CBR DECONTAMINATION APPARATUS, INSTALLED ON A ZIL-157 CHASSIS, CAN BE DRIVEN TO A CONTAMINATED OBJECT OR ESTABLISHED AT A DECONTAMINATION POINT TO WHICH SUCH OBJECTS ARE BROUGHT; IT IS CAPABLE OF TRANSPORTING WATER AND PUMPING IT DIRECTLY TO SHOWER HEADS; AND IT CAN SERVE AS A WATER-RESERVOIR OR WATER-SUPPLY VEHICLE FOR OTHER DECONTAMINATION EQUIPMENT THAT FURNISHES HOT WATER OR STEAM TO SHOWER UNITS, LAUNDRY FACILITIES, AND STEAM CHAMBERS. ANCILLARY EQUIPMENT THAT ADDS TO THE VERSATILITY OF THE APPARATUS IS PROVIDED FOR USE IN PERFORMING SPECIAL TASKS. FOR EXAMPLE, NUZZLES WITH JETS OF VARIOUS SIZES MAY BE ATTACHED TO THE DISCHARGE PIPE FOR ROAD AND TERRAIN DECONTAMINATION. FOR SPRAYING LARGE OR SMALL OBJECTS, OR FOR FILLING SMALL CONTAINERS, EIGHT HOSES MAY BE USED SIMULTANEOUSLY.

(U)MAJOR COMPONENTS OF THE ARS-12U INCLUDE AN OVAL-SHAPED (UNPRESSURIZED) CARGO TANK EQUIPPED WITH TWO WAVE BAFFLES, A TURNOVER GUARD, BODY WALKWAYS, PIPE HANDRAILS, A MANHOLE, AND A DEPTH GAGE; A SELF-PRIMING PUMP POWERED BY THE TRUCK'S ENGINE THROUGH A SPECIAL DRIVESHAFT, FOR DELIVERING 280 TO 380 LITERS OF WATER PER MINUTE AT 1400 TO 1600 DRIVESHAFT REVOLUTIONS PER MINUTE; A DOUBLE-ACTION HAND PUMP THAT DELIVERS 45 TO 56 LITERS OF WATER PER MINUTE AT 45 STROKES PER MINUTE; AND A PLUMBING SYSTEM CONSISTING OF METAL PIPES EMERGING FROM THE TOP OF THE TANK AND BENDING FORWARD AND DOWNWARD TO CONNECT WITH THE POWER PUMP.

(U)EXCEPT FOR MINOR DIFFERENCES, THE ARS-12U IS IDENTICAL WITH THE MODEL ARS-12D, AN EARLIER VERSION OF THE DECONTAMINATION APPARATUS, WHICH WAS MOUNTED ON THE ZIL-151 CHASSIS. THE ARS-12D WAS USED ALSO TO HAUL CHLOROSULFONIC ACID AND TO DISSEMINATE IT AS SCREENING FOG; THE ARS-12U HAS BEEN RELIEVED OF THIS FUNCTION, PROBABLY BECAUSE THE ACID CORRODES THE METAL TANK AND ACCESSORIES.

DATE CATALOGED: 01NOV69

NOMEN: DECONTAMINATION APPARATUS, TRUCK-MOUNTED, MODEL ARS-12U (U) (OLD 2-4230-3-1)
COUNTRY: U.S.S.R.
DATE UPDATED: 28AUG73

PRODUCED/ADOPTED: /1962 ?

CURRENT STATUS: STANDARD

MAJOR COMPONENTS:
- TANK ---------- SEE TEXT
- PUMP
  - -POWER DRIVEN ---- GEAR-TYPE WATER PUMP
  - -HAND OPERATED --- PISTON-TYPE WATER PUMP
- HOSE ---------- METAL AND RUBBER
- STRAPS ---------- N/A

PHYSICAL DATA:
- CAPACITY
  - -MAXIMUM ---------- 2570 LTR
  - -WORKING ---------- ?
- WEIGHT
  - -FILLED ---------- ?
  - -EMPTY ---------- ?
- DIMENSIONS
  - -LENGTH ---------- ?
  - -WIDTH ---------- ?
  - -HEIGHT ---------- ?

DECONTAMINANTS: ---------- *2

PERFORMANCE:
- COVERAGE ---------- *1
- DISCHARGE RATE ---- 284 TO 378 LTR - MIN (MAXIMUM)
- DISCHARGE TIME ---- 7 TO 10 MIN
- OPERATING PRESSURE -- ?

PLUMBING SYSTEM: ---------- RIGID METAL PIPES

GENERAL DATA:
- CARRIER
  - -TYPE ---------- ZIL-157
  - -CAPACITY ---------- *3
- CREW ---------- NCO, DRIVER, OPERATOR
- MISC EQUIPMENT ---- *4

REMARKS:
1/ A MAXIMUM OF 8 LARGE ITEM, SUCH AS VEHICLES OR TANKS, CAN BE DECONTAMINATED SIMULTANEOUSLY.

3/ .2453 KG LIQUID AND EQUIPMENT.

4/ SIX CHESTS OF ANCILLARY EQUIPMENT ARE CARRIED ALONG SIDE THE CARGO TANK. THE CHESTS CONTAIN 17 HOSES, INCLUDING EIGHT 60-FOOT-LONG DECONTAMINATION HOSES; A DISTRIBUTOR PIPE FOR CONNECTING THE EIGHT HOSES; VARIOUS TYPES OF SPRAY NOZZLES; BRUSHES; AND BASINS.

2/ CONTAMINATED ITEMS	CW AGENTS	DECONTAMINANTS
ROADS AND TERRAIN	MUSTARD, LEWISITE, G-AGENTS	EMULSION OF 10% CHLORIDE OF LIME AND 1% WATER GLASS IN WATER.
ROADS AND TERRAIN	MUSTARD, LEWISITE, SARIN AND SOMAN	10% SOLUTION OF SULFURYL CHLORIDE IN DICHLORDETHANE (OR PETROLEUM).
COMBAT EQUIPMENT	MUSTARD, LEWISITE, V-AGENTS	10% SOLUTION OF DICHLORAMINE -T IN DICHLORETHANE OR IN CARBON TETRACHLORIDE.
VEHICLES AND WEAPONS	G-AGENTS	2% SODIUM HYDROXIDE, 5% MONOETHANOLAMINE, AND 20% AMMONIA IN WATER.

DATE CATALOGED: 01NOV69

Original
FOM-4230-2-3-1

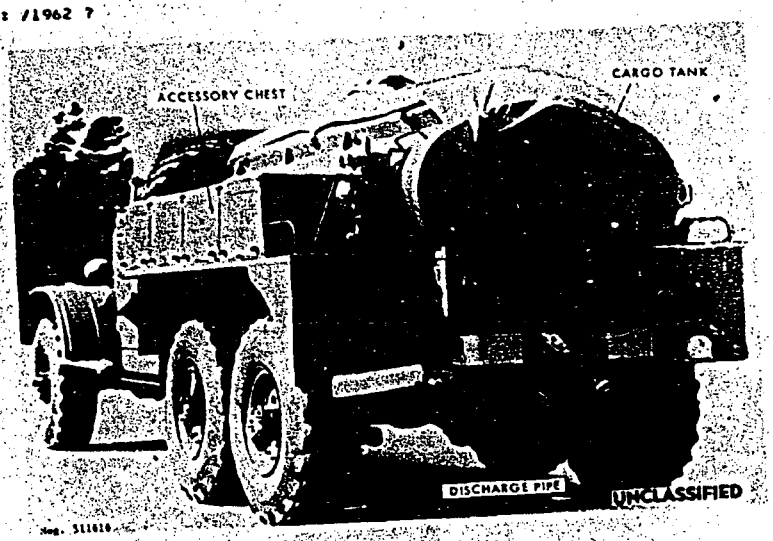
UNCLASSIFIED

ST-CS-03-148-75

NOMEN: DECONTAMINATION APPARATUS, TRUCK-MOUNTED, MODEL ARS-12U (U)

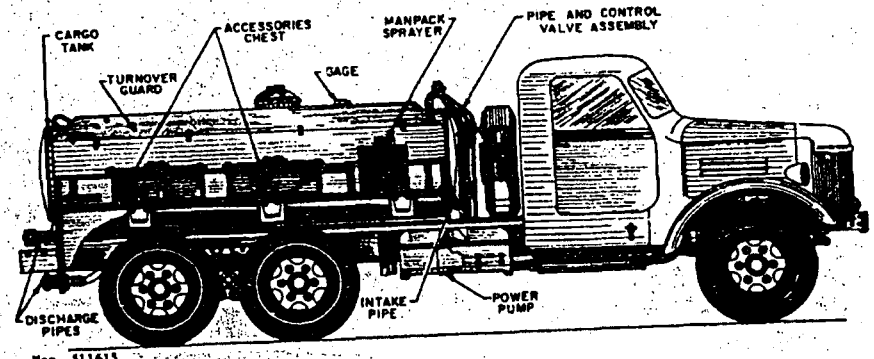
(OLD Z-4230-3-1)
COUNTRY: U.S.S.R.
DATE UPDATED: 28AUG73

PRODUCED/ADOPTED: /1962 ?



Neg. 511610

(UNCLASSIFIED)



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DATE CATALOGED: 01NOV69

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APPENDIX IV.

SELECTED MEDICAL MATERIEL MANUFACTURERS AND MEDICAL LABORATORIES, NORTH VIETNAM (1971)

Annexes — Page

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ANNEX A.

MANUFACTURERS OF MEDICAL MATERIEL

(b)(1)

(CONFIDENTIAL)

MANUFACTURERS OF MEDICAL MATERIEL (Continued)

(b)(1)

ANNEX B.

MEDICAL LABORATORIES

(b)(1)

(b)(1)

(CONFIDENTIAL)

MEDICAL LABORATORIES (Continued)

APPENDIX V.

FOMCAT ILLUSTRATIONS AND DESCRIPTIONS OF PROTECTIVE EQUIPMENT, NORTH KOREA

FOM No.	Title	Page
	(b)(1)	

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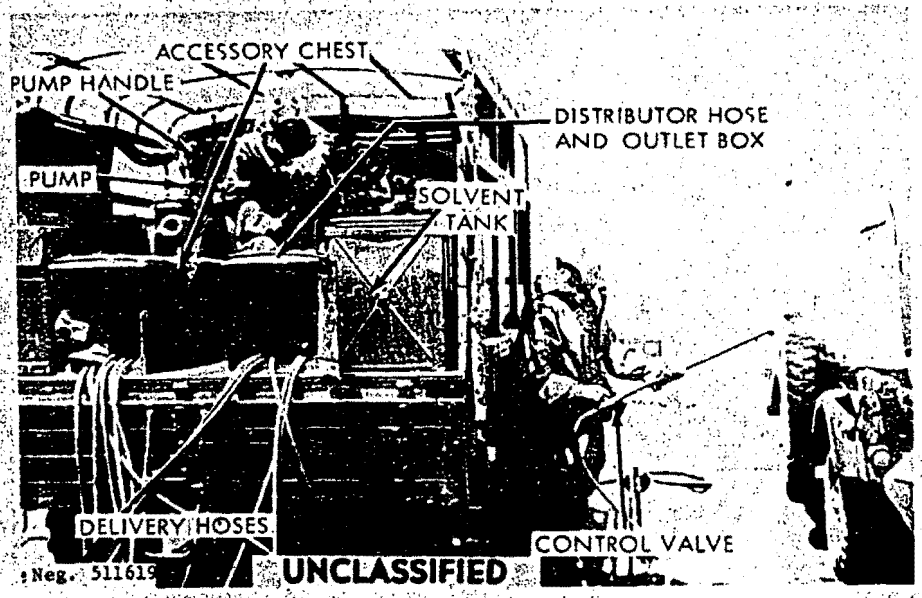
FOM-4230-2-3-3
NOMEN: DECONTAMINATION APPARATUS, TRUCK-MOUNTED, MODEL ADM-48D (U) (OLD 2-4230-3-3)

NATIVE DES: АВТОМОБИЛЬНАЯ МАШИНА, АДМ-48Д
PRODUCED/ADOPTED: /1958 ?
COUNTRY: U.S.S.R.
DATE UPDATED: 25JUN73

(b)(1)

(U)EACH DECONTAMINATION UNIT CONSISTS OF A CARGO TANK, A HAND PUMP, A PRESSURE-EQUALIZING TANK (TO REDUCE SURGING THAT RESULTS FROM THE SLOW-ACTING HAND PUMP), A PLUMBING SYSTEM, A METERING DEVICE, SIX 12 METER SPRAY HOSES, SIX BRUSHES, SIX NOZZLES, FOUR SUCTION HOSES, TOOLS, AND SPARE PARTS. A 64 LITER, RECTANGULAR, STEEL TANK NORMALLY FILLED WITH THE SOLVENT DICHLORDETHANE IS STORED IN THE CARRIER.

(U)THE MODEL ADM-48D ALSO SUPPLIES WATER FOR FIELD SHOWERS AND LAUNDRY FACILITIES. IT CAN BE SET UP FOR OPERATION IN ABOUT 30 MINUTES, AND REQUIRES ABOUT 6 SQUARE METERS OF WORKING SPACE. PLACED ON THE GROUND, THE METERING DEVICE RECEIVES LIQUID DECONTAMINANT THROUGH A HOSE FROM ONE OF THE TRUCK'S TANKS AND RAPIDLY REFILLS THE EMPTY CONTAINERS OF DECONTAMINATION KITS, SUCH AS THE MODEL A-DK, (FOM-4230-2-1-4) WITH MEASURED QUANTITIES.



DATE CATALOGED: 01NOV69

ST-CS-03-148-75

FOM-4230-2-3-3

CONFIDENTIAL

Original

NOMEN: DECONTAMINATION APPARATUS, TRUCK-MOUNTED, MODEL ADM-48D (U)

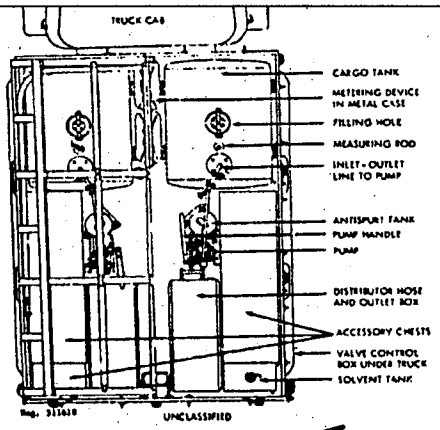
(OLD 2-4230-3-3)

COUNTRY: U.S.S.R.

DATE UPDATED: 25JUN73

PRODUCED/ADOPTED: /1958 ?

(b)(1)



DATE CATALOGED: 01NOV69

XGDS/1/NA

144

CONFIDENTIAL

732

Original

ST-CS-03-148-78

FOM-4230-7-3-1

NOMEN: DECONTAMINATION UNIT, CLOTHING, TRUCK-MOUNTED, MODEL BU-4 (U) (OLD 7-4230-3-1)

NATIVE DES: Bekleidungsentgiftungsanlage BU-4

COUNTRY: EAST GERMANY

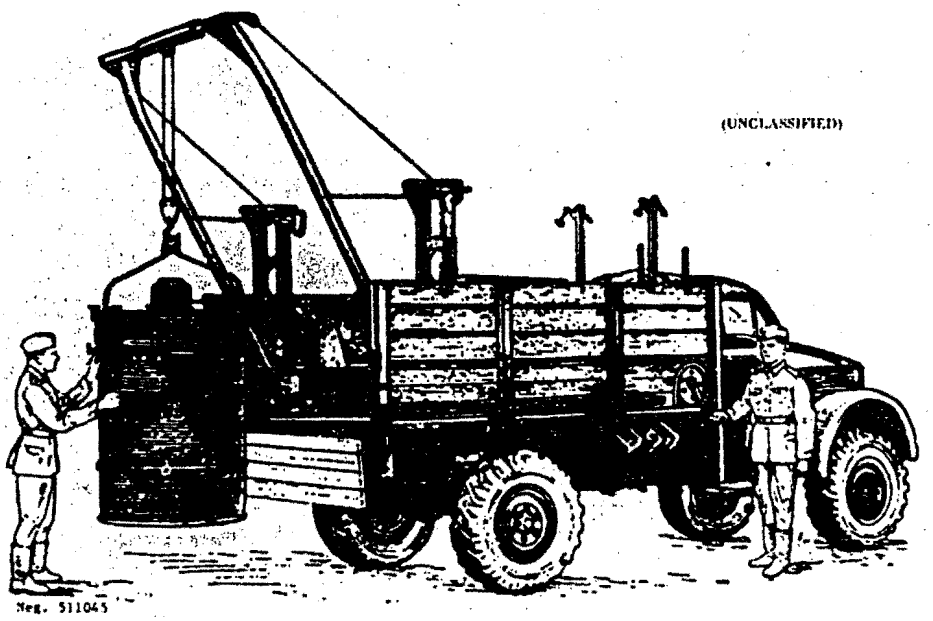
PRODUCED/ADOPTED: /1960 ?

DATE UPDATED: 28AUG73

(U)THE EAST GERMAN MODEL BU-4 DECONTAMINATION UNIT IS USED TO REMOVE CHEMICAL AND BIOLOGICAL CONTAMINANTS FROM COTTON CLOTHING, IMPERMEABLE PROTECTIVE CLOTHING, IMPREGNATED CLOTHING, RUBBER FACEPIECES, BOOTS, CANVAS, AND KITCHENWARE. THE UNIT'S EQUIPMENT IS COMPACTLY LOADED ON A CARGO TRUCK, WHICH IS EQUIPPED WITH A CRANE, AND IS LOWERED TO THE GROUND FOR USE. THE TRUCK BODY IS WOODEN (TO RESIST CORROSION) AND IS MOUNTED ON TYPE GAZ-51 (FOM-2320-2-4-21, GAZ-63 (FOM-2320-2-4-31, OR LO-1800 (FOM-2320-7-4-11) CHASSIS.

(U)THE UNIT HAS TWO IDENTICAL BOILERS. ITEMS TO BE DECONTAMINATED ARE LOADED IN LAUNDRY TRAYS AND LOWERED INTO THE BOILERS. IF THE DECONTAMINATION IS TO BE ACCOMPLISHED BY ADDING AMMONIA TO THE WATER, THE BOILERS ARE COVERED, AND THE CONTAMINATED ARTICLES ARE PLACED ON SCREENS ABOVE THE SOLUTION AND ARE THEN PERMEATED BY STEAM AND AMMONIA VAPORS. ARTICLES MAY ALSO BE DECONTAMINATED BY IMMERSION IN BOILING WATER.

(U)THE BU-4 MAY BE AN IMPROVED VERSION OF THE SOVIET MODELS BU-2 (FOM-4230-2-3-9) AND THE BU-3.



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Neg. 511045

DATE CATALOGED: 01SEP67

NOMEN: DECONTAMINATION UNIT, CLOTHING, TRUCK-MOUNTED, MODEL BU-4 (U) (OLD T-4230-3-1)
COUNTRY: EAST GERMANY
PRODUCED/ADOPTED: /1960 ?
DATE UPDATED: 28AUG73

CURRENT STATUS: STANDARD

MAJOR COMPONENTS:
- TANK ---------- #1
- PUMP
  - -POWER DRIVEN ----- N/A
  - -HAND OPERATED ---- #2
- HOSE ---------- RUBBER
- STRAPS ---------- N/A

PHYSICAL DATA:
- CAPACITY
  - -MAXIMUM ---------- 567 LITERS
  - -WORKING ---------- N/A
- WEIGHT
  - -FILLED ---------- ?
  - -EMPTY ---------- ?
- DIMENSIONS
  - -LENGTH ---------- ?
  - -WIDTH ---------- ?
  - -HEIGHT ---------- ?

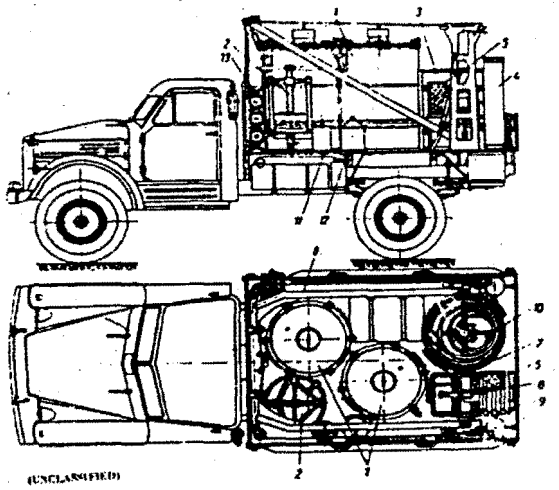
DECONTAMINANTS: ------ WATER, SODA AND WATER, (SEE TEXT)

PERFORMANCE:
- COVERAGE ---------- N/A
- DISCHARGE RATE ------ N/A
- DISCHARGE TIME ------ N/A
- OPERATING PRESSURE -- N/A

PLUMBING SYSTEM: ------ ?

GENERAL DATA:
- CARRIER
  - -TYPE ---------- SEE TEXT
  - -CAPACITY ---------- SEE TEXT
- CREW ---------- ?
- MISC EQUIPMENT ------ PRESS, HAND PUMP, 2 CANVAS WATER CONTAINERS OF 1003 LTR & 1192 LTR CAP. RESPECTIVELY

REMARKS:
1/ 2 DECONTAMINATING BOILERS, CRANE, DRYING APPARATUS, RUBBERIZED CONTAINERS, WATER TANK
2/ 1 HAND PUMP TO SUPPLY UNIT WITH WATER



1. DECONTAMINATION BOILERS
2. DRYING PRESS
3. WATER TANK
4. SMOKESTACK
5. LAUNDRY TRAYS
6. CRANE
7. BOX (TOOLS, SPARE PARTS)
8. WATER PUMP (MANUAL)
9. BENCHES
10. HOSE
11. PAIL
12. CONTAINER (SODA?)
13. STAKES AND PEGS FOR DRYING TENT

Neg. 511046

DATE CATALOGED: 01SEP67

Original
FOM-4230-2-3-4
NOMEN: DECONTAMINATION APPARATUS, TRAILER MOUNTED, MODEL DDP (U)

ST-CS-03-148-75

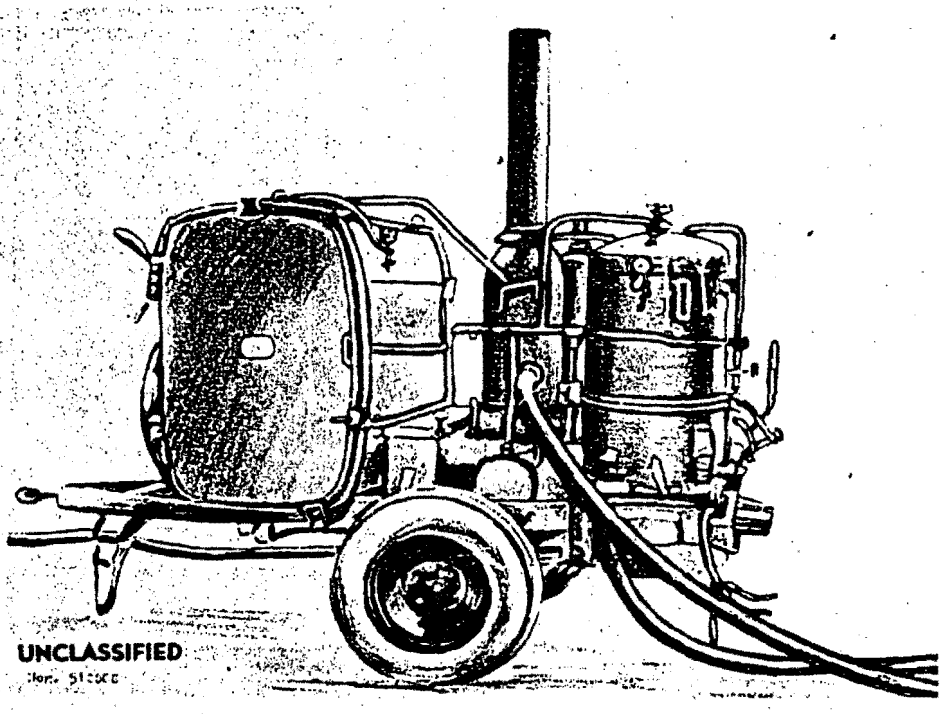
(OLD 2-4230-3-4)

NATIVE DES: ?
PRODUCED/ADOPTED: /1962?

COUNTRY: U.S.S.R.
DATE UPDATED: 28AUG73

(b)(1)

(U)CLOTHING AND EQUIPMENT CONTAMINATED WITH CW OR BW AGENTS ARE SUSPENDED FROM HANGERS IN THE STEAM CHAMBER, TO WHICH PRESSURIZED STEAM IS ADMITTED THROUGH PIPES IN THE FLOOR. TO EXPEDITE CW, ESPECIALLY NERVE, AGENT DECONTAMINATION, AN OPEN VESSEL OF AMMONIA MAY BE PLACED IN THE CHAMBER TO VAPORIZE WITH THE STEAM; THE VESSEL MAY BE FILLED WITH FORMALDEHYDE TO REDUCE THE TIME FOR DESTROYING BW AGENTS. NONSPORE-FORMING MICROBES ARE EXPOSED TO STEAM AT 83 DEG. C. FOR 0.5 HOUR, OR TO STEAM AND 0.08 LTR OF FORMALDEHYDE AT 59 DEG. C. FOR 0.75 HOURS; SPORE-FORMING ORGANISMS ARE DESTROYED IN STEAM AT 98 DEG C. FOR 3 TO 3.5 HOURS, OR IN A MIXTURE OF STEAM AND 0.5 LITER FORMALDEHYDE AT 59 DEG. C. FOR 2.75 HOURS.



DATE CATALOGED: 01DEC66

147

XGDS/2/NA

ST-CS-03-148-75

FOM-4230-2-3-4

CONFIDENTIAL

Original

NOMEN: DECONTAMINATION APPARATUS, TRAILER MOUNTED, MODEL DDP(U)

TOLD 2-4230-3-61

COUNTRY: U.S.S.R.

PRODUCED/ADOPTED: /1962?

(b)(1)

(b)(1)

DATE CATALOGED: 01DEC66

148

XGDS/Z/NA

CONFIDENTIAL

736

Original
POM-4230-2-1-7

ST-CS-03-148-75

NOMEN: DECONTAMINATION KIT, INDIVIDUAL, MODEL IPP (U) (OLD 2-4233-1-7)

NATIVE DES: ?
PRODUCED/ADOPTED: /1960 ?

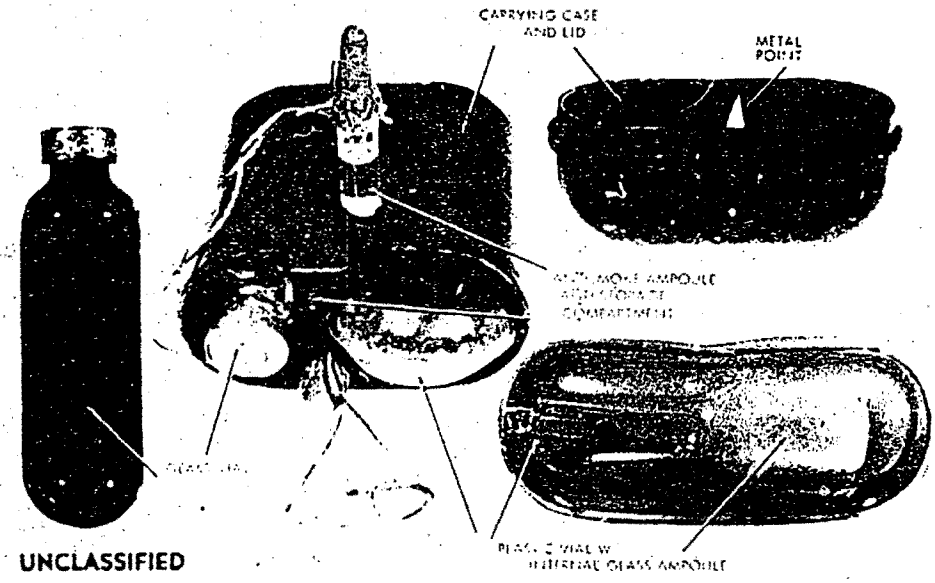
COUNTRY: U.S.S.R.
DATE UPDATED: 19SEP73

(U)THE MODEL IPP KIT, WHICH IS CARRIED IN THE PROTECTIVE MASK CARRIER, IS PROVIDED FOR TREATING SMALL AREAS OF SKIN AND CLOTHING CONTAMINATED WITH CW NERVE AGENTS OR VESICANTS. IT IS ALSO USEFUL AGAINST BW AGENTS.

(b)(1)

(U)FOUR ANTISMOKE GAUZE-WRAPPED AMPOULES, EQUIPPED WITH PULL STRINGS, ARE STORED IN AN X SHAPED COMPARTMENT. FOR USE, AN AMPOULE IS INSERTED INTO THE MASK FACEPIECE AND CRUSHED, AND THE FUMES ARE INHALED TO NULLIFY THE EFFECTS OF IRRITANT SMOKE. THE INHALANT IS COMPOUNDED OF 40 ML OF ETHANOL, 40 ML OF CHLOROFORM, 20 ML OF ETHYL ETHER, AND 10 DROPS OF STRONG AMMONIA WATER.

(U)THE IPP, POSSIBLY ALSO REFERRED TO AS THE IPP-51, IS BELIEVED TO SUPERSEDE THE IPP-3, WHICH CONTAINED A DECONTAMINANT FOR VESICANTS ONLY.



UNCLASSIFIED

DATE CATALOGED: 01AUG68

149

XGDS/2/NA

ST-CS-03-148-75
FOM-4230-2-1-7
NOMEN: DECONTAMINATION KIT, INDIVIDUAL, MODEL IPP (U)

CONFIDENTIAL

Original

(GLO 4-4230-1-7)
COUNTRY: U.S.S.R.
DATE UPDATED: 19SEP73

PRODUCED/ACCEPTED: /1960 ?

CURRENT STATUS: STANDARD

(b)(1)

REMARKS:

(b)(1)

DATE CATALOGED: 01AUG68

CONFIDENTIAL

XGDS/2/NA

APPENDIX VI.

SELECTED MEDICAL MATERIEL MANUFACTURERS AND MEDICAL LABORATORIES, NORTH KOREA (1971)

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ANNEX A.

MANUFACTURERS OF MEDICAL MATERIEL

(c)

(b)(1)

*Data not available

(CONFIDENTIAL)

Classified by Cdr, USAFSTC
Exempt from GDS of EO 11652
Exemption Category 3
Declassify on IMPDET

ST-CS-03-148-75

Original

(CONFIDENTIAL)

ANNEX B.

MEDICAL LABORATORIES

(b)(1)

APPENDIX VII.

SELECTED MEDICAL MATERIEL MANUFACTURERS, MONGOLIAN PEOPLES REPUBLIC (1971)

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ST-CS-03-148.75

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MONGOLIAN PEOPLES REPUBLIC (1971) (Continued)

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1. REPORT NUMBER ST-CS-03-148-75	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) BIOLOGICAL WARFARE CAPABILITIES--ASIAN COMMUNIST COUNTRIES (U)		5. TYPE OF REPORT & PERIOD COVERED Trend study, Group I, Annual. 6. PERFORMING ORG. REPORT NUMBER FSTC T74-03-09-51
7. AUTHOR(s) (b)(6)		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Foreign Science and Technology Center US Army Materiel Command Department of the Army		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS (b)(3):10 U.S.C 424
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE July 1974 13. NUMBER OF PAGES 175
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Biological Warfare
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Biological Warfare Materiel
Biological Warfare Doctrine
Biological Warfare Development Programs
Biological Warfare Agents
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

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Description of document:	Defense Intelligence Agency report, Biological Warfare Capabilities - Asian Communist Countries Supplement One, July 1974
Requested date:	23-October-2008
Released date:	10-June-2013
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Source of document:	Commander US Army Intelligence & Security Command Freedom of Information/Privacy Office ATTN: IAMG-C-FOI 4552 Pike Road Fort George G. Meade, MD 20755-5995 Fax: (301) 677-2956 Email: FOIA/Privacy Office Online FOIA Request Form
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DEPARTMENT OF THE ARMY
UNITED STATES ARMY INTELLIGENCE AND SECURITY COMMAND
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FORT GEORGE G. MEADE, MARYLAND 20755-5995

REPLY TO
ATTENTION OF:

Freedom of Information/
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10 JUN 2013

This is in further response to your Freedom of Information Act (FOIA) request of October 23, 2008, and supplements our electronic message of May 12, 2010.

Coordination has been completed with another element of our command and other government agencies and records returned to this office for our review and direct response to you. We have reviewed the records and determined the records are partially releaseable to you. A copy of the records are enclosed for your use.

We have completed a mandatory declassification review in accordance with Executive Order (EO) 13526. As a result of our review information has been sanitized and 4 pages have been withheld in their entirety as the information is currently and properly classified TOP SECRET, SECRET and CONFIDENTIAL according to Sections 1.2(a)(1), 1.2(a)(2), 1.2(a)(3) and 1.4(c) of EO 13526. This information is exempt from the public disclosure provisions of the FOIA pursuant to Title 5 U.S. Code 552 (b)(1). It is not possible to reasonably segregate meaningful portions of the withheld pages for release. The records are enclosed for your use. A brief explanation of the applicable sections follows:

Section 1.2(a)(1) of EO 13526, provides that information shall be classified TOP SECRET if its unauthorized disclosure reasonably could be expected to cause exceptionally grave damage to the national security.

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Section 1.2(a)(3) of EO 13526, provides that information shall be classified CONFIDENTIAL if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

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In addition, information has been sanitized from the records and 4 pages have been withheld in their entirety as the release of the information would reveal sensitive intelligence methods. This information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(7)(E) of the FOIA. The significant and legitimate governmental purpose to be served by withholding is that a viable and effective intelligence investigative capability is dependent upon protection of sensitive investigative methodologies. It is not possible to reasonably segregate meaningful portions of the withheld pages for release.

The withholding of the information described above is a partial denial of your request. This denial is made on behalf of Major General Stephen G. Fogarty, the Commanding General, U.S. Army Intelligence and Security Command, who is the Initial Denial Authority for Army intelligence investigative and security records under the FOIA. You have the right to appeal this decision to the Secretary of the Army. Your appeal must be postmarked no later than 60 calendar days from the date of this letter. After the 60-day period, the case may be considered closed; however, such closure does not preclude you from filing litigation in the courts. You should state the basis of your disagreement with the response and provide justification for a reconsideration of the denial. An appeal may not serve as a request for additional or new information. An appeal may only address information denied in this response. Your appeal is to be made to this office, for forwarding, as appropriate to the Secretary of the Army, Office of the General Counsel.

Coordination has been completed and we have been informed by the Central Intelligence Agency (CIA) that information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(1) and (b)(3) of the FOIA.

The withholding of the information by the CIA constitutes a denial of your request and you have the right to appeal this decision to the Agency Release Panel within 45 days from the date of this letter. If you decide to file an appeal, it should be forwarded to this office and we will coordinate with the CIA on your behalf. Please cite CIA #F-2010-01292/Army #57F-09 assigned to your request so that it may be easily identified.

Coordination has been completed and we have been informed by the Defense Intelligence Agency (DIA) that their information is exempt from public disclosure pursuant to Title 5 U.S. Code § 552 (b)(1), (b)(2) (b)(3) and (b)(4) of the Freedom of Information Act and Executive Order (EO) 13,526 § 1.4 (c) (d) and (h). The statute invoked under Title 5 U.S. Code 552 (b)(3) is 10 U.S.C. §424, which allows for the protection of organizational and personnel information for DIA.

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You have received all Army intelligence investigative records pertaining to this request.

There are no assessable FOIA fees.

If you have any questions regarding this action, feel free to contact this office at 1-866-548-5651, or email the INSCOM FOIA office at: INSCOM_FOIA_ServiceCenter@mi.army.mil and refer to case #57F-09.

Sincerely,

Brad S. Dorris
Director
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Enclosure

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SAO/ST-SS-03-148-75
SUPPL 1

AFFTH007509

DEFENSE INTELLIGENCE AGENCY

CIRC

AUG 12 1974

BIOLOGICAL WARFARE CAPABILITIES-- ASIAN COMMUNIST COUNTRIES (U)

SUPPLEMENT 1

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This document contains information affecting the national security of the United States within the meaning of the espionage laws U.S. Code Title 18, Sections 793 and 794. The law prohibits its transmission or the revelation of its contents in any manner to an unauthorized person, as well as its use in any manner prejudicial to the safety or interest of the United States or for the benefit of any foreign government to the detriment of the United States. It is to be seen only by personnel especially indoctrinated and authorized to receive information in the designated control channels. Its security must be maintained in accordance with regulations pertaining to TALENT-KEYHOLE Control System.

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BIOLOGICAL WARFARE CAPABILITIES--ASIAN COMMUNIST COUNTRIES - (U)

SUPPLEMENT 1

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SAO/ST-SS-03-148-75

DIA Task No. T74-03-09A

DATE OF PUBLICATION
August 1974
INFORMATION CUTOFF DATE
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SUBJECT MATTER	PAGE NUMBERS	DATE
Title page	None	August 1974
Preface	iii and iv	Original
List of Effective Pages	v and vi	Original
Record of Changes	vii and viii	Original
Table of Contents	ix	Original
List of Illustrations	x	Original
Summary	xi and xii	Original
Section I	1 thru 14	Original
Section II	15 thru 18	Original
DD Form 1473	19 and 20	Original
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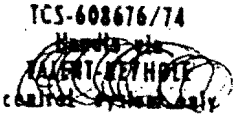

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Figure 5. Tricircular grid area (U).

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Figure 6. Tricircular grid pattern (U).

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Released date:	10-June-2013
Posted date:	13-August-2013
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DEPARTMENT OF THE ARMY
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REPLY TO
ATTENTION OF:

Freedom of Information/
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The withholding of the information by the DIA constitutes a partial denial of your request and you have the right to appeal this decision directly to the DIA. If you decide to file an appeal, it should be forwarded to the Director, Defense Intelligence Agency, ATTN: DAN-1A-FOIA, Washington, DC 20340-5100. Please cite MDR #0155-2010 assigned to your request so that it may be easily identified.

You have received all Army intelligence investigative records pertaining to this request.

There are no assessable FOIA fees.

If you have any questions regarding this action, feel free to contact this office at 1-866-548-5651, or email the INSCOM FOIA office at: INSCOM_FOIA_ServiceCenter@mi.army.mil and refer to case #57F-09.

Sincerely,

Brad S. Dorris
Director
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BIOLOGICAL WARFARE CAPABILITIES - MIDDLE EAST COUNTRIES (U)

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July 1973

Publication No.
ST-CS-03-32-74

ST-CS-03-32-74
US ARMY MATERIEL COMMAND
FOREIGN SCIENCE AND TECHNOLOGY CENTER
Federal Office Building, Charlottesville, Va. 22901

BIOLOGICAL WARFARE CAPABILITIES—MIDDLE EAST COUNTRIES (U)

Publication No. ST-CS-03-32-73, September 1972, is superseded by the inclosed document, ST-CS-03-32-74.

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BIOLOGICAL WARFARE CAPABILITIES– MIDDLE EAST COUNTRIES (U)

(b)(6)

ST-CS-03-32-74

DIA Task No. T74-03-10

July 1973

Information Cutoff Date: 15 June 1973

This study supersedes "Biological Warfare Capabilities–Middle East Countries (U)" ST-CS-03-32-73, dated September 1972.

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PREFACE

(U) This product is a revision of a report (ST-CS-03-32-73) with a similar title that was published in September 1972. The study addresses the biological warfare capabilities of Israel, Egypt, Iran, Iraq, Jordan, Lebanon, Saudi Arabia, and Syria. Trends and forecasts are included.

(U) A bibliography has been prepared separately and can be made available on written request to the Defense Intelligence Agency, ATTN: DT-1A, Washington, D. C. 20301.

(U) Although the cutoff date for information in this document is 15 June 1973, major updatings have been made up to the date of final approval for printing.

(U) Constructive criticisms, comments, or suggested changes are encouraged, and should be forwarded to the Defense Intelligence Agency, ATTN: DT-1A, Washington, D. C. 20301. Critical evaluations from readers will provide guidance for updating, enabling this study to be most responsive to the varied needs of the users.

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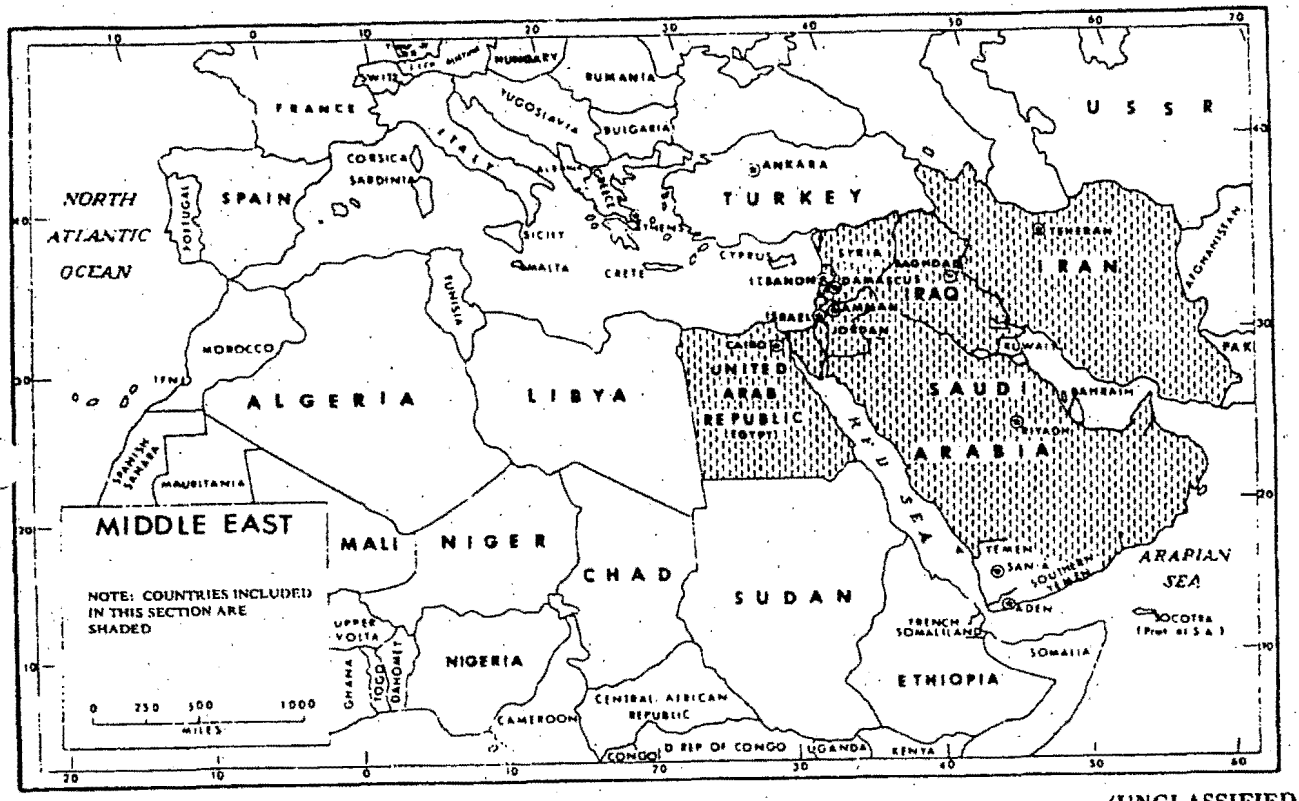
SUMMARY

(U) The biological warfare capabilities of the Middle East countries belong almost entirely to Israel, Egypt (Arab Republic of Egypt), and possibly Iran. The other countries considered in this study, Iraq, Jordan, Lebanon, Saudi Arabia, and Syria, possess no offensive materiel and little or no defensive materiel. All countries with the exception of Israel would be dependent on outside sources for offensive and defensive biological warfare materiel. Israel, while having the most advanced technology in the Middle East, has chosen to purchase some of its defensive materiel from outside sources.

(U) The use of biological agents would offer military advantages to Middle East countries, but at the same time defensive weaknesses would make any victory gained a very tenuous one. This statement should not be interpreted as denying the potential effectiveness of the covert use of biological agents to promote military or economic gains. The BW Convention of 1972 was signed by Egypt, Iran, Iraq, Lebanon, Syria, and Saudi Arabia. As of 24 April 1973, only Saudi Arabia has ratified the BW Convention.



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Map of Middle East (U).

Section I.

ISRAEL

A. INTRODUCTION

1. (U) Historical Background and Competence in Microbiology and Public Health

a. This section will present an evaluation of intelligence data and open source information which concerns the capability of Israel to conduct biological warfare (BW). Available information does not demonstrate that Israel is engaged in an active BW program. The scientific and technical capabilities of personnel, research institutes, and educational institutes, however, would more than provide the expertise which is necessary to initiate or conduct such a program.

b. The evaluated information primarily concerns microbiological research and development conducted by Israel's scientific organizations. Most research programs appear to have been designed to generate new industry or to improve public health and agricultural standards of the nation.

c. No specific institute or organization per se is considered to be participating in biological warfare activities. Specific areas of research and equipment which might be employed for development and production of BW weapons within Israeli institutes and organizations will be discussed in later sections.

2. ~~(S-NFD)~~ Geographical and Political Factors

(b)(1)

NO FOREIGN DISSEM

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(b)(1)

B. ASSESSMENT

3. (~~C-NFD~~) Order of Battle

(b)(1)

(b)(1)

NO ~~FOREIGN~~ DISSEM

(b)(1)

4. (S) BW Materiel

(b)(1)

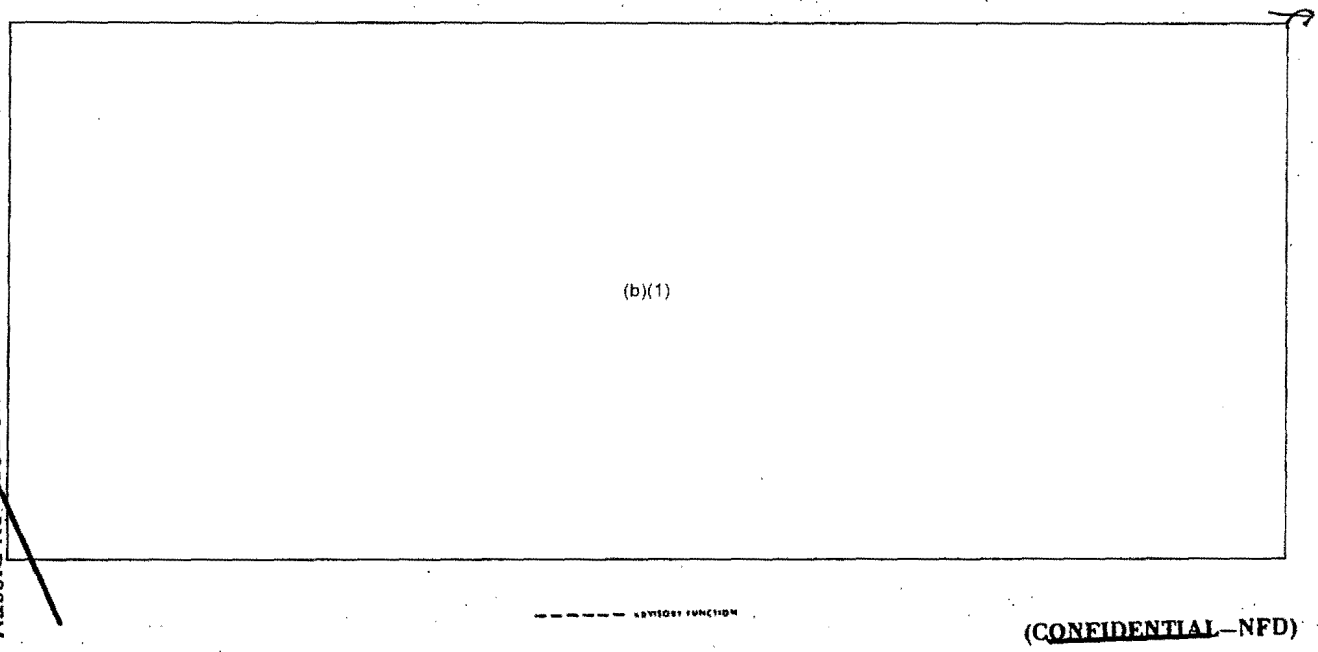
5. (S) Production Facilities and Capabilities

(b)(1)

7. (S-NFD) Doctrine and Procedures

(b)(1)

NO FOREIGN DISSEM



(CONFIDENTIAL—NFD)

Figure 1. Israeli BW research organization (U).

(1) (S) Israel Institute for Biological Reserach P.O.B. 19, Ness-Ziona.

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(b)(1)

(c) (U) Personnel at the IIBR also work on a contract basis for the Ministry of Defense on specific problems of civil defense and for the Israel Defense Forces Medical Corps on projects for the prevention of communicable diseases. Numerous research projects are sponsored by foreign insitutions such as the National Institutes of Health of the US, the National Communicable Disease Center of the US, the US Department of Agriculture, the US Army Medical R&D Command, the Ford Foundation and the World Health Organization. The Department of Epidemiology includes the WHO/FAO & National Leptospirosis Reference Laboratory. The multidisciplinary setup of the Institute enables it to create research teams in accordance with the needs or proposals of local authorities or foreign agencies. Most of the activities are project-oriented and are directed accordingly.

(d) (U) Since its affiliation in 1967 to the Tel Aviv University (Medical School and Faculty of Science), the majority of its senior scientific staff hold academic appointments and belong to the teaching staff of this university, in addition to those lecturing at the Hebrew University of Jerusalem and the Bar-Ilan and the Negev Universities. Since its foundation the Institute has been accepting, by special agreement with the Hebrew University of Jerusalem, graduate students in microbiology and associated fields of biochemistry and chemistry. Recently a similar agreement was reached with the Tel Aviv University and the Weizmann Institute of Science. Fifteen M. Sc. students are being accepted annually and 15 students are currently working toward their Ph.D degrees.

NO FOREIGN DISSEM

(b)(1)

(2) (S) The Weizmann Institute of Science, Rehoveth

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Original

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(d) (U) More recent developments at the Weizmann Institute are summarized below.

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(3) ~~(C)~~ The Hebrew University of Jerusalem, Jerusalem.

(b)(1)

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(b)(1)

(4) ~~(C)~~ Technion, Israel Institute of Technology, Haifa.

(a) (U) Technion is an academic institute which offers courses in engineering and the exact sciences and provides curricula leading to the degree of Doctor of Science.[3] Research facilities are comparable to those found in Western universities.

(b)(1)

(5) ~~(C)~~ Veterinary Institute, Rishon le Zion-Beit Dagon.

(a) (U) During the past decade, the Veterinary Institute was reported to be the source of all vaccines for animal use in Israel.[2] A competant staff of veterinarians and microbiologists was reported to be engaged in research on vaccines, cell culture techniques, propagation of disease agents, bionomics of vectors and disease agents, and physiological and metabolic problems.

(b)(1)

(6) (U) Department of Microbiology, University of Tel Aviv.[8]

(a) (U) This Department occupies a modern isolated building in the new University area on the northern edge of Tel Aviv known as Ramat Aviv. The Department head, Prof. Issac Witz, has organized his work so that he can advise medical students and direct the research activities of the Department. The teaching responsibilities include 80 medical students plus a number of fourth year science students.

(b) (U) The research program has received new impetus since Witz was installed as head of the Department. The interest of Dr. Eylan, former head of the department, was in the antiviral effects of various biological materials. At the International Microbiological Congress in Mexico, he reported on some work with antiviral proteins from *Staphylococcus aureus*. Dr. Eylan found that an acidic extract of the bacteria reacted with the lipid envelope of certain viruses, such as herpes virus and vesicular stomatitis virus, and inactivated them. He is also examining extracts of other bacteria and of plants for inhibition of herpes virus. Other studies are concerned with the interaction of two viruses in the same host tissue, and it was found that Sendai virus enhanced the growth and virulence of West Nile Virus. Virus yields have been increased 1000-fold. The growth and plaque formation of toxoplasma are being studied in cell cultures; by using a special strain, which is not toxic for mice, Eylan is able to examine the effects of various viruses in increasing the virulence of the protozoa. Finally, a program for study of birth defects, such as mongolism caused by a subclinical infection of rubella during pregnancy, has been started. Sera are collected from pregnant women at 3-month intervals and stored until needed to investigate a fetal abnormality. Antibody levels in the serum specimens are determined against suspect viruses in order to discover any relationship with the progress of the pregnancy.

(7) (U) Government Central Laboratories, Jerusalem.

(a) (U) Located within the city of Jerusalem, this laboratory is well equipped and is staffed by capable, energetic scientists. Under the direction of Dr. Ch. B. Gerichter, National Centers for Cholera, Streptococci, Salmonella, Enterobacteriaceae, and Immunohematology and Blood Groups, together with the District Diagnostic Laboratory and the Serum and Vaccine Institute have been established at these laboratories.

(b) (U) The work of the national centers includes receipt and identification of strains of microorganisms from hospitals and public health officers of the entire country. In addition, diagnostic sera and other reagents are prepared for use by the center, and research on development of new diagnostic methods is carried out. Last year 500 strains of *Vibrio cholerae* were received for identification, and 4000 strains of Salmonella were examined for all O and H antigens. Recently when *Salmonella blockley* was found to occur in sporadic outbreaks of gastroenteritis in humans, as well as in poultry and cattle, a phage-typing scheme was devised to identify individual strains of this species. By the use of a phage sensitivity test for each of three symbiotic phages and a lysogenicity test using three indicator strains, it was possible to obtain a framework of 64 theoretically possible phage types. With this scheme, 1256 *S. blockley* strains were grouped into 14 types. During seven food-poisoning outbreaks, in which this scheme was used, all strains in each single outbreak were found to belong to the same phage type.

(c) (U) In the Streptococcus Laboratory, Dr. Bergner-Rabinowitz has guided the work of her group in developing methods for identifying hemolytic streptococci. As a simple first step in classifying strains, they are inoculated on blood agar containing 5 units of bacitracin per ml. On this medium all Group A strains of streptococci are inhibited but other groups will grow. The Group A strains are then typed by agglutination with specific sera. Although this is more tedious than precipitin tests, it is possible to type practically all strains in this way. With the M substance only 15-20% of strains are typed by precipitin tests. Work was undertaken to determine the amount of protective (M) antibody in human sera. A simplified method for detecting type-specific antibodies for Group A streptococci in human sera was developed by using an *in vitro* phagocytosis system with mouse peritoneal leukocytes. This technique compares favorably with the bactericidal method, is simpler, and provides an answer in a short time. In a recent study of 100 patients with glomerulonephritis caused by Group A streptococcus type 55 (a new type in Israel), specific antibodies against type 55 were found in the sera of a significant number of patients as compared with control individuals. Antibodies were detected 2 to 3 months after the initial infection and gradually disappeared 6 to 7 months later. This study demonstrated the practical usefulness of the type-specific antibody test in nephritic patients.

(d) (U) The staff of the Vaccine and Serum Institute prepare five vaccines: those against cholera, plague, rabies, smallpox, and typhoid fever, for use in the entire country. The cholera, plague, and typhoid fever vaccines are killed bacterial suspensions prepared with the standard strains of bacteria. Rabies vaccine is made by the Semple method from infected rabbit brain suspensions which have virus titers of about $10^{6.5}$ LD_{50} for mice. Smallpox vaccine is prepared in chick embryos. It is bacteriologically sterile and is distributed as a glycerinated suspension. Gerichter would like desperately to prepare a dried vaccine, but lacks a lyophilizer. In order to maintain the vaccine in a vigorous state to develop immunity in man, the seed is prepared in large amounts so that the vaccine is not more than three egg passages removed from a thoroughly evaluated seed preparation.

(e) (U) Rubella vaccine is needed in Israel. The Ministry of Health made a decision to immunize all sixth grade girls in Israel against rubella or German measles.[10] At present the importation of the vaccine is under consideration. A decision on the source of vaccine must be made among the following: vaccine prepared in duck embryos by Merck, or in human diploid cell line WI38 by Burroughs Wellcome or Merieux.

(8) (U) **Tel Hashomer Hospital, Tel Aviv.**

(a) (U) The Bacteriology Department of the laboratory of this 1000-bed hospital is directed by Dr. G. Altmann. The hospital occupying a number of single-story buildings which were constructed during WW II is located about 10 miles east of the center of Tel Aviv. These buildings had served as a general hospital and rehabilitation center for the US Army during the Mediterranean campaign. Since that time, there have been some modifications to the buildings, but in general, the problems of communication between the numerous hospital wards and clinics in separate buildings impose many difficulties on the laboratory staff. Altmann and his coworker, Dr. Bianke Bogokowski, have maintained an active program of surveillance of bacterial diseases in this hospital. They work closely with other international laboratories such as the WHO Neisseria Reference Center at Marseilles and the National Communicable Disease Center in Atlanta when special problems have arisen.

(b) (U) In discussing the question of meningitis, Dr. Altmann stated that it is not a serious problem in Israel since they have about only 50 cases per year. From these cases the meningococci isolated were mainly Group C although some Group B strains were detected. He described some work done several years ago in which two groups of young women were studied as carriers of meningococci. One group was composed of 50 women who were admitted to a nurses training school. The other group was composed of the same

number of women who entered army training. Both groups represented women of the same ages and the same types of backgrounds. In following these individuals by nasopharyngeal cultures for meningococci, it was found that the nurses who lived two in a room had a very low carrier rate, and the army women who lived as a group in a single large room in the barracks had a carrier rate over 60%. There was no meningitis in either group. This study confirmed other work which showed that crowding of individuals resulted in a high carrier rate for meningococcus. It also showed that some other factor is responsible for the disease, because a high carrier *per se* does not always mean that the disease appears. With emergency mobilization of manpower and overcrowding of military tranportation and housing, meningitis might be a BW factor.

(c) (U) Because meningitis is a relatively rare disease in Israel and there is no national reference center for meningococci, Altmann would like to keep in touch with microbiologists in other countries to compare data on the diagnosis of meningitis. He has prepared grouping sera for this work, and would like to receive some sera from other laboratories. The commercial sera which he has obtained have not given good results in his hands. When strains of meningococci are isolated, he has sent them to Atlanta and to Marseilles for confirmation of their antigenic type. This has worked out satisfactorily in some cases.

(d) (U) Another phase of the work has been the treatment of typhoid carriers. The use of antibiotics has not been successful in eliminating the carrier state in many people. Therefore, a study is made of each patient in order to determine the nature of the excretion of the bacilli by each individual. When urinary excretion is found, a careful examination of the kidneys is made by X-ray to determine any pathology which is present. Often stones or abscesses are seen. In these cases, surgery is indicated. At the same time, a massive antibiotic therapy with ampicillin or other suitable drug is instituted 2 days before surgery. Antibiotic treatment is continued up to the time of surgery in order to provide a high drug level to prevent spread of the infection when the tissue or abscess is cut. This avoids establishments of new foci of infection. Antibiotic treatment is continued until cultures are negative.

(e) (U) When fecal excretion of the bacilli is found, a similar study is made of the liver and gall bladder. When gall stones, or liver abscesses are seen, surgery is indicated and the antibiotic therapy as outlined for kidney infection is instituted. With this approach, there have been very good results in eliminating typhoid carriers which has permitted these people to function as normal members of society.

(f) (U) There are plans for the construction of a new modern hospital at Tel Hashomer. However, with the many requirements of this growing nation, it may be difficult to make arrangements for the replacement of the numerous small buildings which are

meeting a need today. This means that Altmann and his staff will continue to operate the laboratory of the hospital in the best way they can. For most of the backup for their work in bacteriology or parasitology, they look to the Government Central Laboratory and for virology to the Hebrew University Medical School in Jerusalem, which provide the services for identifying streptococci, staphylococci, salmonella, and other bacteria and viruses isolated in this hospital.

(b)(1)

(4) (U) Vaccines are also manufactured at the Verterinary Institute in Beit Dagon and the Central Health Laboratories in Jerusalem. The latter facility also prepares sera.

9. (C) Conclusion:

a. (U) Israel possesses the most advanced scientific and technical capability found in the Middle East. Research facilities, educational institutions, and the pharmaceutical industries are modern and of high quality. Available technical expertise establishes Israel among those nations in the world most advanced scientifically and technologically.[1]

(b)(1)

10. (U) Trends and Forecast

a. Trends.

(1) In accord with national characteristics and firmly based upon traditions of academic excellence, Israeli scientists will continue to develop technological resources which could be applied to programs having military purposes. If necessary, drawing upon the resources of international jewry, departments and divisions of microbiology and related sciences in Israel will become pre-eminent facilities of their kind. Although the goals established may be ones of academic excellence, problems of immediate and specific interest to the state of Israel will be addressed with priority. Research programs already undertaken indicate a diversity of interests, and trends toward specialization are not evident. Israeli microbiologists, chemists, physicists, and engineers will continue to work easily at the frontiers of their respective technologies. As the most scientifically sophisticated of the nations in the Middle East, should area politics permit, Israel will become a major force for solving historical problems affecting the health of the region.

(2) Biological agents may be produced and packaged for military purposes whenever Israeli policy deems it to their advantage to do so. It is conjecture, but weapon systems may not be sophisticated in their design. Covert applications of biological warfare may be preferred, and given the low standards of public health prevailing in the Arab states, the effectiveness of biological operations, especially in crowded urban centers, cannot be questioned.

(3) Medical defense research and development (R&D) efforts will enable the Israelis to achieve a high level of BW defense preparedness. They will continue to make determined efforts to improve their BW defensive capability to protect both the military and civilian population against a BW attack from any direction.

b. Forecasts

(1) Short-range (5-year projection). Vaccines will be developed for those diseases which would be likely candidates for use in biological warfare—and particularly for those diseases which may be indigenous to countries in the Middle East. Renewed efforts will be made, with some success, to deal with its crisis-level pollution problems. For example, in Jerusalem, which has a population of 300,000, there is no sewage treatment plant. Technological breakthroughs will permit therapeutic treatment for some viral diseases: parasitic diseases will be brought under control, but not eradicated. Based upon free exchange of scientific and technological information, Israeli scientists will be able to produce a selected array of biological warfare materiel in quantities sufficient for military application. Although relatively insensitive to world opinion, there may be advantages favoring weaponization for covert use.

(2) Midrange (10-year projection). If international tensions relax, greater attention will be paid to resolving ecological pollution problems which in this time frame will become acute. The Sea of Galilee, which supplies one-third of Israel's fresh water, is already becoming dangerously polluted by nitrates. If freed from threat of hostile action, Israel will "export" her scientific expertise to neighboring countries. Indigenous diseases will be eradicated amongst stable populations, although small foci of infection will remain among nomadic inhabitants. Insight will be gained which will permit guarded treatment of cancer. By 1982, resolutions of problems in the Middle East will have been initiated and biological weapons no longer considered for development. If tensions remain, economical warfare may be practiced and biological agents may be tailored to create ecological imbalances among neighboring countries.

(3) Long-range (15-year projection). Israeli institutes and universities will become world centers of learning. Ecological and economical problems will be under control. Biomedical science will have conquered most forms of cancer known today (i.e. effective therapeutic treatment will be available), and major international resources will have been committed to attack afflictions caused by auto-immune disfunctions. The Israelis will remain technologically stronger in the biomedical sciences than their Arab neighbors for the next 15 to 20 years. International solutions to Israeli-Arab problems will be found which will no longer necessitate maintenance of forces-in-being. Consistent with worldwide movements, weapons of mass destruction will be demilitarized and military forces will be reduced to small cadres responsible for maintaining border vigilance, performing police functions, and responding to ceremonial needs.

Section II.

EGYPT (ARAB REPUBLIC OF EGYPT)

A. INTRODUCTION

1. (C) (FOUO) Historical Background

(b)(1)

2. (C) Competence in Microbiology and Public Health

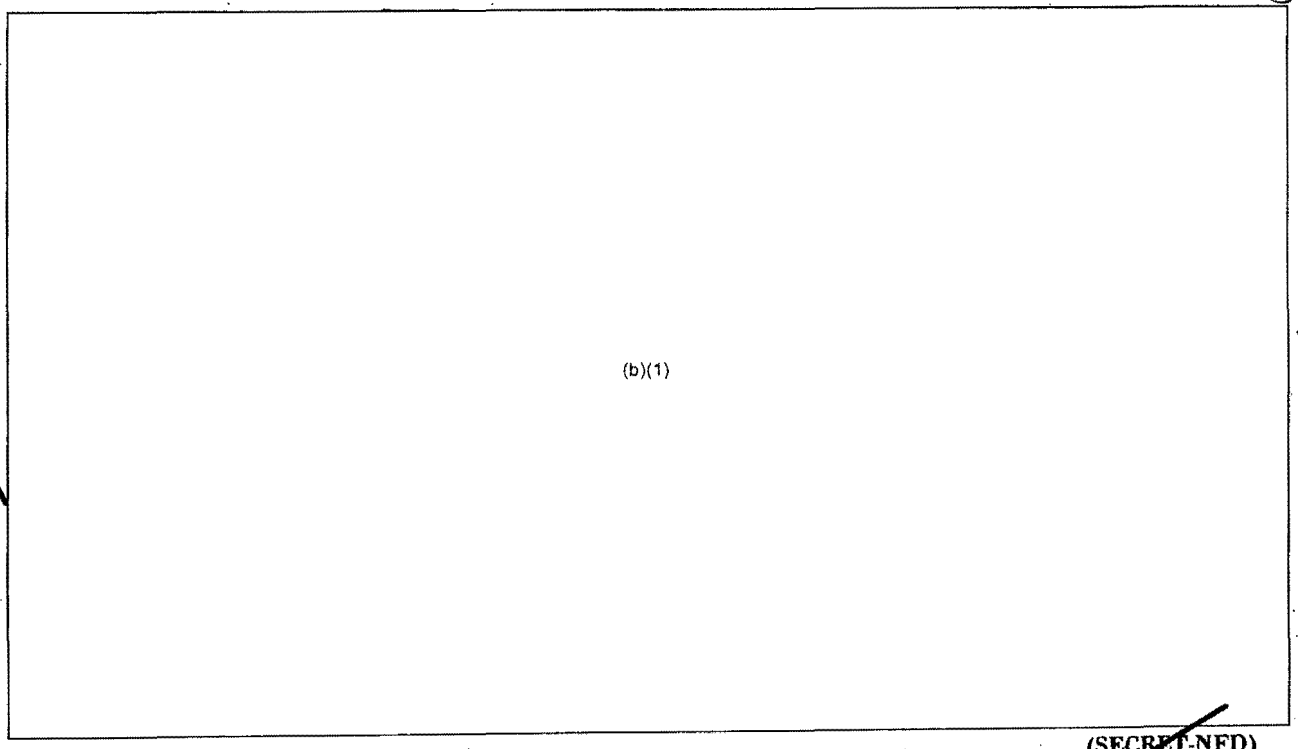
(b)(1)

NO FOREIGN DISSEM

B. ASSESSMENT

3. (S-NFD) Order of Battle

(b)(1)



(SECRET-NFD)

Figure 2. Egyptian CBR warfare organization (U).

Table I. Location of Egyptian Chemical Units (U)

(b)(1)

(SECRET-NFD)

NO FOREIGN DISSEM

(b)(1)

4. (C-Rel to UKCan) BW Materiel

(b)(1)

(b)(1)

5. (S-NFD) Production Facilities and Capabilities

(U) No BW production facilities are known with certainty to exist in Egypt although laboratories do exist which could potentially be used for agent production. There are 12 significant biological plants existing in the country; most are located in Cairo.

(b)(1)

(b)(1)

6. (S-NFD) Stockpiles and Storage Facilities

(b)(1)

7. (U) Doctrine and Procedures

There is no information on offensive doctrine or procedures. As mentioned previously, BW defensive operations are subordinate to the Chemical Warfare Units. Statements of President Sadat indicate that biological weapons, if they exist in the arsenals of the Egyptians, would be used in retaliation if the Israelis initiated such warfare. The Soviets would most likely be concerned with policy decisions concerning Egyptian use of biological weapons.

8. (S-NFD) Research, Development, and Testing

(b)(1)

(b)(1)

e. (U) University Laboratories.

(1) (U) The university research, except for that conducted by the American University of Cairo, is of poor quality by Western standards. The Ain Shams University, Cairo, and the Cairo University also have limited research facilities and work on national priority items.

(2) (U) A protocol signed late in 1971 leaves the American University in Cairo under the control of its all-American trustee board and confirms its administrative autonomy while at the same time recognizing its place within the Egyptian national education system. The protocol was signed December 20 but has been given little publicity

by either side. It is the result of lengthy negotiations following an exchange of notes between the two governments last summer, bringing the university under the US-Egyptian cultural agreement. Egypt agreed to the protocol, it is thought, because the university serves as a useful channel for Egyptians wishing to carry out advanced studies in the United States. The protocol stipulates that at least 75 percent of the students should be Egyptian while the teaching staff is to be divided into 45 percent American citizens, 45 percent Egyptian citizens and 10 percent from third countries. This, in effect, merely confirms the status quo since now just over 80 percent of the students are Egyptian. The American University is incorporated in the District of Columbia and registered in New York State and its degrees are recognized in the United States.[10]

(b)(1)

9. (C-NFD) Conclusions

(b)(1)

c. (U) Egypt lacks extensive research and development facilities to support a sophisticated BW program. If deemed necessary, they could divert the activities of their pharmaceutical and vaccine laboratories to the production of BW agents.

(b)(1)

10. (U) Trends and Forecasts

a. Trends

(1) The quality of biomedical education in Egypt is good, and is likely to remain so. There are, unfortunately, limited opportunities for professionally trained employees to work in-country. This condition is not likely to improve in the near future. An increasing

amount of antibiotics is being produced in Egypt under various licensing agreements. While the quality of biologicals produced is quite good by standards prevailing in the Middle East, the products are inferior to those manufactured in West Europe. This condition also is not likely to change since to correct contributory causes would require massive infusions of capital. Although further growth is expected in Egypt's biological production industry, the country will most likely lag behind Israel in its production capability. Low standards of public health exist throughout Egypt, and, if Arab-Israeli tensions do relax, some effort might be directed toward improving the quality of life for the average Egyptian. Even with foreign help on a fairly large scale, this task will be a difficult one. The greatest public health problem in Egypt today is the incidence of schistosomiasis; the problem worsens daily, and programs of national priority will be required to even cope with this parasitic disease.

(2) The Egyptians could produce sufficient materiel for biological operations, but it seems likely that external assistance would be required. Fear of retaliation from Israel might also deter even those covert attacks threatened by Sadat. Limited sophistication shown by Egyptian military forces would seem to minimize their ability to employ biological warfare on an effective scale. The greater predictability—and presumably the greater availability—of chemical materiel might suggest its greater usefulness in tactical or strategic operations if weapons of mass destruction were required.

b. Forecasts

(1) Short-range (5-year projection). More foreign aid will be sought to improve the quality of public health in Egypt. Programs enjoying national emphasis will be initiated to eradicate shistosomiasis but they will only serve to identify the depth of the problems to be solved. Indebtedness to the USSR and limited economic expansion will preclude any real growth in the sciences and technologies. Limited quantities of selected biological agents could be made available, but use concepts would probably limit their effectiveness to a harassment.

(2) Midrange (10-year projection). Should Arab-Israeli tensions ease, foreign aid would probably become available to help raise standards of public health in Egypt. Short of a political detente in the Middle East, the quality of science and engineering in Egypt is unlikely to improve. If Egyptian technicians and scientists leave their country for greater opportunities elsewhere, a regression of current capabilities could occur. A deficit in balance of payments and a low Gross National Product would curtail Egyptian efforts to develop modern production facilities. In the mid-range time frame, biological warfare may become even less of an option for Egyptian planners because of such a deterioration and because of the increased technological superiority of Israel.

(3) Long-range (15-year projection). International pressures will force a solution for Arab-Israeli problems, and Egyptian resources can slowly be brought to bear on Egyptian problems. Diseases historically indigenous to Egypt will be brought under control, and Egypt will begin to play a leading role in bringing the emerging nations of Africa into the modern world. Egypt will continue to show improvement in the quality of its microbiological research during the next 15 years and will probably attempt to close present research and development gaps which exist between the Middle East powers. Consistent with world developments, weapons of mass destruction will be destroyed, and international exchanges of scientists and engineers will most likely preclude lesser nations from secretly developing such weapons.

Section III.

IRAN

A. INTRODUCTION

1. (S) Historical Background

(b)(1)

2. (C) Competence in Microbiology and Public Health

a. (U) The public health facilities in Iran are inadequate to provide modern service to all the people. Living conditions are poor, there is a high illiteracy rate, and public sanitation measures are inferior. Medical care has been limited and rather primitive because of geographic inaccessibility. By drafting physicians into the national service, improved medical care is being brought to remote villages. These villages provide opportunity for field investigations in areas of public health, nutrition, and epidemiology.

(b)(1)

(b)(1)

B. ASSESSMENT

3. (S-NFD) Order of Battle

(b)(1)

(b)(1)

4. (U) BW Materiel

There is no information that any BW materiel is in Iran's possession. However, elements of the Iranian Armed Forces have requested information on M8/66 protective masks. When the "Battle" class destroyer ARTEMIS arrived from England 20 July 1970, it was not equipped with special CBW protective equipment. The SAAM, another "Battle" class destroyer, is

fitted with citadel compartments, filtered air systems, water washdown fixtures, a cleansing station, and an NBC headquarters. The SAAM was not complete at the time of inspection, and it must be noted that it was being prepared as a private venture, the personal investment of the Shah of Iran. The newly commissioned Iranian destroyers, ZAAL and FARAMARZ, are equipped for CBR defense. All the vessels mentioned were constructed in England. While no visible evidence of BW programs exists, the latter vessles could be modified for use in covert, off coast, operations.

5. (U) Production Facilities and Capabilities

Iran has the technical capability and facilities for the limited production of BW materiel.

6. (U) Stockpiles and Storage Facilities

There are no known stockpiles of BW materiel in Iran.

7. (U) Doctrine and Procedures

Iran has not developed a defined BW doctrine or policy.

8. (C-NFD) Research, Development, and Testing

(b)(1)

(b)(1)

9. (C) Conclusions

(b)(1)

10. (U) Trends and Forecasts

a. Trends. Scientific and technological improvements are coming slowly to Iran. In the biomedical fields, emphasis has been placed on public health and education. Foreign scientific exchanges are taking place. Improved facilities for diagnosis, hospitalization, and medical care are becoming available to the average citizen of the small village. With the national management of the oil fields,[11] the open overtures to Russia and China, the importation of a Japanese engineering company to construct desalination water plants, and the employment of East German firms to construct diesel-powered electric generating plants, Iran is beginning to realize its role as a force in the Persian Gulf.

b. Forecasts.

(1) Short-range (5-year projection). Changes are occurring to enhance the scientific and technological base of Iran. Diseases of antiquity have become specific assignments of university study. National control of sale of crude petroleum to international oil companies should improve the financial status of the state. An increase in defensive training against biological and chemical warfare is being given to Iranian troops. Offensive biological materiel will not be acquired or developed overtly.

(2) Midrange (10-year projection). With the established rate of enrollment and successful completion of educational course in medicine and public health, historical foci of infection should be well under control. The spillover of medically educated scholars should benefit the entire world community. Fossil fuel shortages should bring a greater world demand for natural fuel reserves with a greater national income without dependence on foreign aid. Electrification and water reclamation begun in the early 1970's should begin to show effects in the nation. Having acquired status as a leader in the Persian Gulf, Iran is likely to withdraw from a loose Arab confederation if Arab-Israeli hostilities flare. Technical competence acquired by investment in an educated population could be diverted to weaponry for biological warfare.

(3) Long-range (15-year projection). With decreases in supplies of fossil fuels, the oil reserves of the nation should provide a continued ample bargaining power both in international politics and economics. Results of university studies of indigenous diseases should begin to spill over to the international community. Open communication with world science in all fields should further improve the lot of the Iranian nation and that of the people of the Middle East. If deemed necessary, biological weaponry will not be beyond the ability of the Iranian people.

Section IV.

IRAQ

A. INTRODUCTION

1. (U) Historical Background

a. The Republic of Iraq has been plagued by many internal tensions and international disputes over the past 2 or 3 decades. Many difficulties involving foreign countries have arisen over the development of Iraq's oil industry. General living in Iraq is often difficult because of the extremes of physical conditions—mountains, heat, cold, and floods, and large areas of uncultivated land. On 1 June 1971, Iraq nationalized the assets of Western owned oil companies. The increase in revenue from sale of oil appears to be diverted to industrial, public health, and agricultural improvements. With Soviet aid, the Iraqis have built the Baghdad-Al Basrah railroad, the antibiotic plant in Samarra, the agricultural machinery plant in Al-Iskandariyah, the cotton combine in Al-Kut, the electrical engineering and mechanical plants near Baghdad, and the Iraq Petroleum Company complex in northern Ar-Rumeyhah.

b. In 1956 Iraq joined the Baghdad Pact to counter communist aggression. When hostilities broke out between Israel and the Arab states of Egypt, Jordan and Syria, Iraq severed diplomatic relations with the United States and Great Britain, charging that these had aided Israel in the war. Relations with the West, including France, the United Kingdom, and the United States have gradually improved. However, Iraq will probably rely more on the Soviets for military advisors and equipment. Ninety percent of the military equipment is of Soviet origin, and the East is still the dominant influence.

2. (U) Competence in Microbiology and Public Health

Iraq's general public health status is believed to be similar to that of neighboring Middle East nations. Iraq has been plagued almost perennially by epidemics of cholera and other diseases, which have required the country to seek aid from the USSR, various Eastern countries, and the World Health Organization. Iraq also suffers from a lack of technically trained people. An abundance of clinical material is available in Iraq. Some research is conducted at the Medical Research Center in Baghdad, the Military Hospital in Al Rashid, the Ninerva Horticultural Station in Northern Iraq, and the University of Baghdad.

B. ASSESSMENT

3. (S-NF-D) Order of Battle

(b)(1)

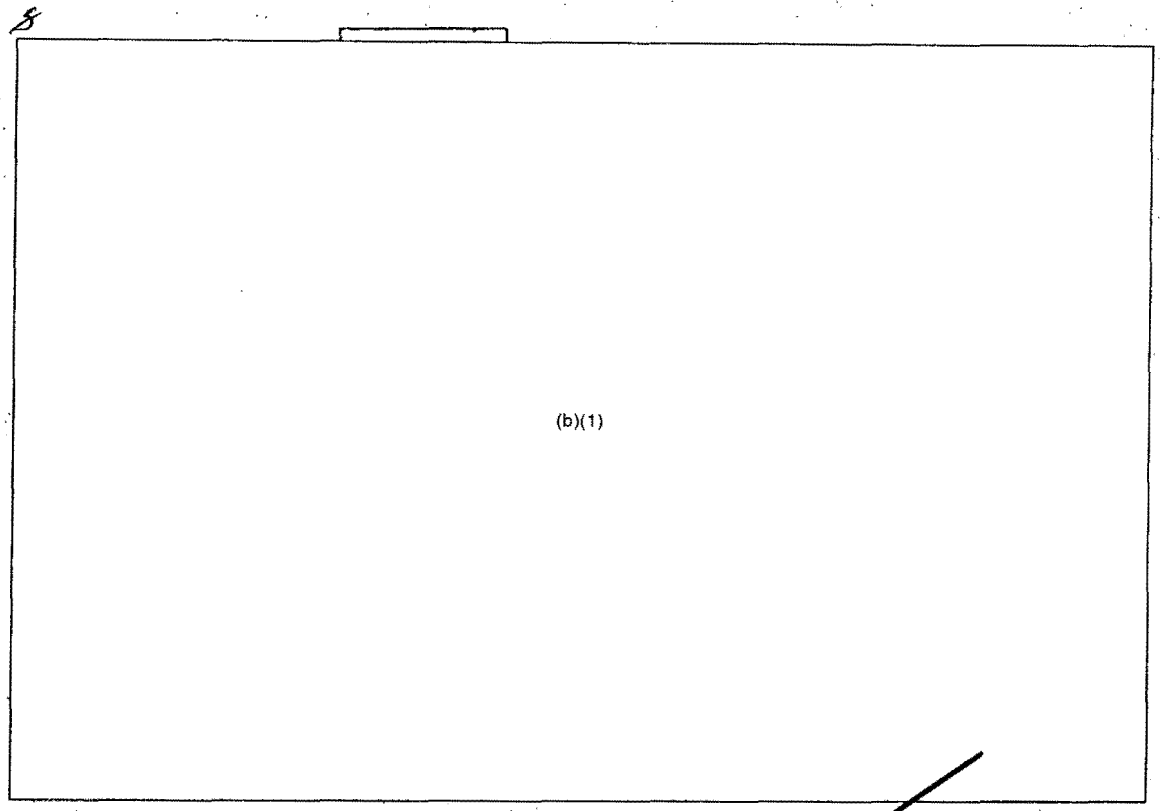
Table II. Location of Iraqi CBR Units (U)

(b)(1)

(b)(1)

(SECRET)

NO FOREIGN DISSEM



(SECRET-NFD)

Figure 3. Iraqi CBR organization (U).

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Original

S

(b)(1)

4. (S-NFD) BW Materiel

a. (U) Iraq has no offensive BW materiel.

(b)(1)

5. (U) Production Facilities and Capabilities

Iraq lacks the industrial base and technical knowledge to support the production of BW materiel. However, in 1963, the Economic Planning Board authorized the Ministry of Industry to spend ID 445,000 to build a factory in Samarra capable of producing annually 5½ tons of penicillin, 5½ tons of streptomycin, 2 tons of dihydrostreptomycin, and 6½ tons of tetracyclines. The pharmaceutical factory of Samarra (34°12′N 43°52′E) has been operational since February 1971. An increasing Iraqi reliance is anticipated for drugs and medicines produced in East Europe, even though such items are regarded to be inferior. A current need exists for US pharmaceuticals, but for political reasons no direct purchases are possible. Indeed, all US drugs must be bought through third countries without any indication or invoices showing US origin.

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6. (U) Stockpiles and Storage Facilities

There are no known stockpiles of BW materiel in Iraq.

7. (U) Doctrine and Procedures

There is no available information on Iraqi BW doctrine or procedures.

8. (U) Research, Development, and Testing

The Iraqi Army Medical Service is aware of problems to be solved in the event of biological operations and has received documents concerning BW from France, the Soviet Union, the United States, and from Egypt and other countries in the United Arab Command. Iraq's military personnel will continue to maintain awareness, but they will only have a moderate capability to engage in medical defense R&D.

9. (C) Conclusions

(b)(1)

10. (U) Trends and Forecasts

a. Trends.

(1) Iraq, as noted, lacks the industrial base and technical knowledge to produce materiel for biological warfare. If trained scientists do increase in number, basic problems of public health and sanitation will require all their talents and attention. There seems little reason to believe that Iraq will be able to initiate programs to develop and weaponize biological agents.

(2) The Iraqi military may improve their physical defense posture to some slight degree so that some maneuverability in a toxic environment might be maintained. Any such increase would likely be of marginal value in the event of hostilities.

b. Forecasts.

(1) Short-range (5-year projection). If tensions remain high between the Arabs and Israelis, some attention might be given to improving marginally the capabilities of Iraqi soldiers to operate in a toxic environment. Biological weapons for operational use will not be acquired. Minimal improvements in standards of public health may be achieved. Should tensions ease, international assistance could increase the rate at which the lot of the average Iraqi could be improved.

(2) Midrange (10-year projection). With international support, indigenous diseases and problems of public health will be attacked. The World Health Organization will become increasingly effective in controlling epidemics, although eradication of historical plagues will not be achieved. If military hostilities have not occurred during this time frame, chances are good that a successful resolution to Middle East problems can be achieved.

(3) Long-range (15-year projection). With decreased tensions in the Middle East, Iraq will profit from an international effort to upgrade standards of health and education in lesser developed nations. The country will become more self-sufficient in controlling outbreaks of epidemic diseases; however, residual foci are likely to remain. Never able to develop or procure materiel for biological operations, Iraqi defensive CBR capabilities will gradually erode.

Section V.

JORDAN

1. (U) Introduction

Jordan is governed by the hereditary monarchy of the Hashemite family, limited by the Constitution and assisted by a cabinet theoretically responsible to a bicameral Parliament. Real power is held by the king. Following the Arab-Israeli war, the government's stability was strengthened, but the shortcomings of the government and military forces highlighted by defeat caused eventually some unrest. Further deterioration was evidenced by the nation's inability to control Palestinian guerrilla forces whose challenge to the government's authority created a critical situation for the regime. As a result of the September 1970 civil war and subsequent operations which ended in July 1971, Jordan's army killed, captured, or scattered, virtually all of the guerrillas who had been able to run "a state within a state" inside Jordan. Jordan's navy is too small and inadequately equipped to conduct patrols or defensive actions. The air force demonstrated a fair and unsuspected capability during the civil war.

2. (C) Order of Battle:

(b)(1)

3. (C) BW Materiel

(b)(1)

(b)(1)

4. (U) Production Facilities and Capabilities

No BW production facilities have been reported in Jordan.

5. (U) Stockpiles and Storage Facilities

There are no stockpiles of BW agents in Jordan.

6. ~~(C)~~ Doctrine and Procedures

(b)(1)

7. ~~(C)~~ Research, Development, and Testing

a. (U) There is strong doubt whether Jordan possesses the scientific and technical capabilities to either study, produce, or test biological weapon systems.

(b)(1)

8. ~~(C)~~ Conclusions

(b)(1)

9. (U) Trends and Forecasts

a. Trends. With international support, biomedical facilities might be developed in Jordan; but such institutions would most likely be concerned with civilian problems of public health. The scientific/technological base in Jordan is inadequate to support a research and development program to weaponize biological materiel.

b. Forecasts.

(1) Short-range (5-year projection). Biological weapons will neither be acquired nor developed. Any biomedical research undertaken will be to improve diagnostic care and epidemiological surveillance.

(2) Midrange (10-year projection). Jordan military forces may be maintained to permit independence of action vis-a-vis national policies of Syria and Iraq. Jordan forces will be armed with conventional weapons only. With economic improvements, standards of medical competence in the area will be raised. Cooperative exchanges with Israeli scientists and engineers may be initiated only after an Arab/Israeli settlement.

(3) Long-range (15-year projection). The political detente throughout the Middle East will accelerate economic improvements in Jordan. A medical school and a technological institute will be created. Foci of infectious diseases may persist, but will be closely supervised.

Section VI.

LEBANON

A. INTRODUCTION

1. (U) Historical Background

The Republic of Lebanon was formally proclaimed a sovereign independent state by the French in November 1941. It was not until 1946, however, that Lebanon was able to bring about the withdrawal of French troops and transfer all important public services to the Lebanese government. Lebanon has been involved in various kinds of economic and political collaboration with the Arab, the Western, and the Soviet Worlds. Like other Arab States, Lebanon was at war with the new State of Israel from May 1948, but negotiated an armistice in March 1949. In recent years American influence has increased in the Middle East, and Lebanon receives considerable revenues from the oil companies whose pipelines bring the oil of Iraq and Saudi Arabia through Lebanese territory.

2. (C) Competence in Microbiology and Public Health

(b)(1)

B. ASSESSMENT

3. (C) Order of Battle

(b)(1)

(b)(1)

4. (U) BW Materiel

No materiel items for offensive or defensive BW use had ever been acquired by Lebanon prior to 1970. In May of that year, the Lebanese Army purchased five US protective masks (M25A1 Models), and in March 1971 they procured ten other masks (M17A1) for test and evaluation purposes. The Ministry of Health budget in 1972 amounted to 2-5 million dinars. Unexpected service costs of 310,000 dinars caused a request for an additional 20% budget increase. The Ministry of Health buys drugs for the departments of Health, Defense, and Interior. To August 1972, 397,000 dinars were paid for drugs.

5. (U) Production Facilities and Capabilities

Lebanon lacks the industrial base needed to produce either BW agents or related pharmaceuticals.

6. (U) Stockpiles and Storage Facilities

No stockpiles are thought to exist in Lebanon.

7. (U) Doctrine and Procedures

The Lebanese army has not developed any BW procedures or doctrine.

8. (C) Research, Development, and Testing

(b)(1)

C

(b)(1)

9. (C) Conclusions

(b)(1)

10. (U) Trends and Forecasts

a. Trends. Lebanon will preserve her independent identity and continue to serve as a bridge to the West.

b. Forecasts.

(1) Short-range (5-year projection) Limited funds and shortages of medical supplies and facilities preclude any attempt to weaponize biological materiel.

(2) Midrange (10-year projection). Lebanon will become increasingly independent of other Arab states and will initiate accords with Israel. Cooperative programs will be initiated and exchanges of technical personnel will occur. The University of Beirut will continue to graduate medical doctors who will slowly bring under control diseases indigenous to the country. Epidemic foci will persist. The army will remain an ineffective force and will be used primarily for civil police purposes.

(3) Long-range (15-year projection). Standards of public health and sanitation will improve. Academic/technological facilities will remain abreast of the times, but foreign aid will continue to be required to assure adequate and progressive programs.

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Section VII.

SAUDI ARABIA

1. (C) Saudi Arabia

(b)(1)

2. (U) Trends and Forecasts

a. Trends. There is no reason to believe that Saudi Arabia will acquire biological weapons. The country lacks a technological base to produce them. Military forces are not prepared to use such sophisticated weaponry in an effective manner. These conditions are unlikely to change.

b. Forecasts.

(1) Short-range (5-year projection). Saudi Arabia has procured limited stocks of protective masks in the near past. These have not been issued to troops, training has not been accomplished, and maintenance appears to be unsatisfactory. These indicators suggest a lack of aggressive intent on the part of the Saudi Arabian Army to handle sophisticated equipment. Conditions are unlikely to change in the next 5 years.

(2) Midrange (10-year projection). The use of weapons of mass destruction by either the Arabs or the Israelis will no longer pose a realistic threat. Limited cooperation may be initiated to improve standards of health and education throughout the Middle East. Exchanges of scientists and engineers may accelerate such programs.

(3) Long-range (15-year projection). In the absence of hostilities—which are probably more likely to occur in the near future, if at all--tensions will continue to disappear. International aid and actions taken by Middle East nations themselves will enhance significantly the low standards of life in this part of the world. Hostilities which are centuries old cannot be eradicated, but political settlements will be found which will prevent either party from seeking a military solution.

Section VIII.

SYRIA

1. (C NFD) Syria

(b)(1)

e. (U) A Veterinary Laboratory and Research Division, attached to the Ministry of Agriculture, does exist in Syria. The Division produces all vaccines required for endemic and parasitic animal diseases, and has undertaken some diagnostic activities. The most important vaccines produced locally are those for sheep and goat pox, anthrax, fowl plague, and fowl diphtheria.

2. (U) Trends and Forecasts

a. (U) Trends. Syria's policy is to work for Arab unity. Some military assistance has been provided to Syria by the USSR, but there is no reason to expect that Syrian forces

would or could engage in biological warfare. Syria lacks the technical and industrial base to produce biological materiel for military purposes. Syria is not likely to develop such weapons.

b. (U) Forecasts.

(1) (U) Short-range (5-year projection). Syria will continue to work toward Arab unity. Some military assistance has been and will be continued to be supplied to Syria by the USSR. The production of biological material for military purposes is beyond the technical or industrial base of Syria.

(2) (U) Midrange (10-year projection). With the aid of the USSR, Syria will implement plans for the development of industry and the manufacture of basic goods. Supplying the technical skills demanded by an industrial and agricultural expansion should raise educational standards. Rises in education standards should in turn bring about a public awareness of the need for higher public health standards.

(3) (U) Long-range (15-year projection). The effects of the damming of the Euphrates should be felt. An increase in cultivation of acreage of arid lands by irrigation and the use of available hydroelectric power to energize industry should make Syria a self-sufficient nation. Income from the sale of fossil fuels diverted to health and education of its citizenry could help to heal Middle East tensions. Suspicions among the lead Arab nations, eased by education, should decrease the need for war and weapons of mass destruction to settle ancient and newly occurring disputes.

~~NO~~ FOREIGN DISSEM

BIBLIOGRAPHY

1. (b)(1) (S-NFD).

2. Prywes, M., ed 1960 (U).

3. FSTC 381 T65 441, October 1965 (U).

4. (b)(1) (C).

5. ONR Technical Report 64-68, 21 August 1968 (U).

6. *European Scientific Notes*, 24-7. Published by the Office of Naval Research, London, 1970 (U).

7. Dullforce, William. "Cairo US College Gets New Status," The Washington Post, 29 February 1972 (U).

8. *Jerusalem Post*, 14 June 1971 (U).

9. *Science*, Vol 177, 4050, 25 August 1972 (U).

10. *Jerusalem Post*, 2 August 1972 (U).

11. Le Monde, 6 January 1973 (U)

12. (b)(1) (S-NFD).

13. (b)(1) (S-NFD).

14. (b)(1) (S-NFD).

15. (b)(1) (S).

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11. SUPPLEMENTARY NOTES This study supersedes ST-CS-03-32-73, same subject, dated September 1972	12. SPONSORING MILITARY ACTIVITY Foreign Science and Technology Center US Army Materiel Command Department of the Army

13. ABSTRACT

This report evaluates the biological warfare capabilities of the Middle East countries. Each country is evaluated in terms of its materiel, facilities, or organizations which would support such an effort. In addition, civilian and military research and development programs applicable to the preparation of biological materiel for military use are characterized. Trends and forecasts are included.

The biological warfare capabilities of the Middle East countries belong almost entirely to Israel, Egypt (the Arab Republic of Egypt), and possibly Iran. The other countries treated in this study, Iraq, Jordan, Lebanon, Saudi Arabia, and Syria, possess no offensive materiel and little or no defensive materiel. All countries with the exception of Israel, and the possible exception of Egypt and Iran, would be dependent on outside sources for offensive and defensive biological warfare materiel. Israel, with the most advanced technology in the Middle East, has nevertheless chosen to purchase some of its defensive materiel from outside sources.

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REPLY TO
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10 JUN 2013

This is in further response to your Freedom of Information Act (FOIA) request of October 23, 2008, and supplements our electronic message of May 12, 2010.

Coordination has been completed with another element of our command and other government agencies and records returned to this office for our review and direct response to you. We have reviewed the records and determined the records are partially releaseable to you. A copy of the records are enclosed for your use.

We have completed a mandatory declassification review in accordance with Executive Order (EO) 13526. As a result of our review information has been sanitized and 4 pages have been withheld in their entirety as the information is currently and properly classified TOP SECRET, SECRET and CONFIDENTIAL according to Sections 1.2(a)(1), 1.2(a)(2), 1.2(a)(3) and 1.4(c) of EO 13526. This information is exempt from the public disclosure provisions of the FOIA pursuant to Title 5 U.S. Code 552 (b)(1). It is not possible to reasonably segregate meaningful portions of the withheld pages for release. The records are enclosed for your use. A brief explanation of the applicable sections follows:

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Section 1.4(c) of EO 13526, provides that information pertaining to intelligence activities, intelligence sources or methods, and cryptologic information shall be considered for classification protection.

In addition, information has been sanitized from the records and 4 pages have been withheld in their entirety as the release of the information would reveal sensitive intelligence methods. This information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(7)(E) of the FOIA. The significant and legitimate governmental purpose to be served by withholding is that a viable and effective intelligence investigative capability is dependent upon protection of sensitive investigative methodologies. It is not possible to reasonably segregate meaningful portions of the withheld pages for release.

The withholding of the information described above is a partial denial of your request. This denial is made on behalf of Major General Stephen G. Fogarty, the Commanding General, U.S. Army Intelligence and Security Command, who is the Initial Denial Authority for Army intelligence investigative and security records under the FOIA. You have the right to appeal this decision to the Secretary of the Army. Your appeal must be postmarked no later than 60 calendar days from the date of this letter. After the 60-day period, the case may be considered closed; however, such closure does not preclude you from filing litigation in the courts. You should state the basis of your disagreement with the response and provide justification for a reconsideration of the denial. An appeal may not serve as a request for additional or new information. An appeal may only address information denied in this response. Your appeal is to be made to this office, for forwarding, as appropriate to the Secretary of the Army, Office of the General Counsel.

Coordination has been completed and we have been informed by the Central Intelligence Agency (CIA) that information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(1) and (b)(3) of the FOIA.

The withholding of the information by the CIA constitutes a denial of your request and you have the right to appeal this decision to the Agency Release Panel within 45 days from the date of this letter. If you decide to file an appeal, it should be forwarded to this office and we will coordinate with the CIA on your behalf. Please cite CIA #F-2010-01292/Army #57F-09 assigned to your request so that it may be easily identified.

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You have received all Army intelligence investigative records pertaining to this request.

There are no assessable FOIA fees.

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Sincerely,

Brad S. Dorris
Director
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DST-1800E-532-81

30 OCT 1981

DIA

CHEMICAL AND BIOLOGICAL WARFARE CAPABILITIES—NONALIGNED COUNTRIES (JAPAN, AFGHANISTAN, AND PAKISTAN), SUMMARY REPORT (U)

Prepared By
US ARMY
ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND
FOREIGN SCIENCE AND TECHNOLOGY CENTER

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CHEMICAL AND BIOLOGICAL WARFARE CAPABILITIES-- NONALIGNED COUNTRIES (JAPAN, AFGHANISTAN, AND PAKISTAN), SUMMARY REPORT (U)

AUTHOR
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This document has been processed for CIRC.

*Afghanistan and Pakistan are included for the first time.

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DST-1600E-532-81
30 October 1981

PREFACE

(U) This document summarizes information in the 1978 trend study DST-1600S-532-78-SUP 1 as amended 20 October 1981, on the chemical and biological warfare capabilities of Japan, Afghanistan, and Pakistan* to which contributions were made by the Defense Intelligence Agency, the US Army Medical Intelligence and Information Agency, the Naval Intelligence Suppport Center, and the Foreign Technology Division of the US Air Force Systems Command. Request for the trend study, or its updated pages, should be forwarded to Commander, Foreign Science and Technology Center, 220 Seventh Street NE., Charlottesville, VA 22901 (ATTN: DRXST-PO).

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

*Afghanistan and Pakistan are included in this study for the first time.

DST-1600E-532-81
30 October 1981

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30 October 1981

1. Introduction and Overview (U)

a. (U) The chemical and biological warfare (CBW) capabilities of Japan, Afghanistan and Pakistan are assessed in this summary report. Areas of concern include policy and doctrine, organization, training, protective posture and materiel, agents and munitions, production and stockpiles, research and development (R&D), and technological transfer.

(b)(1)

2. Japan (U)

(b)(1)

b. (C-NOFORN) Organization and Training (U). (b)(1)

(b)(1)

c. (C-NOFORN) Defensive Posture and Materiel (U). (b)(1)

(b)(1)

d. (C-NOFORN) Agents and Munitions (U). (b)(1)

(b)(1)

(b)(1)

e. (C-NOFORN) Production and Stockpile (U). No CW or BW agents are produced or stockpiled, but items of defensive CBW materiel are produced (included are masks and clothing, CW detection kits, decontamination equipment, nerve-agent antidotes, and other pharmaceuticals). The only items stored are some defensive equipment, smoke, and riot-control munitions, and possibly s-- flame munitions.

f. (C-NOFORN) Research and Development (U).

(b)(1)

g. (C-NOFORN) Aerospace and Naval Capabilities (U). (b)(1)

(b)(1)

(b)(1)

h. Technological Threat (U).

(b)(1)

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(A) (C-NOFORN) (b)(1)

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3. Afghanistan (U)

a. (C-NOFORN) Policy and Doctrine (U). (b)(1)

(b)(1)

b. (C-NOFORN) Organization and Training (U). (b)(1)

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c. (C-NOFORN) Defensive Posture and Materiel (U). (b)(1)

(b)(1)

d. (C-NOFORN) Agents and Munitions (U). (b)(1)

(b)(1)

e. (C) Production and Stockpiles (U). (b)(1)

(b)(1)

f. (C) Research and Development (U). (b)(1)

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g. (U) Technological Threat (U). (b)(1)

(b)(1)

4. Pakistan (U)

a. (C-NOFORN) Policy and Doctrine (U). (b)(1)

(b)(1)

b. (C-NOFORN) Organization and Training (U). (b)(1)

(b)(1)

c. (C-NOFORN) Defensive Posture and Materiel (U). (b)(1)

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5. Technological Transfer (U)

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The withholding of the information described above is a partial denial of your request. This denial is made on behalf of Major General Stephen G. Fogarty, the Commanding General, U.S. Army Intelligence and Security Command, who is the Initial Denial Authority for Army intelligence investigative and security records under the FOIA. You have the right to appeal this decision to the Secretary of the Army. Your appeal must be postmarked no later than 60 calendar days from the date of this letter. After the 60-day period, the case may be considered closed; however, such closure does not preclude you from filing litigation in the courts. You should state the basis of your disagreement with the response and provide justification for a reconsideration of the denial. An appeal may not serve as a request for additional or new information. An appeal may only address information denied in this response. Your appeal is to be made to this office, for forwarding, as appropriate to the Secretary of the Army, Office of the General Counsel.

Coordination has been completed and we have been informed by the Central Intelligence Agency (CIA) that information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(1) and (b)(3) of the FOIA.

The withholding of the information by the CIA constitutes a denial of your request and you have the right to appeal this decision to the Agency Release Panel within 45 days from the date of this letter. If you decide to file an appeal, it should be forwarded to this office and we will coordinate with the CIA on your behalf. Please cite CIA #F-2010-01292/Army #57F-09 assigned to your request so that it may be easily identified.

Coordination has been completed and we have been informed by the Defense Intelligence Agency (DIA) that their information is exempt from public disclosure pursuant to Title 5 U.S. Code § 552 (b)(1), (b)(2) (b)(3) and (b)(4) of the Freedom of Information Act and Executive Order (EO) 13,526 § 1.4 (c) (d) and (h). The statute invoked under Title 5 U.S. Code 552 (b)(3) is 10 U.S.C. §424, which allows for the protection of organizational and personnel information for DIA.

The withholding of the information by the DIA constitutes a partial denial of your request and you have the right to appeal this decision directly to the DIA. If you decide to file an appeal, it should be forwarded to the Director, Defense Intelligence Agency, ATTN: DAN-1A-FOIA, Washington, DC 20340-5100. Please cite MDR #0155-2010 assigned to your request so that it may be easily identified.

You have received all Army intelligence investigative records pertaining to this request.

There are no assessable FOIA fees.

If you have any questions regarding this action, feel free to contact this office at 1-866-548-5651, or email the INSCOM FOIA office at: INSCOM_FOIA_ServiceCenter@mi.army.mil and refer to case #57F-09.

Sincerely,

Brad S. Dorris
Director
Freedom of Information/Privacy Office
Investigative Records Repository

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EIRC

24- DST-1650E-032-81

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before 26 Feb 82

DIA
DEFENSE INTELLIGENCE AGENCY

CHEMICAL AND BIOLOGICAL WARFARE CAPABILITIES—MIDDLE EAST COUNTRIES: SUMMARY REPORT (U)

Prepared By
US ARMY
ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND
FOREIGN SCIENCE AND TECHNOLOGY CENTER

Copy No.
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CHEMICAL AND BIOLOGICAL WARFARE CAPABILITIES— MIDDLE EAST COUNTRIES: SUMMARY REPORT (U)

AUTHOR
(b)(6)

DST-1600E-032-81

DIA TASK UNIT PT-1600-01-04L

DATE OF PUBLICATION
7 August 1981

Information Cutoff Date
June 1981

This document supersedes DST-1600E-032-79.

This is a Department of Defense Intelligence Document prepared by the Foreign Science and Technology Center, US Army Materiel Development and Readiness Command, and approved by the Assistant Vice Directorate for Scientific and Technical Intelligence of the Defense Intelligence Agency.

NOT RELEASABLE TO FOREIGN NATIONALS

CLASSIFIED BY: MULTIPLE SOURCES
REVIEW ON: 7 AUGUST 2007

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DST-1600E-032-81
7 August 1981

PREFACE

(U) This summary report assesses the chemical and biological warfare capabilities of Israel, Egypt, Iraq, Syria, Iran, Jordan, Lebanon, and Saudi Arabia. A detailed presentation and analysis of these capabilities may be found in the trend study DST-1600S-032-75-SUP 1, Chemical and Biological Warfare Capabilities--Middle East Countries (U) (~~SECRET NOFORN WNINTEL~~), as amended 10 August 1981. The study was prepared by the US Army Foreign Science and Technology Center, with contributions from the Defense Intelligence Agency, the Foreign Technology Division of the US Air Force Systems Command, the Naval Intelligence Support Center, and the US Army Medical Intelligence and Information Agency.

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

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1. Introduction and Overview (U)

a. (U) This report summarizes the chemical and biological warfare (CBW) capabilities of Israel, Egypt, Iraq, Syria, Iran, Jordan, Lebanon, and Saudi Arabia. The countries are presented in the order of their relative CBW capabilities. Areas of concern include policy and doctrine, military organization, training, materiel, production potentials, research and development (R&D) activities, and trends and forecast.

b. (U) All of the Middle East countries except Jordan have signed and ratified or acceded to* the 1925 Geneva Protocol prohibiting the use of chemical warfare (CW) and biological warfare (BW) agents; all except Israel have signed the 1972 Convention on Biological Weapons, which bans the development, production, and stockpiling of BW weapons and toxins. Only Iran, Jordan, Lebanon, and Saudia Arabia, however, have ratified the convention, which went into effect 26 March 1975. Even though one or both of these international agreements have been accepted, violations in the Middle East would not be unexpected.

c. (S-NOFORN) (b)(1)

(b)(1)

*(U) Signing indicates an intention to accept an agreement. Ratification is the legal confirmation of an agreement by an original signatory. Accession is confirmation by a government that was not a signatory before the agreement went into effect.

e. (C-NOFORN) CBW Protection (U). (b)(1)

(b)(1)

f. (C-NOFORN) Production and Stockpiles (U). (b)(1)

(b)(1)

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h. (C-NOFORN) Trends and Forecast (U). (b)(1)

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3. Egypt (U)

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7 August 1981

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45 Iraq (U)

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5. Syria (U)

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6. Iran (U)

(C-NOFORN)

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(C) 7. Jordan, Lebanon, and Saudi Arabia (U)

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7 August 1981

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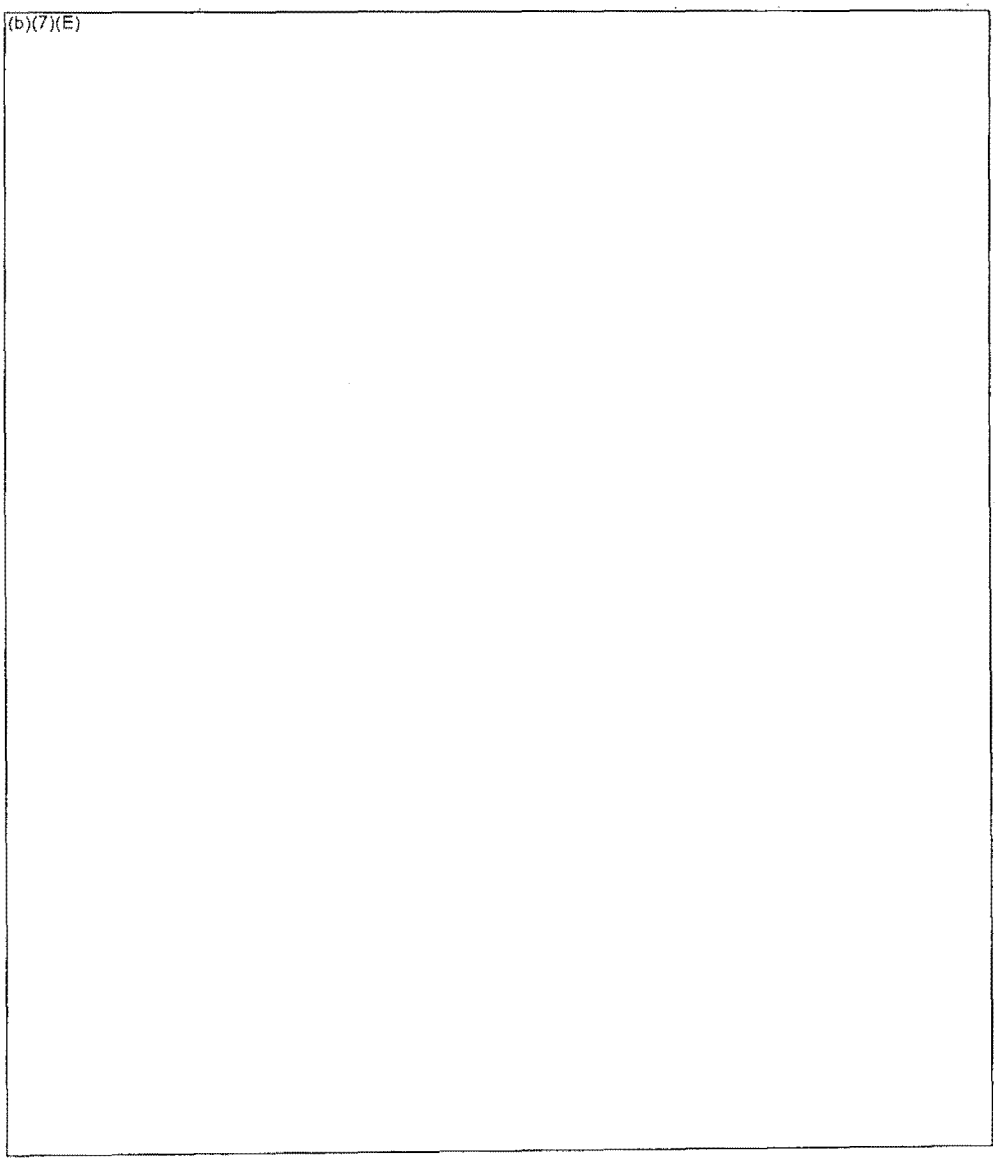

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7 August 1981

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7 August 1981

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Description of document:	Defense Intelligence Agency report, Chemical and Biological Warfare Capabilities - Asian Communist Countries, Summary Report, 27 August 1982
Requested date:	23-October-2008
Released date:	10-June-2013
Posted date:	13-August-2013
Source of document:	Commander US Army Intelligence & Security Command Freedom of Information/Privacy Office ATTN: IAMG-C-FOI 4552 Pike Road Fort George G. Meade, MD 20755-5995 Fax: (301) 677-2956 Email: FOIA/Privacy Office Online FOIA Request Form
Note:	This report is one of 16 reports released under Mandatory Declassification Review by the US Army Intelligence & Security Command. All of these reports may be accessed here: http://www/governmentattic.org/inscomBWCW.html

DEPARTMENT OF THE ARMY
UNITED STATES ARMY INTELLIGENCE AND SECURITY COMMAND
FREEDOM OF INFORMATION/PRIVACY OFFICE
FORT GEORGE G. MEADE, MARYLAND 20755-5995

REPLY TO
ATTENTION OF:

Freedom of Information/
Privacy Office

10 JUN 2013

This is in further response to your Freedom of Information Act (FOIA) request of October 23, 2008, and supplements our electronic message of May 12, 2010.

Coordination has been completed with another element of our command and other government agencies and records returned to this office for our review and direct response to you. We have reviewed the records and determined the records are partially releaseable to you. A copy of the records are enclosed for your use.

We have completed a mandatory declassification review in accordance with Executive Order (EO) 13526. As a result of our review information has been sanitized and 4 pages have been withheld in their entirety as the information is currently and properly classified TOP SECRET, SECRET and CONFIDENTIAL according to Sections 1.2(a)(1), 1.2(a)(2), 1.2(a)(3) and 1.4(c) of EO 13526. This information is exempt from the public disclosure provisions of the FOIA pursuant to Title 5 U.S. Code 552 (b)(1). It is not possible to reasonably segregate meaningful portions of the withheld pages for release. The records are enclosed for your use. A brief explanation of the applicable sections follows:

Section 1.2(a)(1) of EO 13526, provides that information shall be classified TOP SECRET if its unauthorized disclosure reasonably could be expected to cause exceptionally grave damage to the national security.

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The withholding of the information by the CIA constitutes a denial of your request and you have the right to appeal this decision to the Agency Release Panel within 45 days from the date of this letter. If you decide to file an appeal, it should be forwarded to this office and we will coordinate with the CIA on your behalf. Please cite CIA #F-2010-01292/Army #57F-09 assigned to your request so that it may be easily identified.

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The withholding of the information by the DIA constitutes a partial denial of your request and you have the right to appeal this decision directly to the DIA. If you decide to file an appeal, it should be forwarded to the Director, Defense Intelligence Agency, ATTN: DAN-1A-FOIA, Washington, DC 20340-5100. Please cite MDR #0155-2010 assigned to your request so that it may be easily identified.

You have received all Army intelligence investigative records pertaining to this request.

There are no assessable FOIA fees.

If you have any questions regarding this action, feel free to contact this office at 1-866-548-5651, or email the INSCOM FOIA office at: INSCOM_FOIA_ServiceCenter@mi.army.mil and refer to case #57F-09.

Sincerely,

Brad S. Dorris
Director
Freedom of Information/Privacy Office
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Enclosure

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DST-1600E-148-82

DEFENSE
INTELLIGENCE
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CHEMICAL AND BIOLOGICAL WARFARE CAPABILITIES— ASIAN COMMUNIST COUNTRIES (U)

SUMMARY REPORT

27 AUGUST 1982

Copy No. 19 of 29
STS2-5464

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CHEMICAL AND BIOLOGICAL WARFARE CAPABILITIES— ASIAN COMMUNIST COUNTRIES (U)

Summary Report

AUTHORS

(b)(6)

DST-1600E-148-82

DIA TASK UNIT PT-1600-01-03L

DATE OF PUBLICATION
27 August 1982

Information Cutoff Date
July 1982

This study supersedes DST-1600E-148-80.

This is a Department of Defense Intelligence Document prepared by the Foreign Science and Technology Center, US Army Materiel Development and Readiness Command, and approved by the Assistant Vice Directorate for Scientific and Technical Intelligence of the Defense Intelligence Agency.

This study has been processed for CIRC.

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CLASSIFIED BY: MULTIPLE SOURCES
REVIEW ON: 27 AUGUST 2012

DST-1600E-148-82
27 August 1982

PREFACE

(U) This study summarizes, as far as available information allows, the chemical and biological warfare offensive and defensive capabilities of China, North Korea, the Socialist Republic of Vietnam, the Mongolian Peoples Republic, Laos, and Kampuchea. A detailed presentation and analysis of these capabilities may be found in the trend study DST-1600S-148-76-SUP 1-CHG 3, Chemical and Biological Warfare Capabilities--Asian Communist Countries (U), as amended in August 1982.

(U) Constructive criticisms, comments, or suggested changes are encouraged and should be forwarded to the Defense Intelligence Agency, Washington, DC 20301 (b)(3):10 U.S.C 424

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DST-1600E-148-82
27 August 1982

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S f. Production and Stockpiles (U).

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g. Research and Development (U).

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c. (C) Training (U). (b)(1)

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d. (S-NOFORN-WNINTEL) Agents and Munitions (U). (b)(1)

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e. CBW Defense and Protection (U).

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f. (S) Production and Stockpiles (U). (b)(1)

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h. (S) Aerospace and Naval CBW Capabilities (U). (b)(1)

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d. (U) Research and Development (U). (b)(1)

(b)(1)

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(b)(1)

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b. ~~(C)~~ CBW Materiel (U). (b)(1)

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(b)(1)

b. ~~(S-NOFORN)~~ Kampuchea (U). (b)(1)

(b)(1)

6. Technological Threat (U)

(U) This report has provided a summary of the CBW capabilities of the Asian Communist countries, thus presenting the potential CBW threat posed by these

countries. The following paragraphs summarize what might be expected in the future. Because of the paucity of intelligence information, the predictions are based on such trends as are discernible, on logical extensions of current activities, and on the analysts' insight. Current unreported CBW activities and events may require changes in these predictions.

a. (S-NOFORN) Overview (U). (b)(1)

(b)(1)

b. China (U).

(1) (U) (b)(1)

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(3) (S-NOFORN) (b)(1)

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c. (U) North Korea (U). (b)(1)

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27 August 1982

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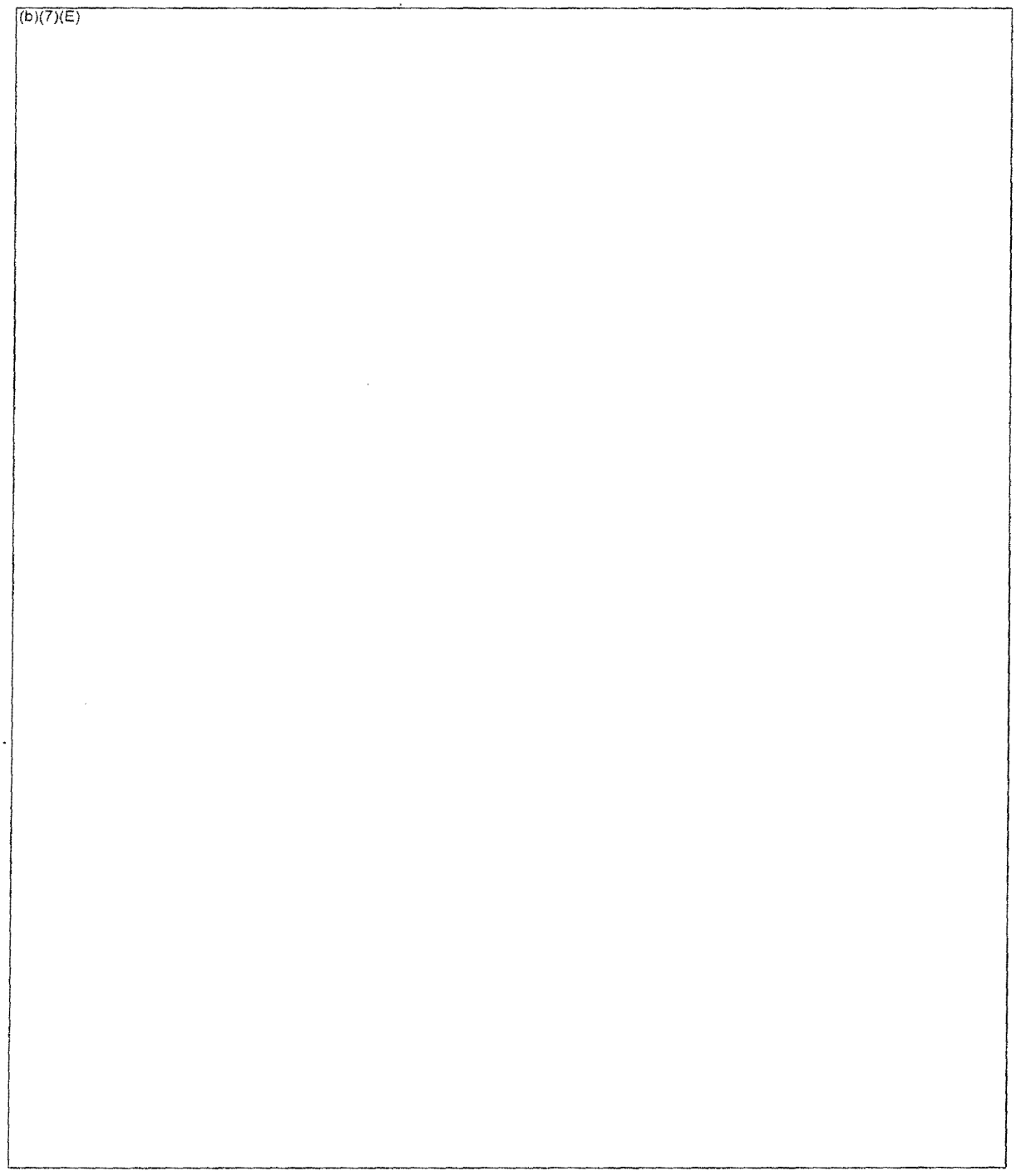

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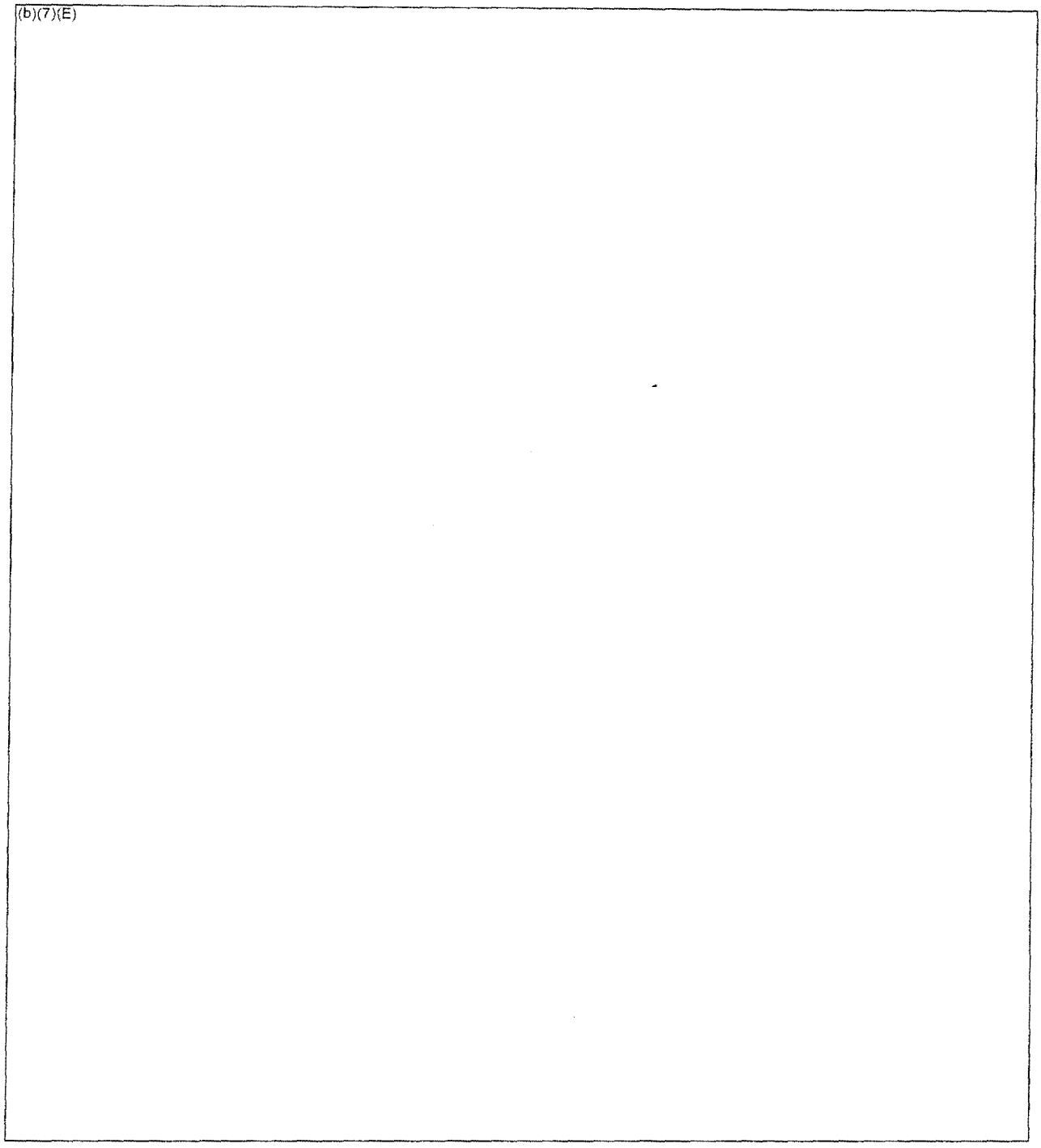

Description of document:	Defense Intelligence Agency report, Chemical and Biological Warfare Capabilities - Asian Communist Countries, Supplement One, October 1978
Requested date:	23-October-2008
Released date:	10-June-2013
Posted date:	13-August-2013
Source of document:	Commander US Army Intelligence & Security Command Freedom of Information/Privacy Office ATTN: IAMG-C-FOI 4552 Pike Road Fort George G. Meade, MD 20755-5995 Fax: (301) 677-2956 Email: FOIA/Privacy Office Online FOIA Request Form
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DEPARTMENT OF THE ARMY
UNITED STATES ARMY INTELLIGENCE AND SECURITY COMMAND
FREEDOM OF INFORMATION/PRIVACY OFFICE
FORT GEORGE G. MEADE, MARYLAND 20755-5995

REPLY TO
ATTENTION OF:

Freedom of Information/
Privacy Office

10 JUN 2013

This is in further response to your Freedom of Information Act (FOIA) request of October 23, 2008, and supplements our electronic message of May 12, 2010.

Coordination has been completed with another element of our command and other government agencies and records returned to this office for our review and direct response to you. We have reviewed the records and determined the records are partially releaseable to you. A copy of the records are enclosed for your use.

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Sincerely,

Brad S. Dorris
Director
Freedom of Information/Privacy Office
Investigative Records Repository

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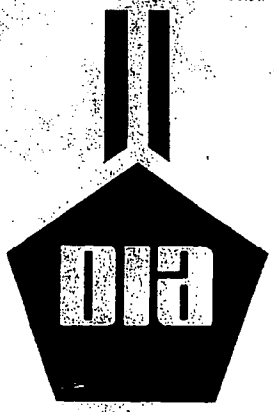

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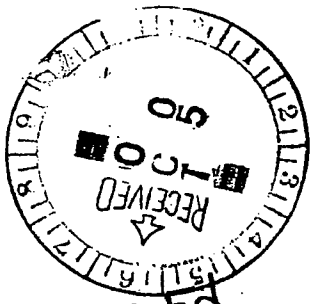

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CHEMICAL AND BIOLOGICAL WARFARE CAPABILITIES—ASIAN COMMUNIST COUNTRIES (U)

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October 1978

DST-1600S-148A-76-SUP 1

Publication No.
DST-1600S-148-76-SUP 1
Amendment A

US ARMY MATERIEL
DEVELOPMENT AND READINESS COMMAND
FOREIGN SCIENCE AND TECHNOLOGY CENTER
Charlottesville, VA 22901

CHEMICAL AND BIOLOGICAL WARFARE CAPABILITIES— ASIAN COMMUNIST COUNTRIES (U)

Publication No. DST-1600S-148-76-SUP 1, published August 1976, is amended as follows: The pages listed below are to be removed and destroyed in accordance with existing security regulations, and new pages are substituted therefor, or are added.

Remove pages:	Insert new pages:
Front and back covers	Front and back covers
Title page	Title page
iii thru v (Reverse Blank)	iii thru vi
ix thru xviii	ix thru xviii
1 and 2	1 thru 2.2
5 and 6	5 and 6
11 and 12	11 thru 12.2
17 and 18	17 thru 18.2
37 and 38	37 and 38
47 thru 50	47 thru 50.2
55 and 56	55 thru 56.2
59 thru 70	58.1 thru 70.2
97 thru 108	97 thru 108
111 thru 114	111 thru 114
117 thru 122	117 thru 122
125 thru 130	125 thru 130
133 thru 136	133 thru 136.8
	142.1 thru 142.8
243 and 244	243 thru 245 (Reverse Blank)

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ERRATA

Publication No.
DST-1600S-148-76-SUP 1

US ARMY MATERIEL
DEVELOPMENT AND READINESS COMMAND
FOREIGN SCIENCE AND TECHNOLOGY CENTER
Charlottesville, VA 22901

CHEMICAL AND BIOLOGICAL WARFARE CAPABILITIES--
ASIAN COMMUNIST COUNTRIES (U)

1. Recipients of subject study are to remove or excise caveats as indicated in paragraph 2.

2. Specific corrections are as follows:

a. Front cover, bottom of page--"NOT RELEASABLE TO CONTRACTORS OR CONTRACTOR/CONSULTANTS" and "DISSEMINATION AND EXTRACTION OF INFORMATION CONTROLLED BY ORIGINATOR."

b. Page i, (Title Page), bottom of page--"NOT RELEASABLE TO CONTRACTORS OR CONTRACTOR/CONSULTANTS" and "DISSEMINATION AND EXTRACTION OF INFORMATION CONTROLLED BY ORIGINATOR."

c. Page 1, bottom of page--"NOT RELEASABLE TO CONTRACTORS OR CONTRACTOR/CONSULTANTS" and "DISSEMINATION AND EXTRACTION OF INFORMATION CONTROLLED BY ORIGINATOR."

d. Page 47, para 24--"ORCON-NO CONTRACT", "NOT RELEASABLE TO CONTRACTORS OR CONTRACTOR/CONSULTANTS", and "DISSEMINATION AND EXTRACTION OF INFORMATION CONTROLLED BY ORIGINATOR."

e. Pages 49, 50, 51, 52, 53, 54, paras 24b, 24b(5), 24e, 24e(1), 24e(2), 24e(4) and bottom of applicable pages: "ORCON-NO CONTRACT", "NOT RELEASABLE TO CONTRACTORS OR CONTRACTOR/CONSULTANTS" and "DISSEMINATION AND EXTRACTION OF INFORMATION CONTROLLED BY ORIGINATOR."

f. Pages 123, 124, paras 21, 21a, and the bottom of each page--"ORCON-NO CONTRACT", "NOT RELEASABLE TO CONTRACTORS OR CONTRACTOR/CONSULTANTS", and "DISSEMINATION AND EXTRACTION OF INFORMATION CONTROLLED BY ORIGINATOR."

g. Back cover--"NOT RELEASABLE TO CONTRACTORS OR CONTRACTOR/CONSULTANTS" and "DISSEMINATION AND EXTRACTION OF INFORMATION CONTROLLED BY ORIGINATOR."

Date of Errata: September 1976

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PREFACE

(U) This comprehensive study assesses the capabilities of the Asian Communist countries to conduct chemical and biological warfare, both offensively and defensively. DST-1600E-148-82, Chemical and Biological Warfare Capabilities--Asian Communist Countries: Summary Report (U), August 1982 (SECRET-NOFORN-WNINTEL), provides a concise, inclusive summary of the capabilities of these countries.

★ (U) The first five sections of the study are arranged by country. The sixth section contains technological threat projections. A minimum of information is included on smoke, flame, and incendiaries. Additional information can be found in separate studies DST-1620S-146-82, Flame and Incendiary Materials and Devices--Foreign (U), dated February 1982 (~~SECRET-NOFORN-WNINTEL~~) and DST-1620S-145-81, Smoke and Other Chemical Obscurants--Foreign (U), dated August 1981 (~~SECRET-NOFORN-WNINTEL-ORCON~~). Appendixes to the study include the following: a list of investigators in the field of chemical and biological warfare or related research, the facilities with which they are associated, and their special research interests; a list of the Chinese facilities reported as having CBW functions; and a numerical listing of pertinent Foreign Materiel Catalog items, with detailed information on, as well as technical characteristics of, chemical and biological materiel reportedly produced in the Asian Communist countries. Change 3 includes, as appendix III, a copy of State Department Special Report No. 98, Chemical Warfare in Southeast Asia and Afghanistan, March 1982, which presents evidence on chemical and biological warfare activities. The sections on China, North Korea, and the Mongolian Peoples Republic have not been changed. Although some details have become dated, most of the information remains valid.

(b)(1)

(U) This document will be used to satisfy the needs of US policy planners, Department of Defense staff, military departments, commanders in the field, intelligence collectors and analysts, and research and development personnel. It will also be used to satisfy Department of Defense quick-reaction requirements, both formal and informal.

(U) This study is being disseminated devoid of bibliographic material to facilitate wider distribution. A compiled bibliography has been prepared separately and can be made available to authorized recipients upon request to the Commander, US Army Foreign Science and Technology Center, 220 Seventh St., NE., Charlottesville, VA 22901 (ATTN: DRXST-PO). Individuals making such requests are cautioned that the addition of the bibliography to (or its association with) the study makes mandatory a more restricted distribution of the study. When the bibliography is attached, the study must carry the additional caveats DISSEMINATION AND EXTRACTION OF INFORMATION CONTROLLED BY ORIGINATOR and NOT RELEASABLE TO CONTRACTORS OR CONTRACTOR/CONSULTANTS.

(U) Most illustrations appearing in this document are identified by a six-digit negative number printed in the lower left corner of the figure. Users can request prints of these illustrations by citing the negative numbers and the short title of this study in a request addressed to the Commander, US Army Foreign Science and Technology Center, 220 Seventh Street, NE., Charlottesville, VA 22901 (ATTN: DRXST-PO).

(U) A star in the left margin indicates that the adjacent paragraph contains significant new or revised information since the last edition of this study. A star preceding a table or figure caption indicates either that the table or figure is new or that it has been changed in some respect.

(U) Constructive criticisms, comments, or suggested changes are encouraged, and should be forwarded to the Commander, US Army Foreign Science and Technology Center, 220 Seventh Street, NE., Charlottesville, VA 22901 (ATTN: DRXST-PO).

ERRATA

DST-1600S-148-76 SUP 1
August 1976

US ARMY MATERIEL
DEVELOPMENT AND READINESS COMMAND
FOREIGN SCIENCE AND TECHNOLOGY CENTER
Charlottesville, VA 22901

CHEMICAL AND BIOLOGICAL WARFARE CAPABILITIES–
ASIAN COMMUNIST COUNTRIES (U)

Page 43: Formula For G-type nerve agent–change Cl to F.

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CHEMICAL AND BIOLOGICAL WARFARE CAPABILITIES— ASIAN COMMUNIST COUNTRIES (U)

AUTHORS
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DST-1600S-148-76-SUP 1-CHG 3

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DATE OF PUBLICATION
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Information Cutoff Date
July 1982

This study supersedes ST-CS-03-148-75 and ST-CS-03-170A-74, as amended.

This is a Department of Defense Intelligence Document prepared by the Foreign Science and Technology Center, US Army Materiel Development and Readiness Command, under the DOD S&T intelligence program, with contributions from the Defense Intelligence Agency, the US Army Medical Intelligence and Information Agency, the Naval Intelligence Support Center, and the Foreign Technology Division of the US Air Force Systems Command, and approved by the Assistant Chief of Staff for Intelligence, US Army.

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LIST OF EFFECTIVE PAGES

SUBJECT MATTER	PAGE NUMBERS	DATE
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	27 and 28	Original
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	111 and 112	14 July 1980
	112.1 and 112.2	October 1978
	113 and 114	14 July 1980
	115 and 116	Original
	117 thru 124	14 July 1980
	125	Original
	126 and 127	October 1978
	128	Original

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CHANGE NUMBER	DATE OF CHANGE	DATE ENTERED	SIGNATURE, RANK/RATE AND ORGANIZATION OF INDIVIDUAL ENTERING CHANGE
ERRATA	Sept. 1976	12 Nov 76	(b)(6)
Amendment #1	Oct 78	25 Sep 78	
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SUMMARY

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DST-1600S-148-76-SUP 1-CHG 3
27 August 1982

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SECTION I

CHINA (U)

A. INTRODUCTION AND BACKGROUND (U)

1. Introduction (U)

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2. Background (U)

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2.1. General Health Conditions (U)

a. (U) Basic medical problems in China include a generally inadequate level of professional medical training and a lack of facilities and material. Fully trained physicians and specialists are in critically short supply. Hospitals frequently lack modern medical equipment. The diet of most Chinese is currently only minimally adequate, and malnutrition could occur in the event of a major drought or natural disaster, or as a result of a disruption of the food distribution system. Disease problems include a high incidence of cancer (particularly nasopharyngeal, gastrointestinal, esophageal, and liver cancers) and an increase in tuberculosis and cardiovascular disease. The prevalence of most parasitic diseases (such as schistosomiasis, filariasis, and hookworm) has been substantially reduced.

b. (U) Despite these shortcomings the health services have continued efforts to institute effective disease-control measures, contain epidemics, enforce public health regulations, supervise medical educational standards adequately, and carry out countrywide health education programs. There is a fair to good capability to activate and operate emergency medical services in response to disasters. The life expectancy at birth in 1975 was 62 years. The death rate dropped from 24 deaths per 1000 population in 1962 to under 12 per 1000 in 1971.

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B. POLICY AND DOCTRINE (U)

★3. Policy (U)

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Table 0. (U) Higher-Level Chinese Military Organizations[197 198]

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Table I. (U) Functions of PLA Chemical Units (Continued)

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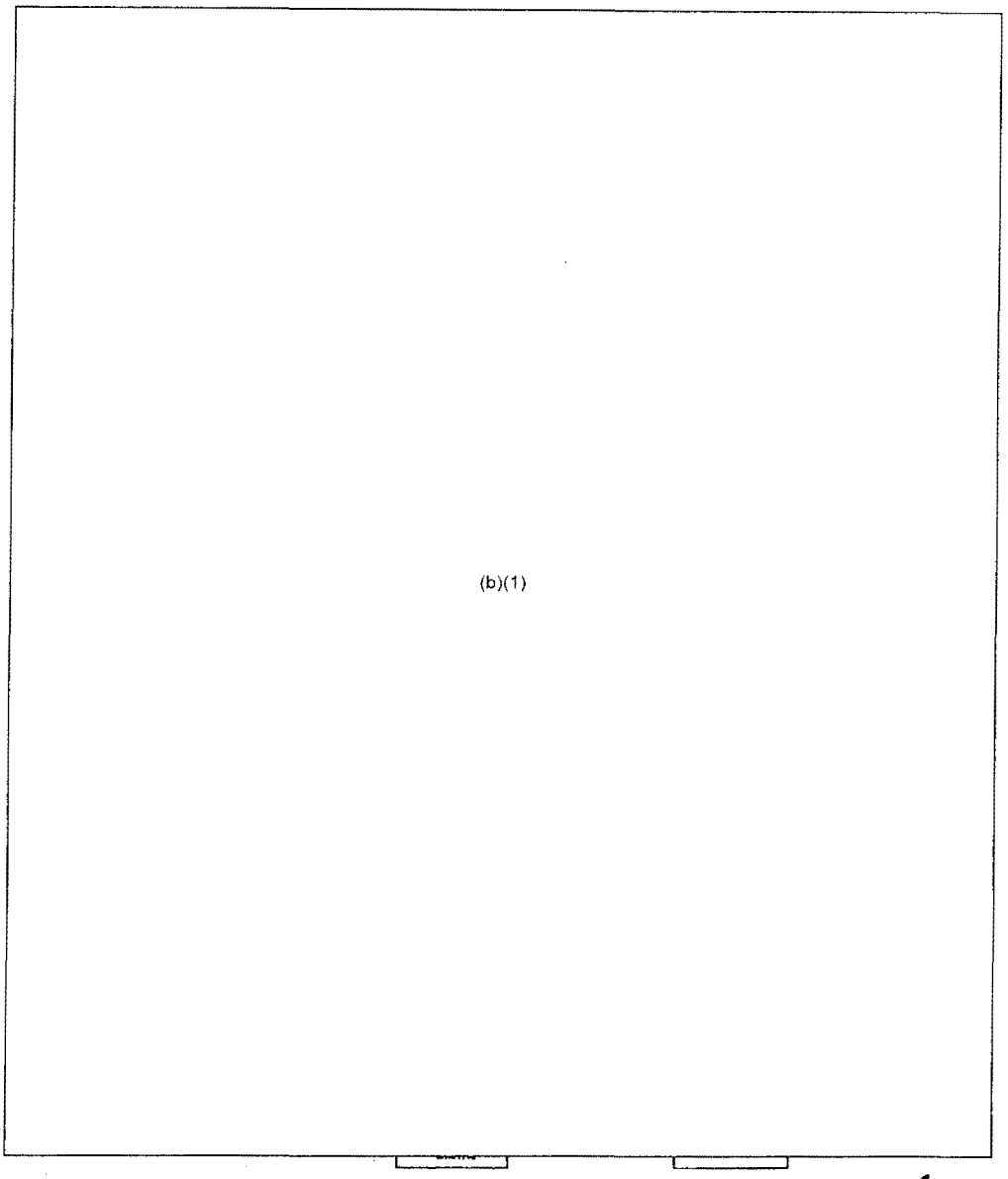

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Figure 1. (U) CW Organization in China

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(S) 6. Assignment of Chemical Units and Troops (U)

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(S) c. Division (U).

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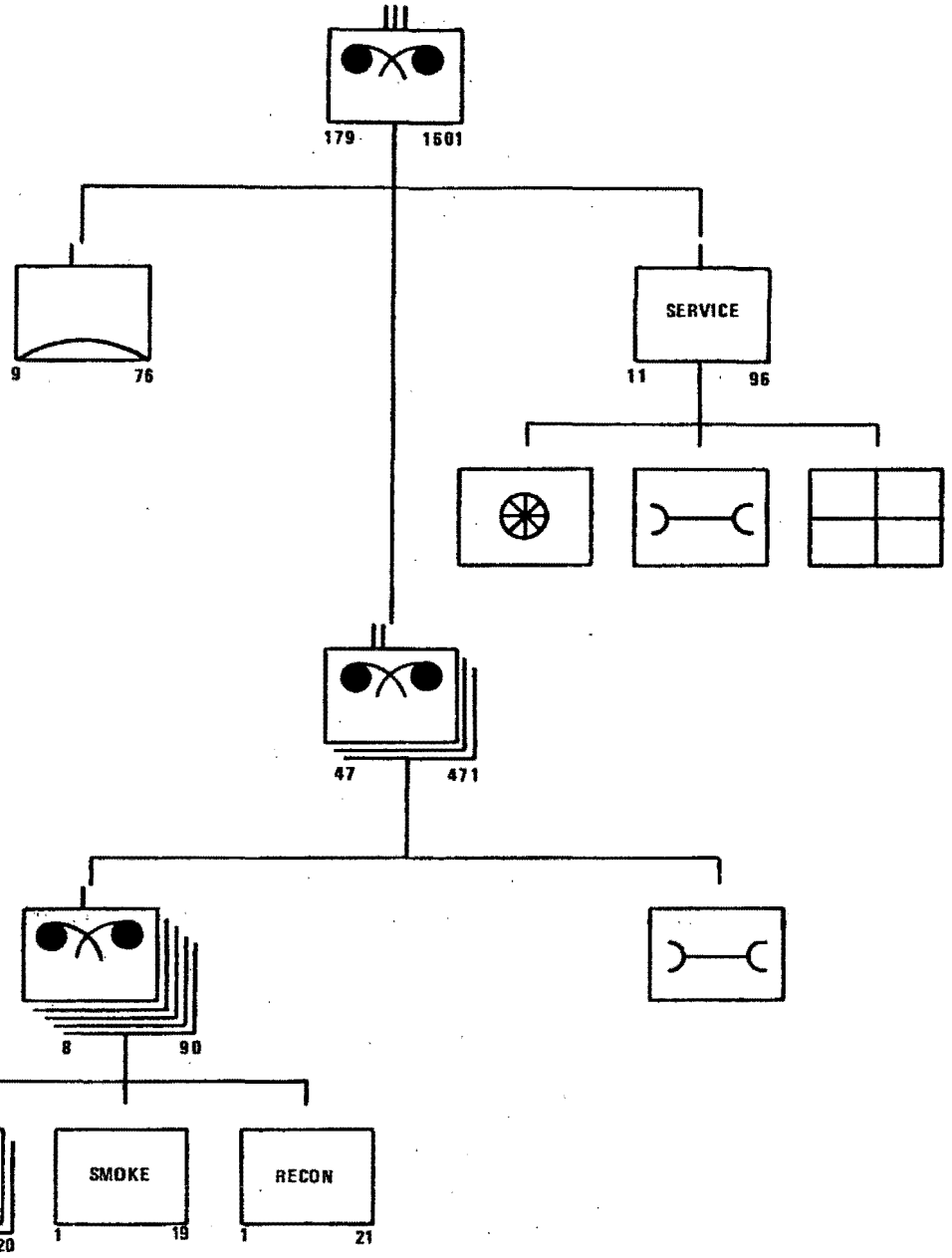

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★ Figure 2. (U) Probable Organization of an Independent Chemical Defense Regiment

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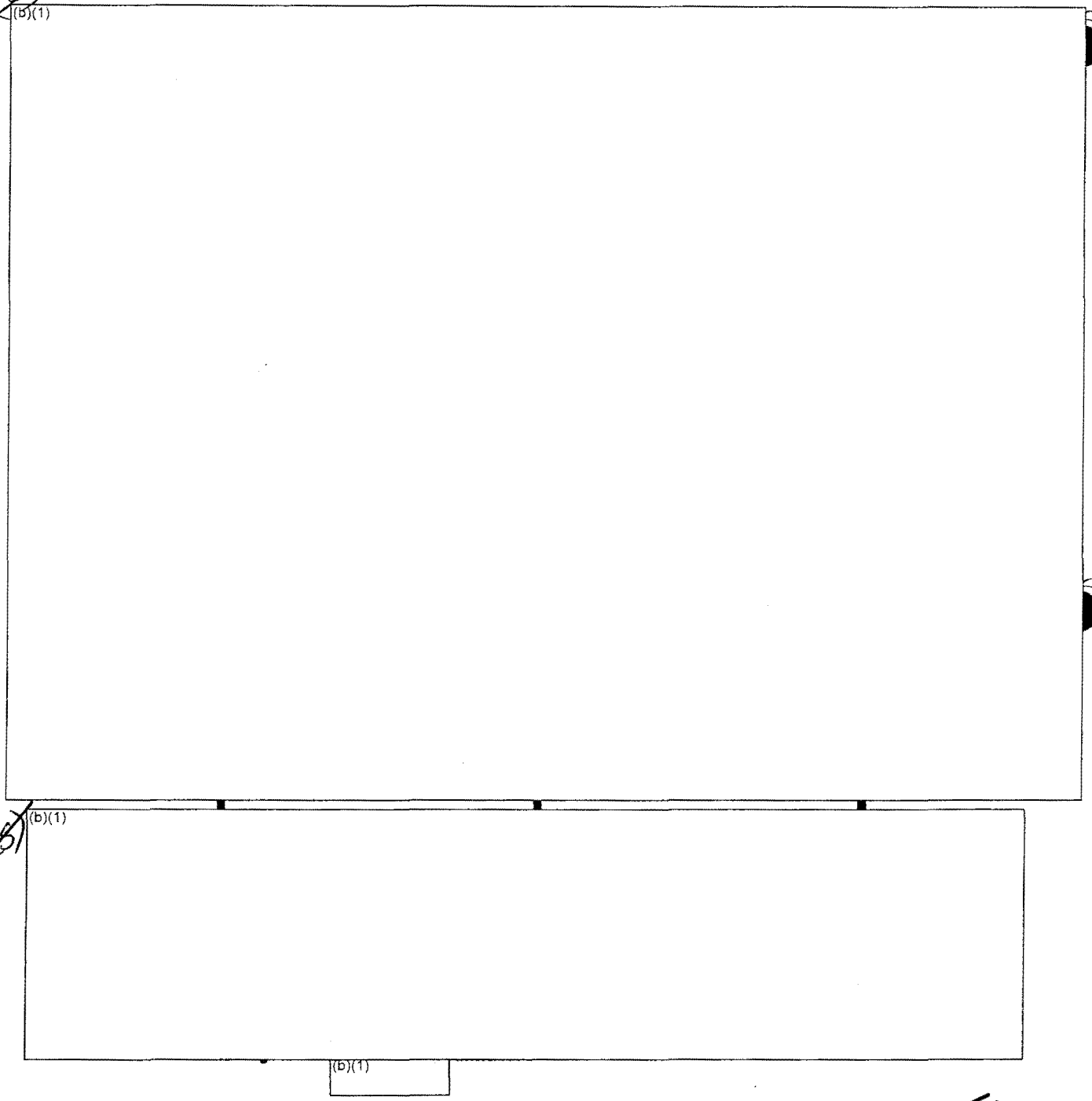

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Figure 3. (U) Army-Level Chemical Battalion, China

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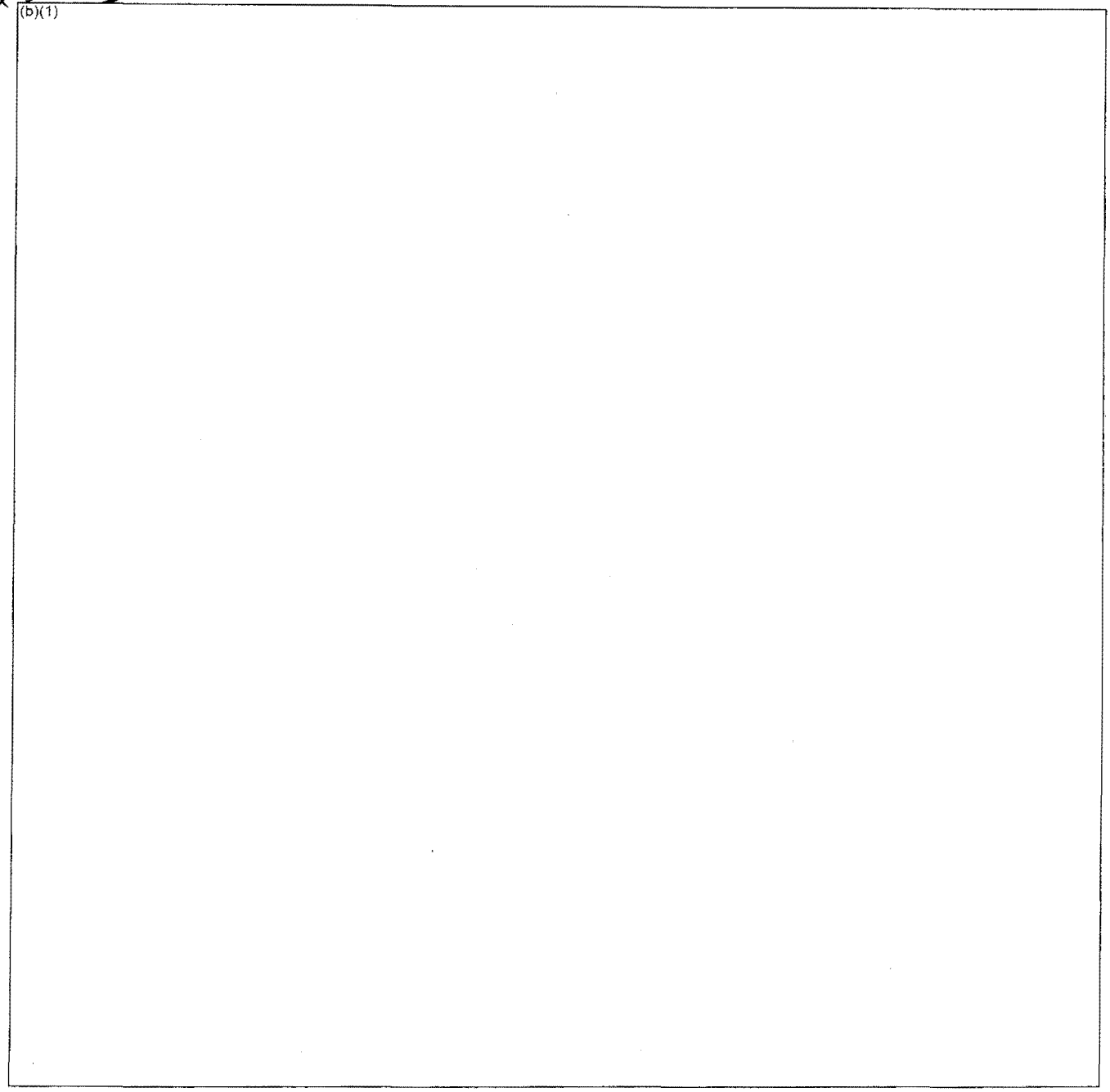

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Figure 6. (U) Organization of Chemical Platoon, China

7. Strategy and Tactics (U)

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(1) (U) The Chinese troops will use individual CW equipment, such as cape-groundsheets, and unit vehicles to cross contaminated areas in offensive operations. Contaminated personnel will not be evacuated until the mission has been accomplished.

(2) (U) Chemical personnel are assigned to assault units, probably to conduct CW reconnaissance, operate CW-agent detection and identification equipment, and mark routes through and around contaminated areas.

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(4) (U) The Chinese advocate the use of smoke to support combat operations.

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c. Defense (U).[20]

(1) (U) In defense against a chemical attack, the chemical staff officer at unit level recommends the location of the command post, prepares the unit chemical defense plan and submits it for approval, and insures that CW and other subordinate units are prepared to execute the plan. His recommendations include the establishment of weather observation and agent detection outposts operated by CW personnel, the location of decontamination stations, and the number of non-CW personnel to be posted by combat units to warn of a CW attack. The chemical staff officer probably advises the commander on other matters, including CW logistics and the control of the local population subjected to a CBW attack.

(2) (U) In defense against a CBW attack, chemical units perform the following functions to support the command: reconnaissance and technical intelligence gathering; meteorological forecasting; decontamination; detection and identification; technical supervision for CBW defense measures and training programs; and technical supervision of unit supply, maintenance, and salvage activities.

(3) (U) In order to perform his defensive mission after CW training, the individual soldier is required to know the characteristics and physical effects of agents; recognize a CBW attack and be able to give warning signals and spread an alarm; properly use and maintain his individual equipment; perform his mission while masked and wearing protective clothing; and accomplish his military mission regardless of contamination.

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8. Chemical, Biological, and Radiological Training (U)

(S) a. Chemical Troops (U).

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TABLE II. (U) Reported CBR Training Facilities in China

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Figure 7. (U) Decontamination Exercise, China

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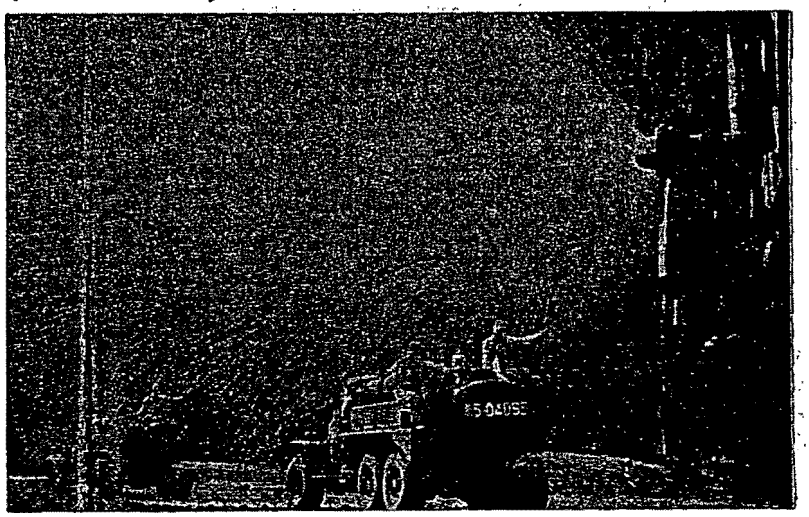

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Figure 8. (U) Road Decontamination Exercise, China

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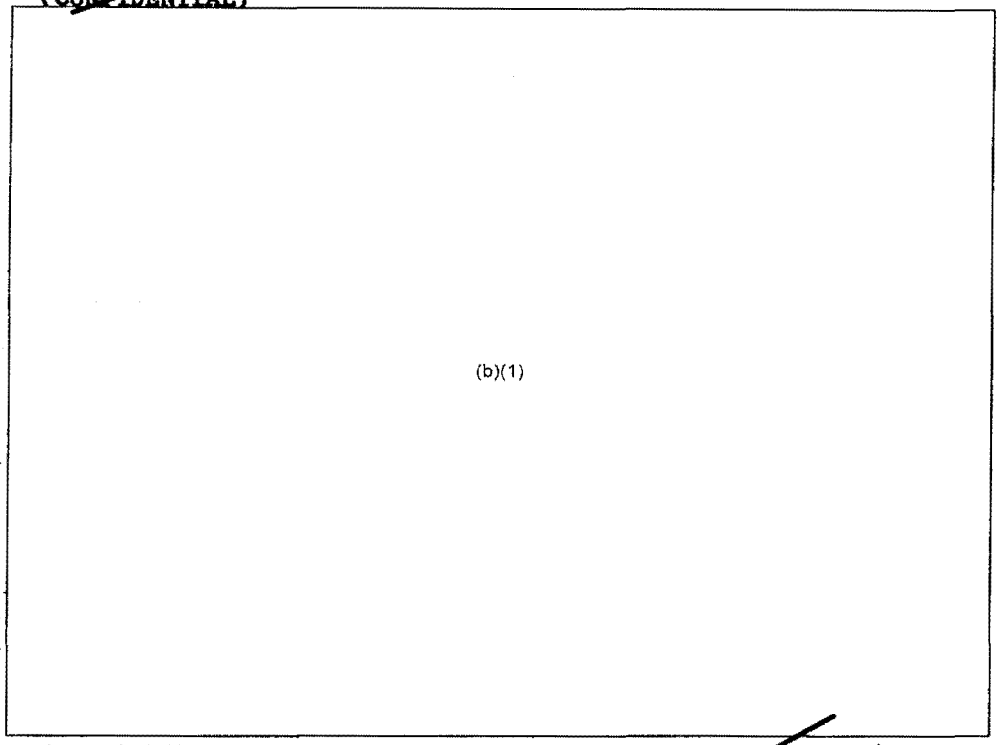

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Figure 9. (U) Troops Preparing to Ford Stream in Full Protective Clothing

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b. Other Troops (U).

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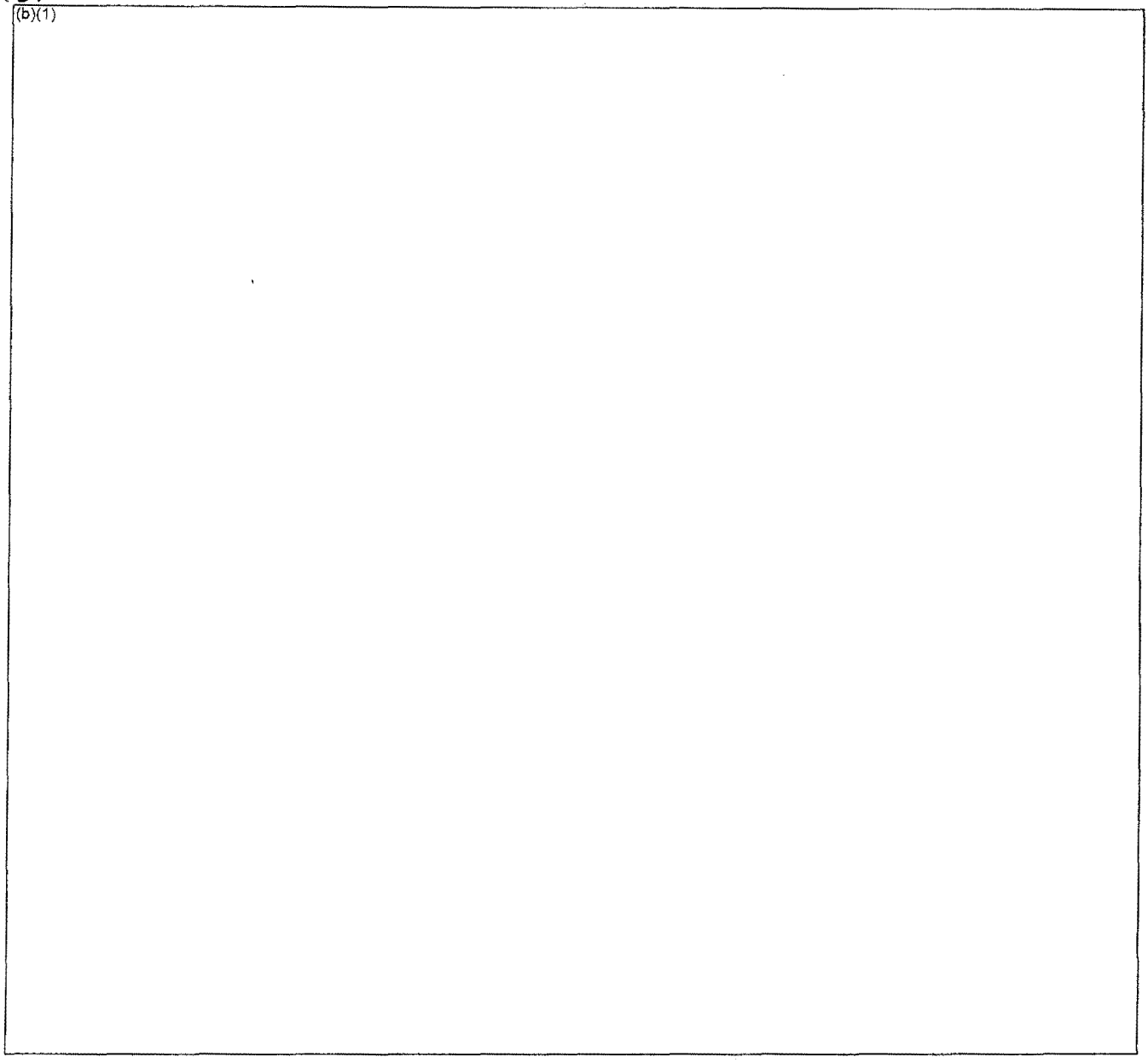

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D. CHEMICAL AND BIOLOGICAL AGENTS AND MUNITIONS (U)

10. General (U)

(b)(1)

11. Chemical Warfare Agents (U)

(b)(1)

12. Biological Warfare Agents (U)

(b)(1)

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13. Chemical Warfare Delivery Systems (Including Flame, Smoke, and Incendiaries (U)

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Table III. (U) Characteristics of Probable Chemical Ground Munitions

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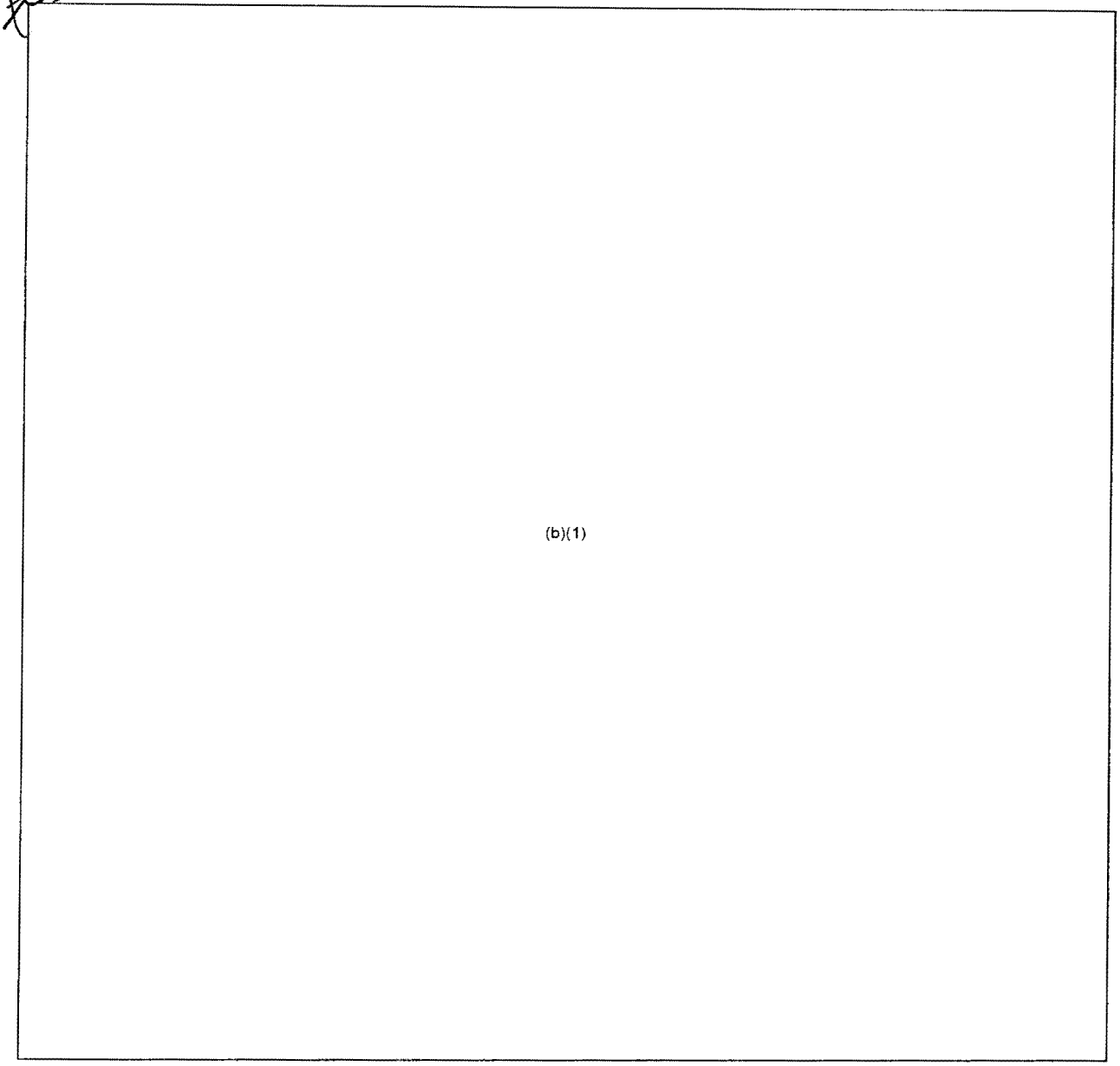

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d. (U) The Chinese have studied the transovarian transmission of *Rickettsia tsutsugamushi* by two types of *Trombicella deliensis*, which provides basic information for establishing vector colonies and their subsequent infection for possible use in a vector-agent system.[43] A 1966 publication urged that extensive studies of insect culture be undertaken in order to remain abreast of foreign developments.[44]

e. (U) The Institute of Genetics, Chinese Academy of Sciences (CAS), studies special topics in microbiology and entomology, areas of research considered the "vanguard for future bacteriological warfare."[45] Allegedly, discoveries in the field of bacteriology made by this institute have had profound effects on the entire mainland, but these discoveries have not been disclosed.

E. DEFENSE AND PROTECTION

15. General (U)

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16. Individual and Collective Protection (U)

★ a. (C) Protective Masks and Canisters (U). (b)(1)

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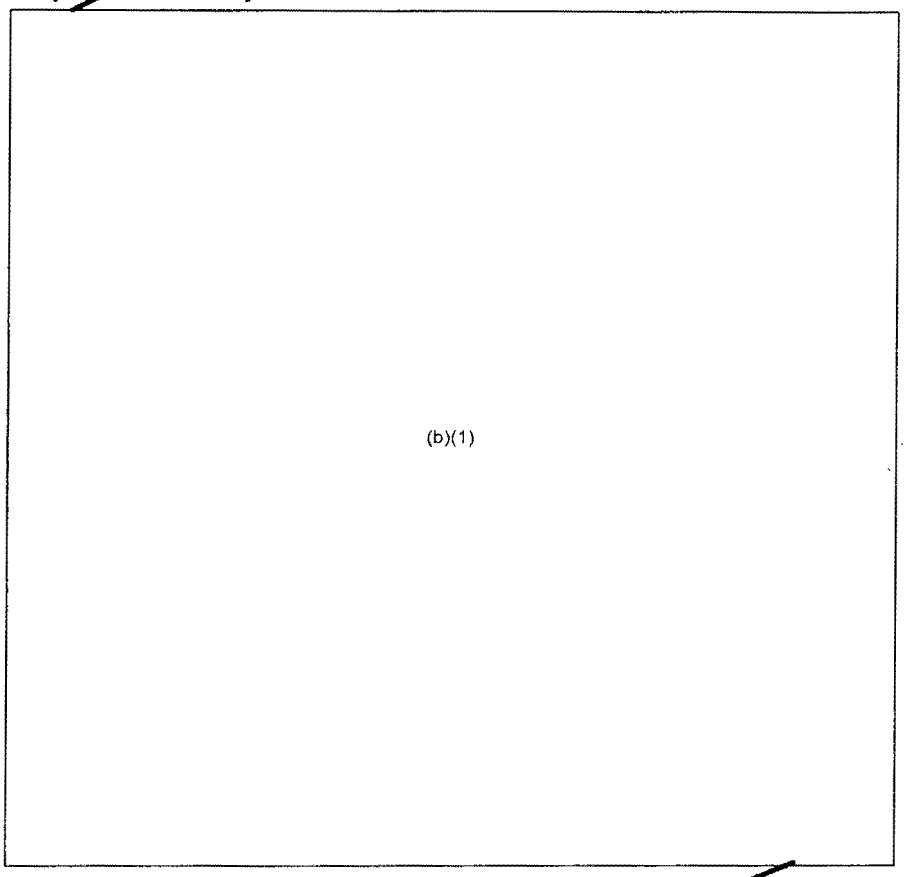

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Figure 9.1. (U) CBR Protective Mask With Left-Cheek-Mounted Canister

b. Protective Clothing (U).

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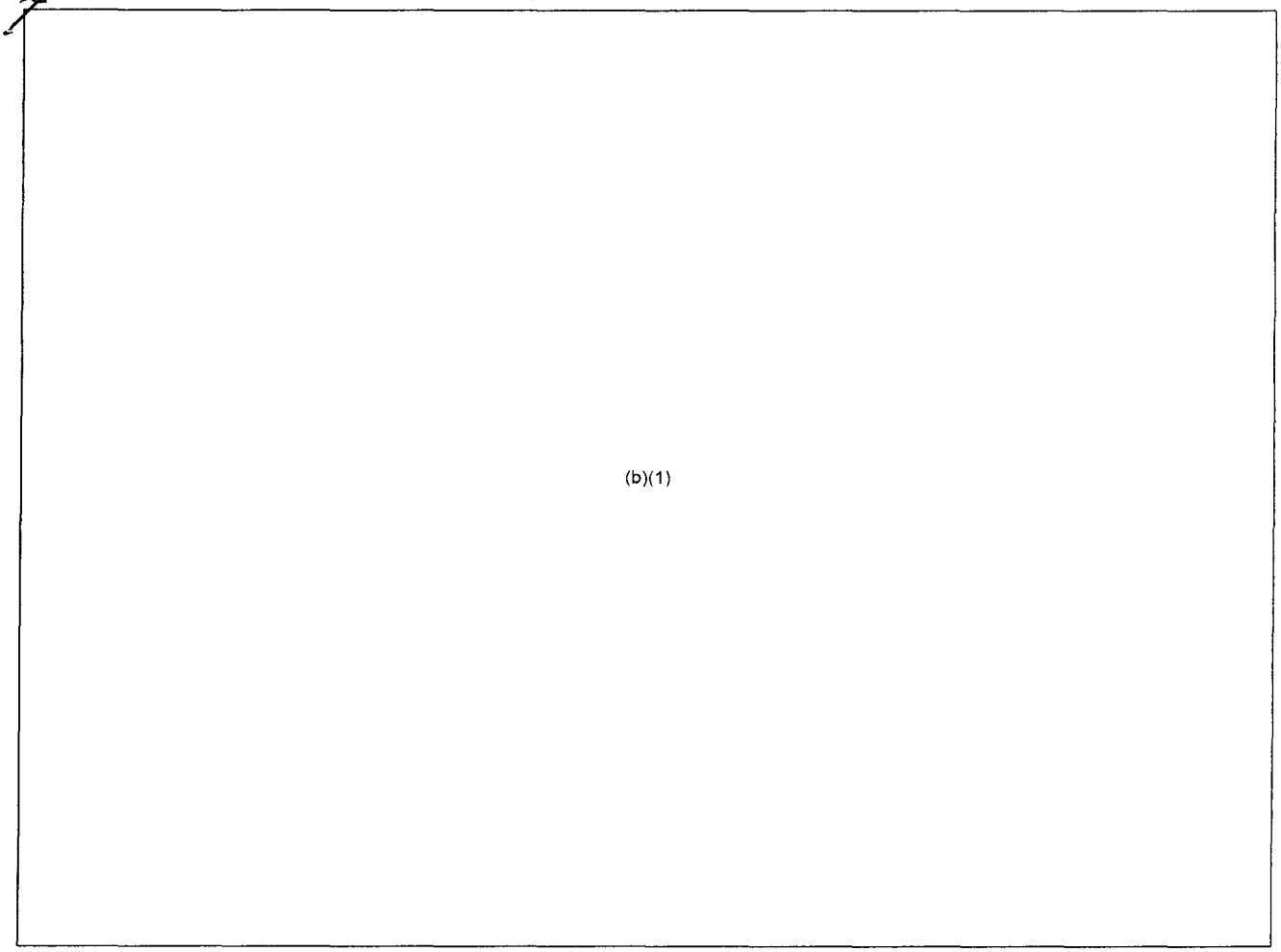

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17. (c) Detection and Identification

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18. (C) Decontamination

a. First-Aid Kits.

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(b) (~~C~~) Manpack Decontamination Equipment (U). (b)(1)

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c. Truck-Mounted Decontamination Equipment (U).

(b)(1)

d. (~~C~~) Biological Warfare Decontamination Equipment (U). (b)(1)

(b)(1)

19. Prophylaxis and Therapy (U)

a. Chemical Warfare (U).

(1) (U) Some locally made individual kits contain solutions to minimize the effects of WP.[5]

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★ Table III.1. (U) Nerve Agent Antidotes

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(5) (U) Chinese scientists claim that trypsin treatment is effective against a wide variety of elapid (cobra, mamba, krait, etc.)

snakebites.[58] Injection into mice of trypsin close to the "bite site" 10 to 15 minutes after a lethal dose of cobra venom effected a 100% survival rate. The powdered trypsin is cheaper and more stable than specific antisera and apparently as effective.

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(2) (U) Chinese military cadres are inoculated with a combined cholera and typhoid vaccine once a year.[2] Claims have been made that all people have received vaccinations for smallpox and that the disease has been eradicated. Vaccines or antisera for typhoid, paratyphoid, typhus, diphtheria, tetanus, rabies, plague, cholera, yellow fever, and Japanese B encephalitis (JBE) have been developed, but the scale of use is not known. The use of live vaccines has been exploited in China and such vaccines for brucellosis, plague, and anthrax are available. Vaccines for the more serious animal diseases, such as swine plague, hog cholera, rinderpest, and foot-and-mouth disease, have been developed. In 1964, a method of aerosol immunization was introduced into veterinary practice.[60] The vaccine material is sprayed or dusted into a room where animals are exposed and immunized.

(b)(1)

(5) (U) Quantities of vaccines, antibiotics, and antisera are believed to be sufficient for military needs, but not for all domestic requirements.[39]

(6) (U) Some locally made individual kits are provided with soap and antiseptics to prevent infections.[5]

F. PRODUCTION AND STOCKPILES (U)

20. Production (U)

(b)(1)

b. Toxic Chemical Warfare Agents (U).

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c. (S-NOFORN) Smoke, Flame, and Incendiary Munitions (U). (b)(1)

(b)(1)

★ d. (C) Biological Warfare Agents (U). (b)(1)

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e. Defensive Materiel (U).

(1) Chemical and Biological Warfare Materiel (U).

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(2) (S-NOFORN) Biological Warfare Materiel (U). (b)(1)

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21. ~~(S-NOFORN-WNINTEL)~~ Stockpile/Storage Facilities

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b. ~~(S-NOFORN-WNINTEL)~~ Storage Facilities.

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G. RESEARCH AND DEVELOPMENT (U)

22. General (U)

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23. Chemical Warfare Agents (U)

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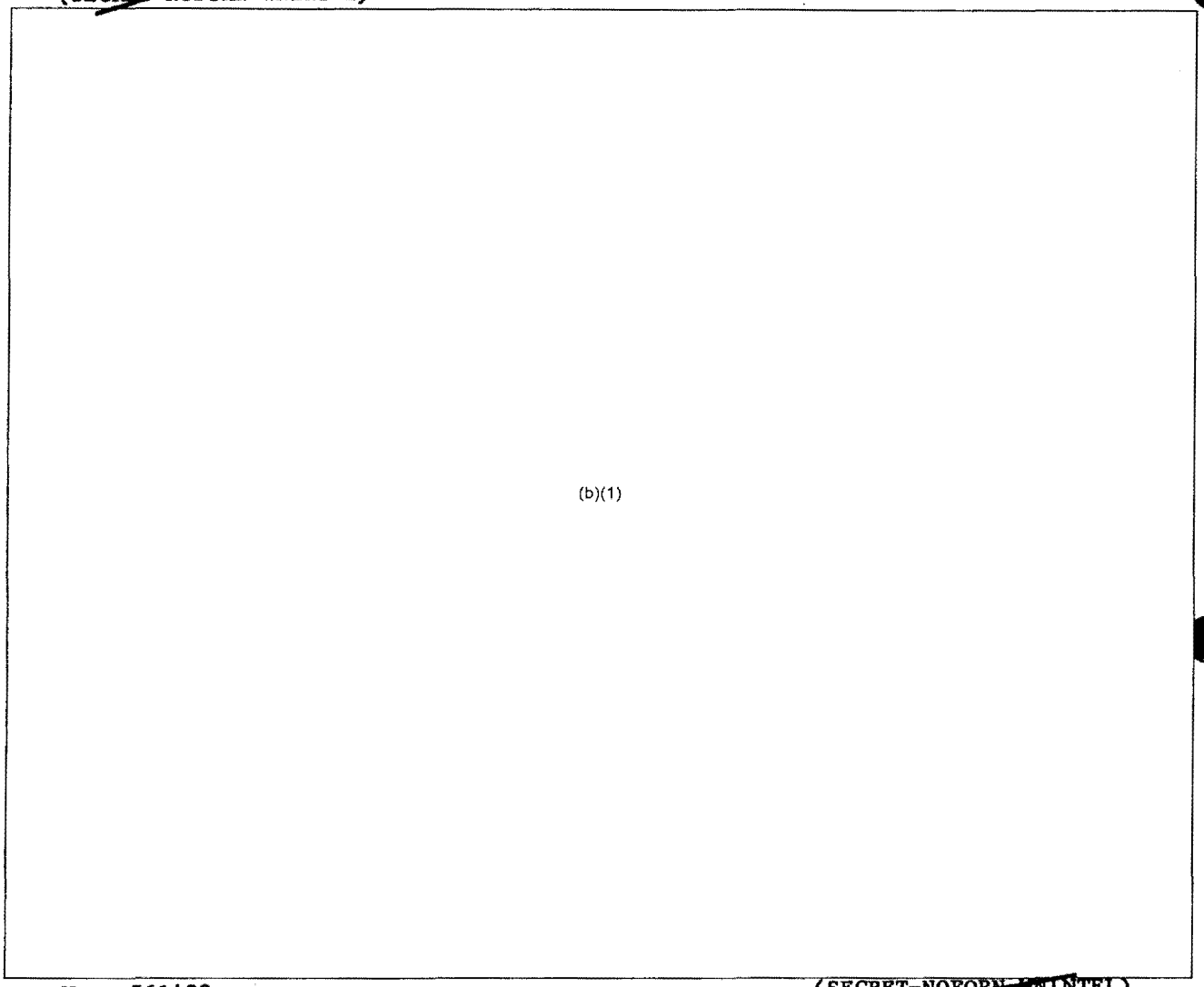

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Figure 13. ((S-NOFORN-WNINTEL) (SECRET-NOFORN-WNINTEL)

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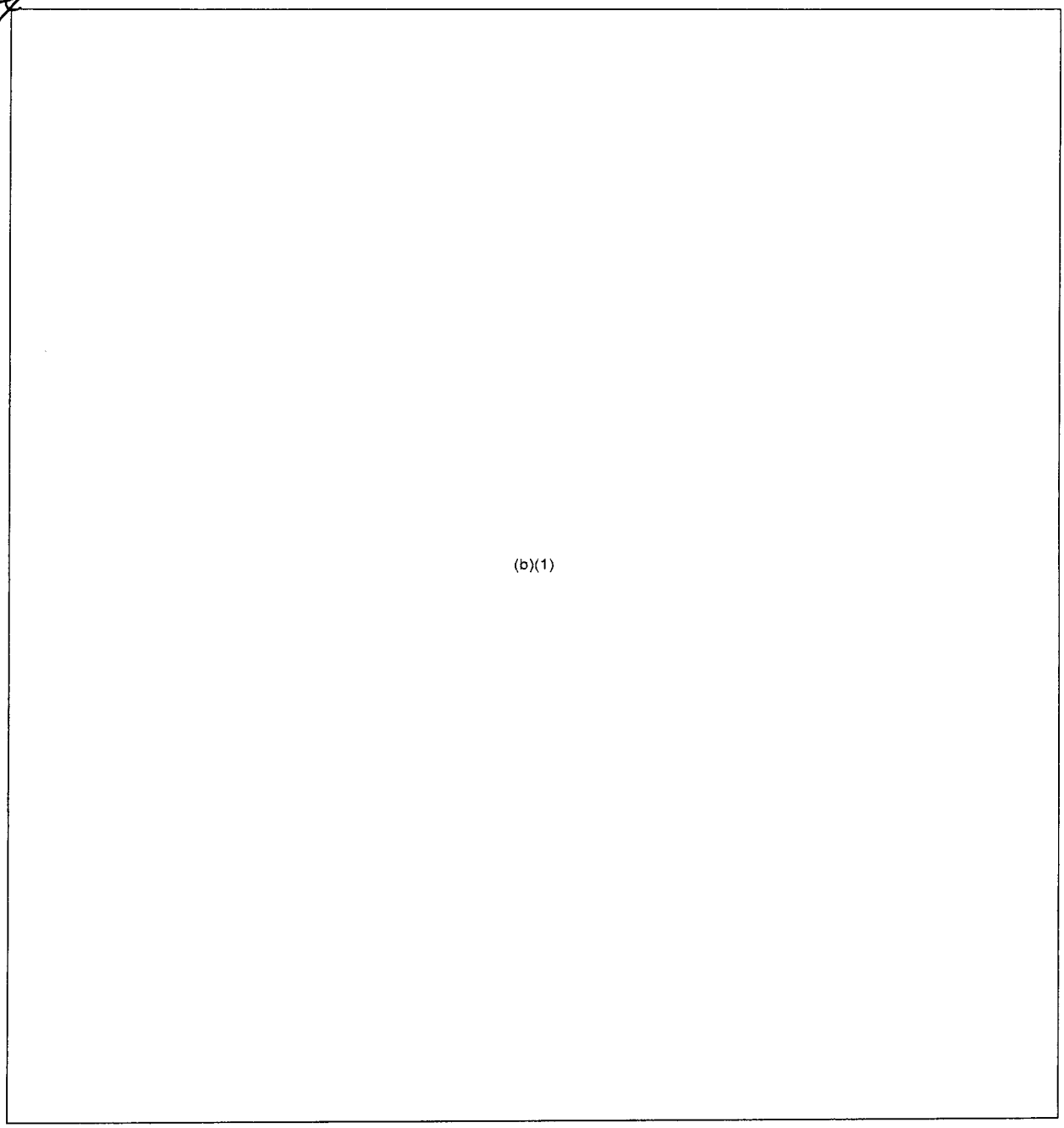

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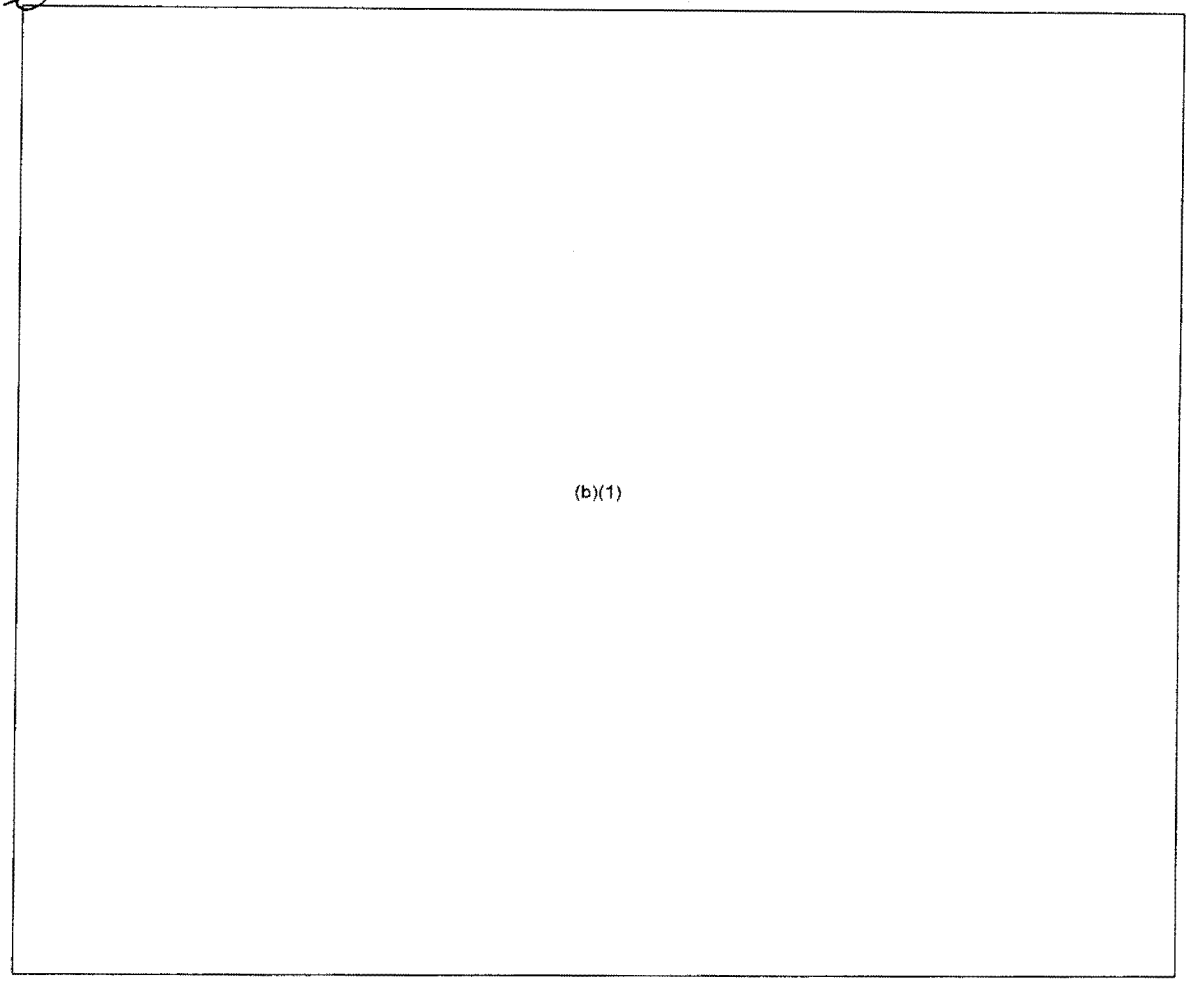

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Table IV. Potential BW Agents (U)

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b. Research Related to Agent Development (U).

(b)(1)

(3) (U) The propagation and characterization of Rickettsia prowazekii (typhus fever),[106] [107] Salmonella and Shigella species (typhoid fever and dysentery),[108] [109] and JBE virus have been studied at the Institute of Biological Products, Chengtu. None of this work has been related to BW research, but the accumulated data could be used to support related R&D efforts.

(4) (U) Investigators at the Fukien Institute of Epidemiology, Foo-chou, have studied the vectors of Rickettsia tustusgamushi,[110] the detection of Leptospira,[111] and immunological methods for identifying Coxiella burnetti. The antibiotic resistance of a large number of strains of Shigella was studied by the China Medical College and the Inner Mongolia Medical College, Huhenot.[112] These studies might have some application to a BW program, although these diseases are prevalent public health problems.

(b)(1)

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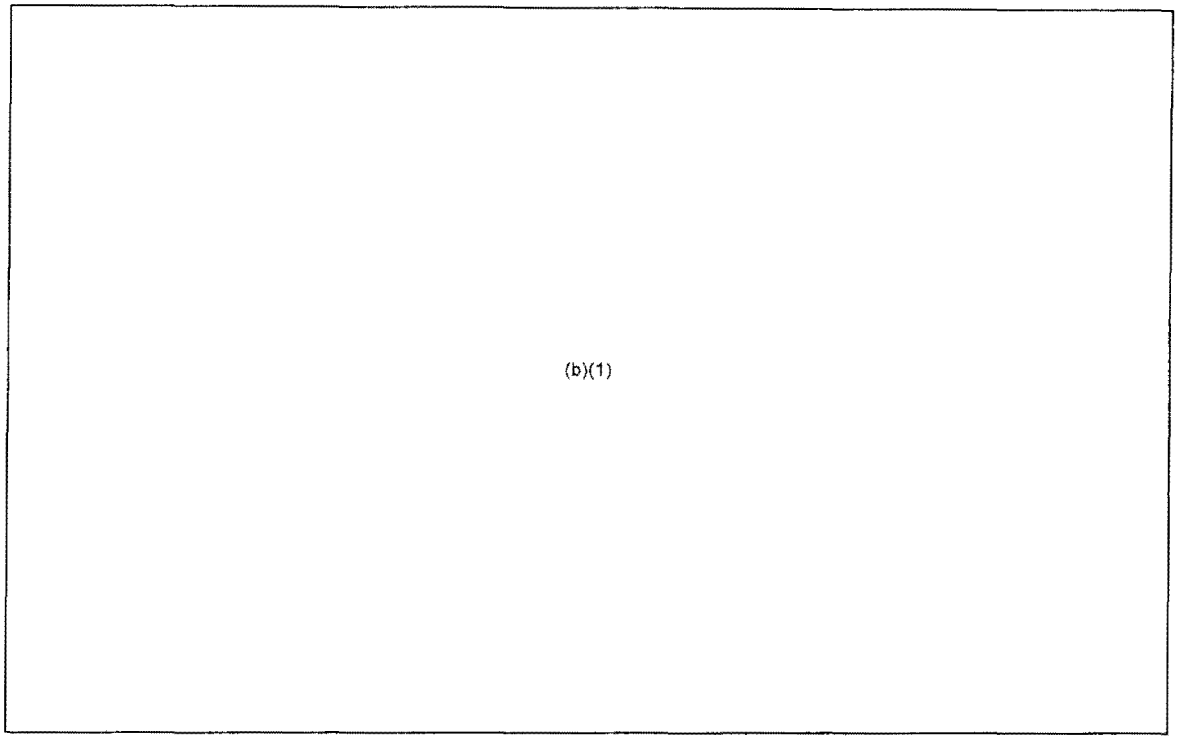
c. ~~(C)~~ Bioengineering.



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e. Crop-Pest Control (U).

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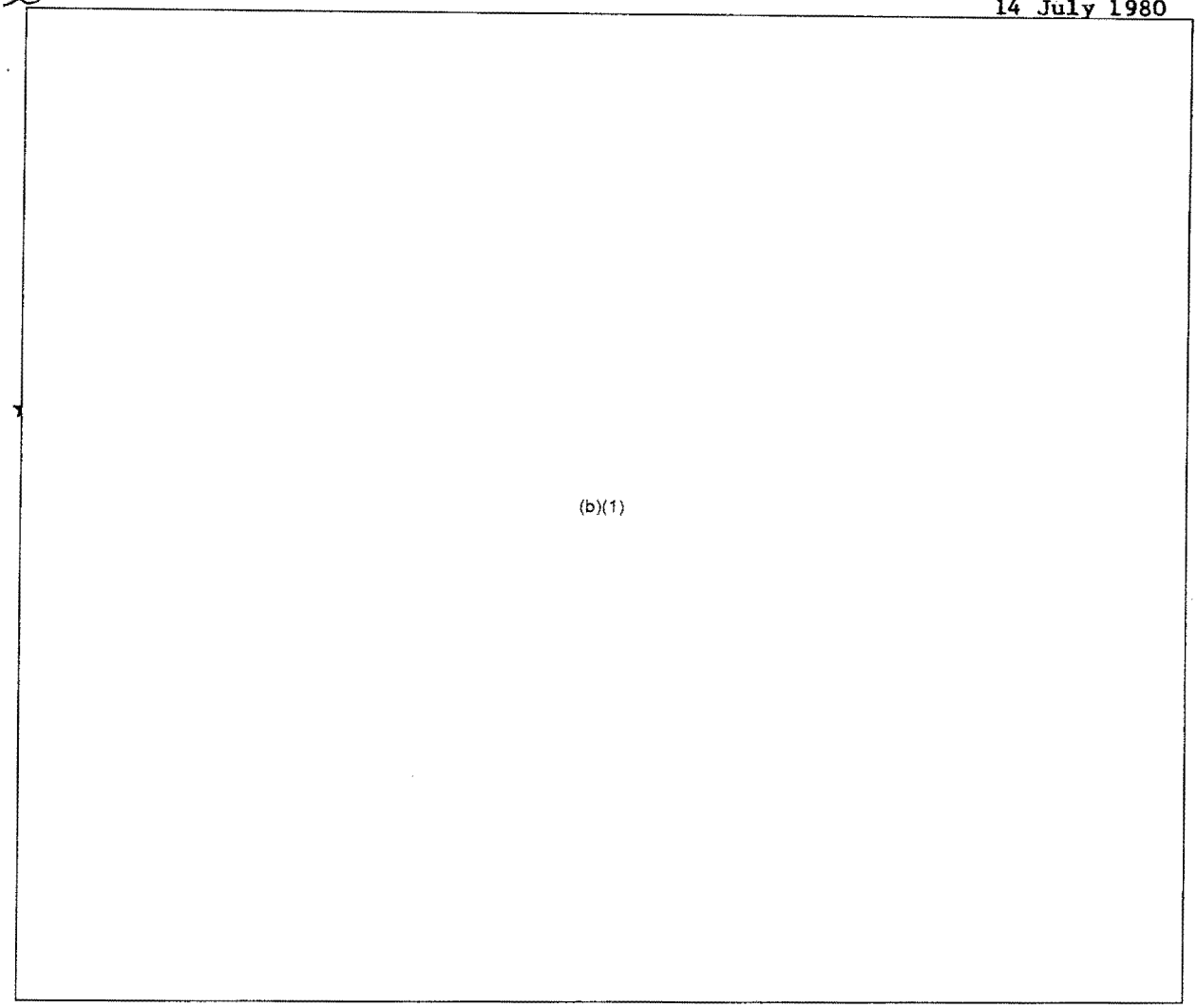

b. Biological Warfare (U).

★ (1) (U) Little research can be related directly to the detection and identification of BW agents; however, it should be noted that methods used to detect and identify organisms causing diseases provide a basic knowledge applicable to the rapid detection of BW agents. Antiepidemic stations located in each ward could provide a unified disease reporting system in the event of hostilities.[296]

(2) (U) The Wuhan Army General Hospital obtained rapid results in identifying 55 different species of bacteria by their biochemical reactions in 20 to 24 hours, as opposed to 4 to 5 days by conventional means.[146] Various authors have summarized methods for the rapid identification of B. anthracis.[148] Other studies suggestive of rapid identification methods have described experiments with incomplete antibodies for the diagnosis of brucellosis and compared various methods for identifying brucella.[149]

(b)(1)

26. Prophylaxis and Therapy (U)

a. Chemical Warfare (U).

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The structural formula of toxogonin is:

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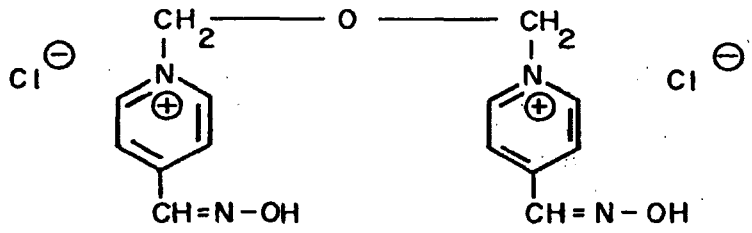

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(7) (U) Drug regimens being tested for the treatment of cyanide poisoning include intramuscular injection of 100 mg of hydrocobalamine or chlorocobalamine per kilograms of body weight, and slow intranevous injection of an EDTA-glucose solution.

b. (~~S~~) Biological Warfare (U). (b)(1)

(b)(1)

27. Chemical and Biological Test Sites (U)

(~~S~~)

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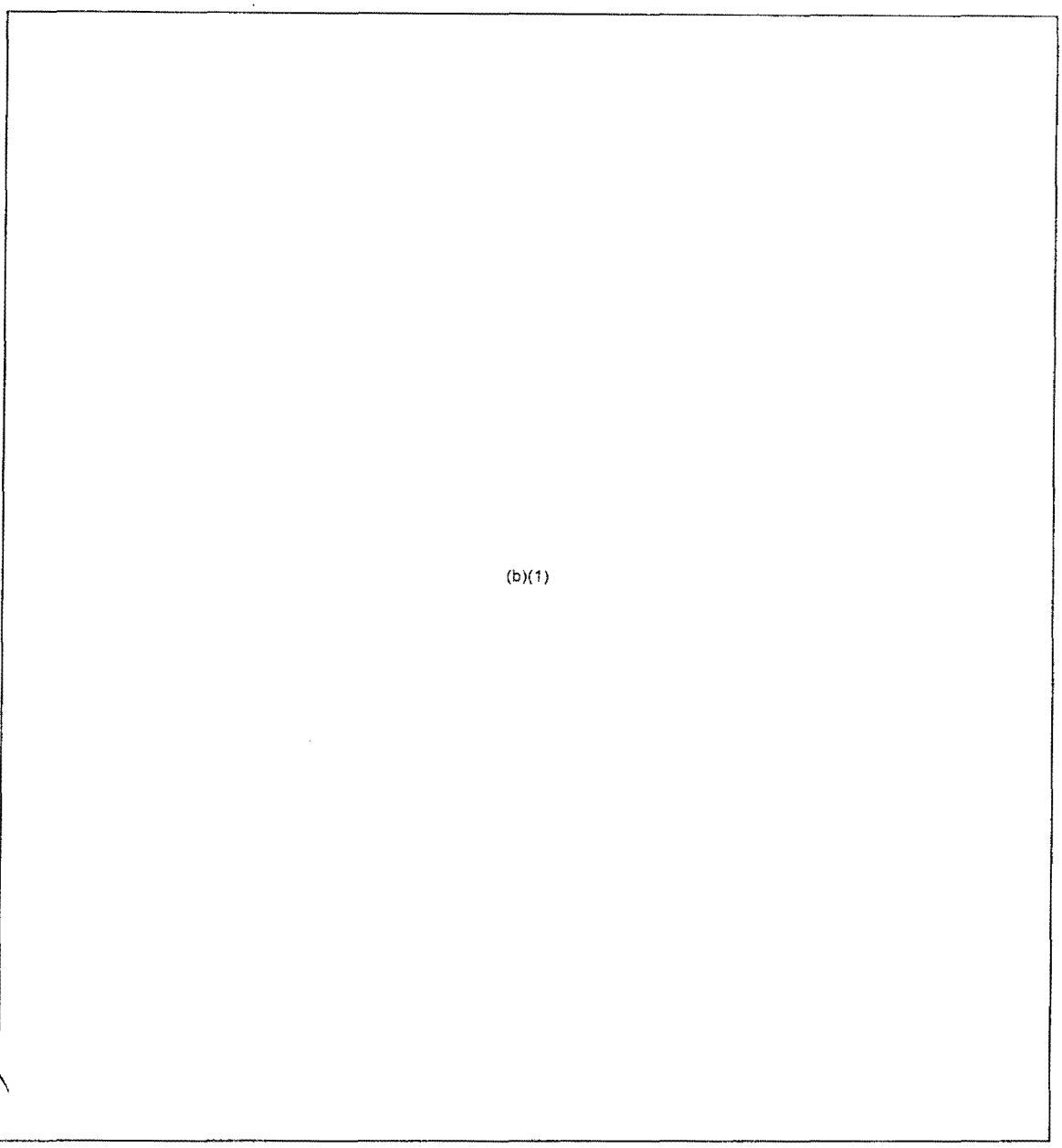

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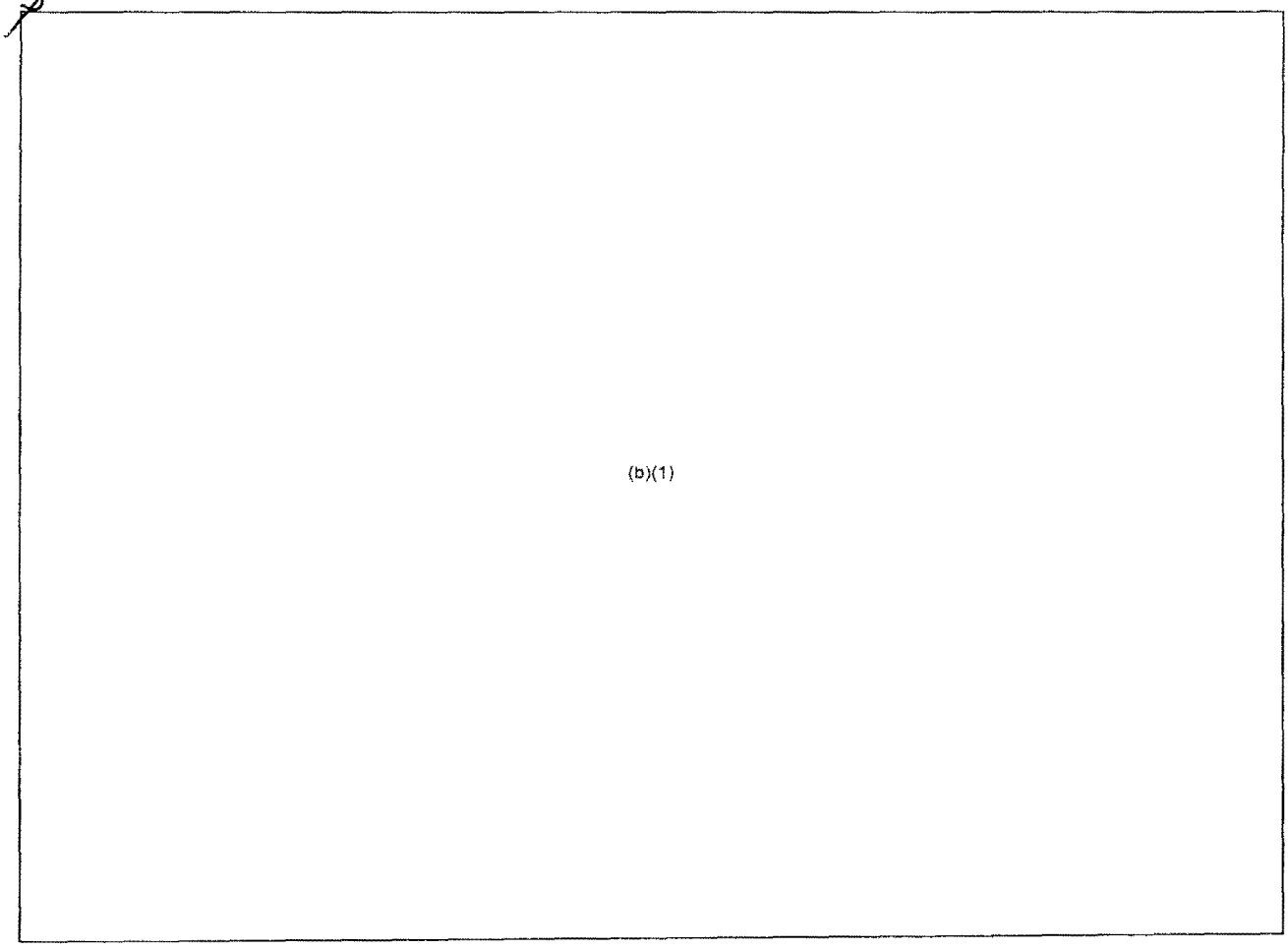

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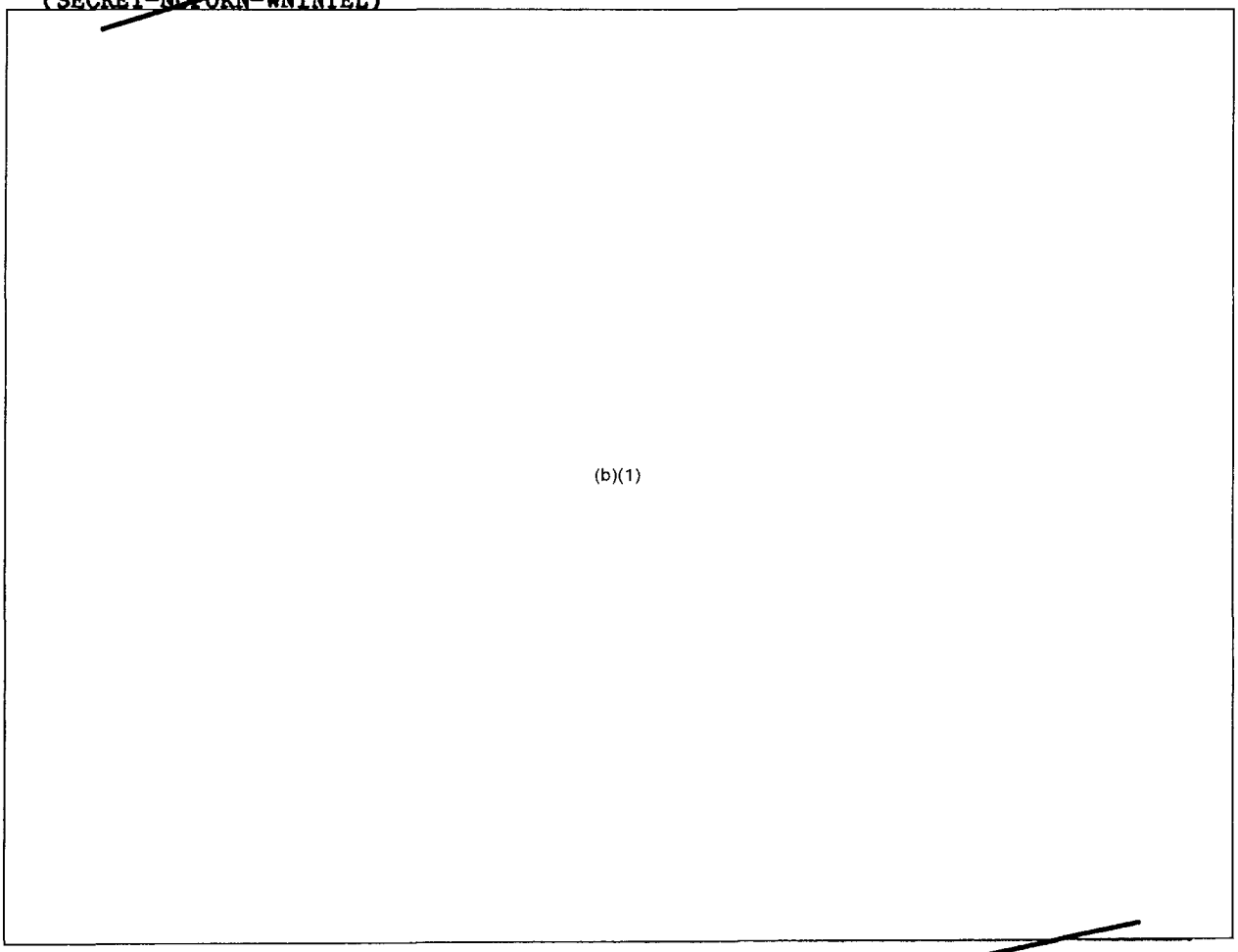

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Figure 15.2. (U) Tower at Center of Grid Pattern

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H. AEROSPACE CHEMICAL AND BIOLOGICAL WARFARE CAPABILITY (U)

28. Policy, Doctrine, Organization, and Training (U)

a. ~~(C)~~ Policy and Doctrine (U). (b)(1)

(b)(1)

b. ~~(S)~~ Organization (U). (b)(1)

(b)(1)

c. (~~C~~ RELUKCAASNZ) Training (U). (b)(1)

(b)(1)

29. Agents and Munitions (U)

(b)(1)

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(b)(1)

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30. Defense or Protection (U)

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31. Research and Development (U)

(b)(1)

I. NAVAL CHEMICAL AND BIOLOGICAL WARFARE CAPABILITY (U)

32. Chemical and Biological Warfare Organization and Function (U)

★ a. (C-NOFORN) Navy Chemical and Biological Warfare Organization (U).

(b)(1)

b. (C-NOFORN) Policy and Doctrine (U).

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33. Weapon Systems Effective Against Naval and Marine Corps Targets (U)

★ a. (S-NOFORN-WNINTEL) Chemical Weapons (U). (b)(1)

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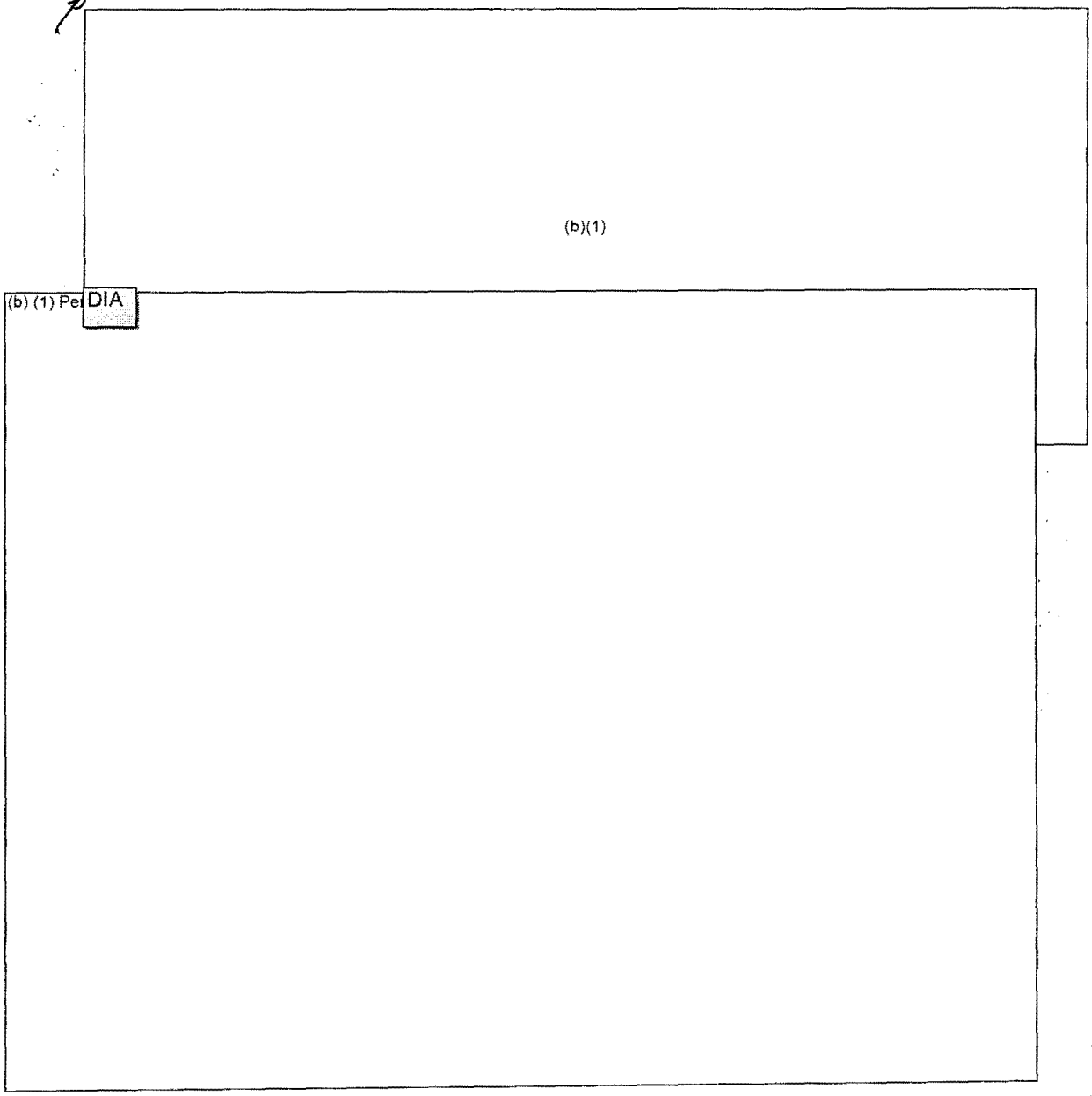

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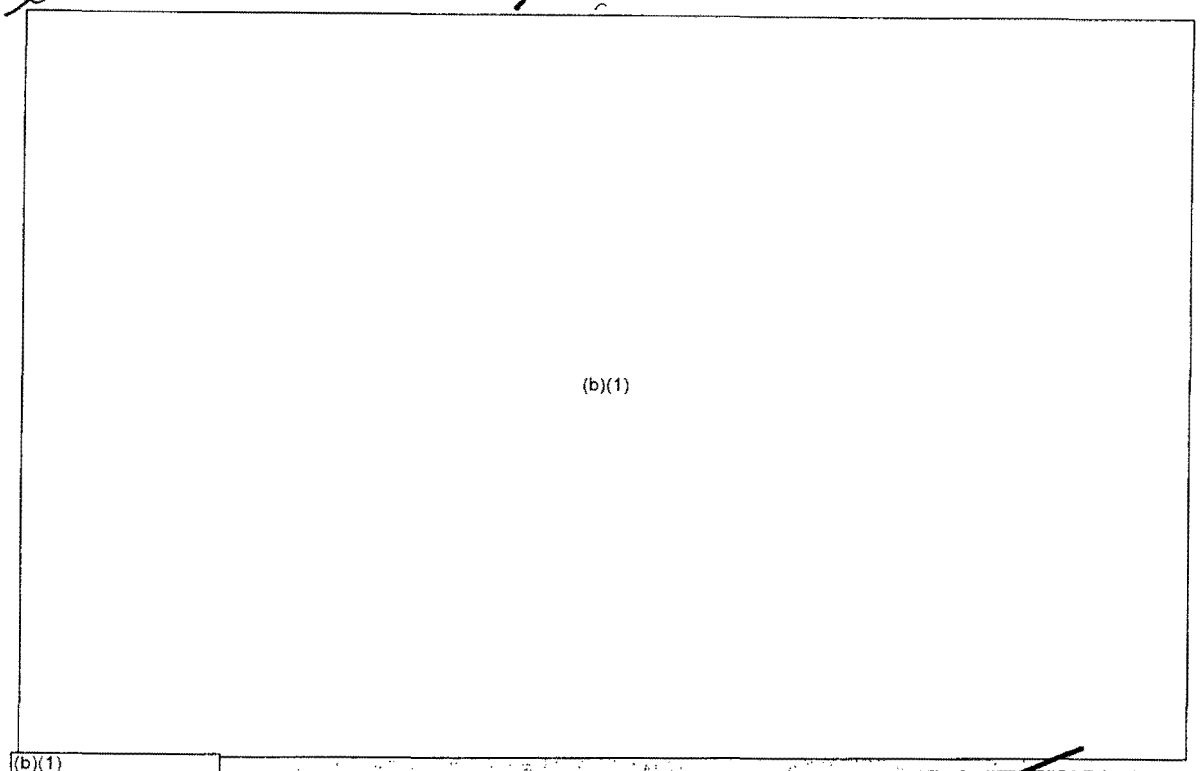

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Figure 17. CBW exercise aboard Chinese ship (U).

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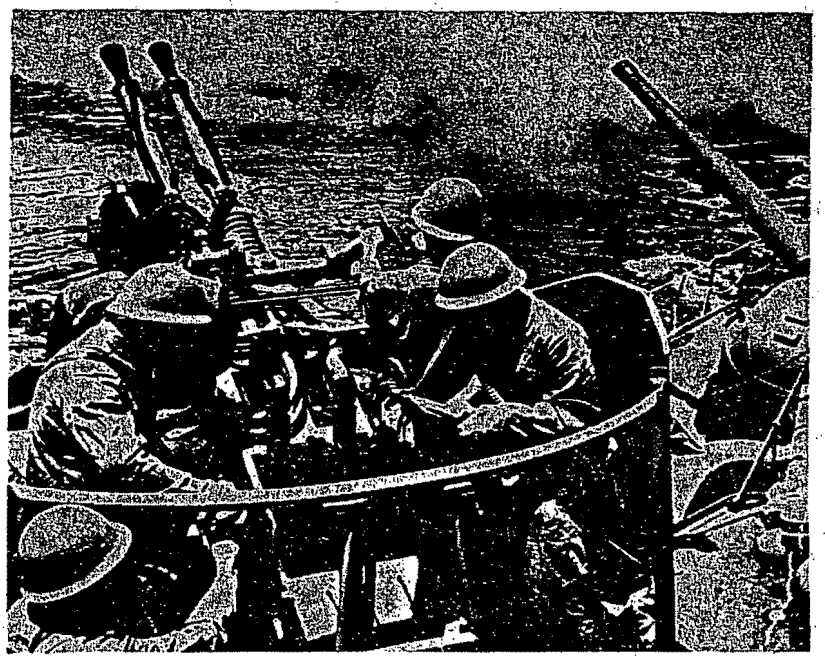

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Figure 18. (U) Drill Aboard a Destroyer Under CBW Conditions (From a Source Dated 1973)

34. Chemical and Biological Warfare Protective Systems and Equipment (U)

a. Shipboard Collective Protection Systems (U).

★ (1) (S-~~NOFORN~~) Citadels and filtered ventilation systems (U).

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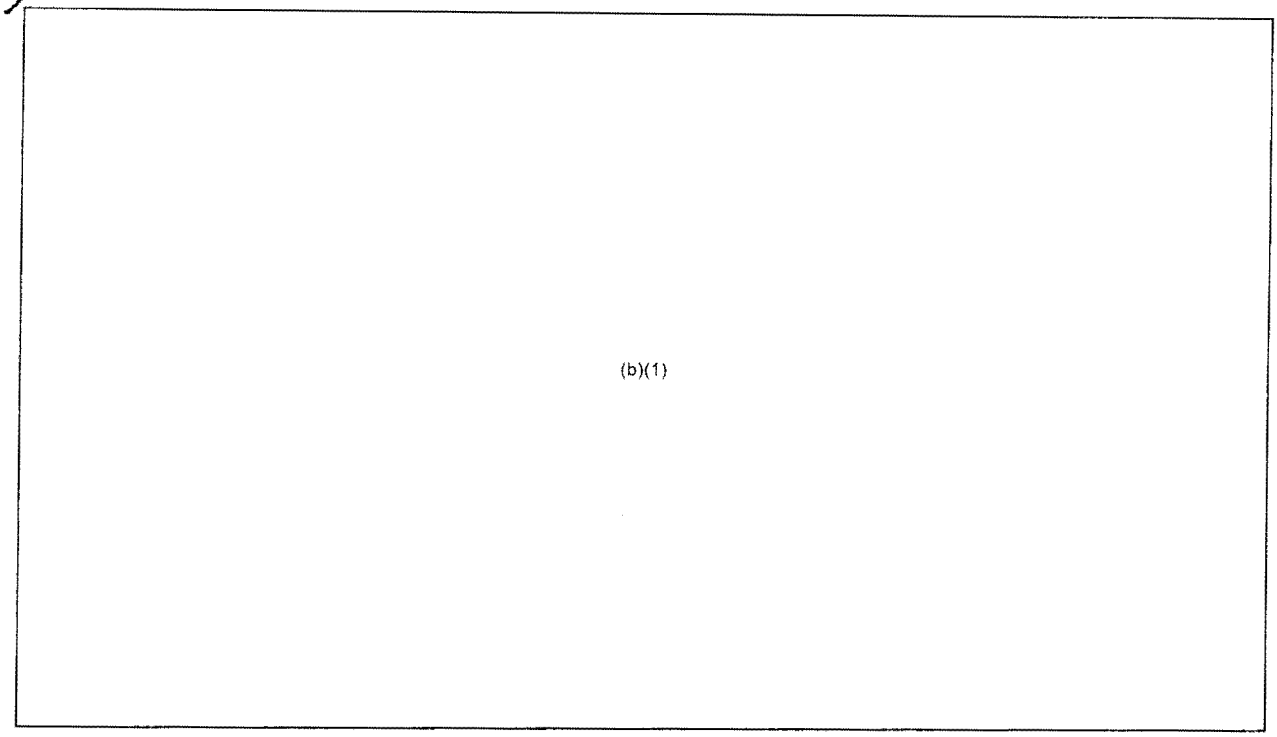

(3) (U) CBW detection and alarms (U). Available information does not indicate the presence of any installed shipboard CBW detection systems or automatic alarms in the Chinese Navy.

SECTION II

VIETNAM (U)

A. INTRODUCTION AND BACKGROUND (U)

1. Introduction (U)

(b)(1)

(b)(1)

2.1 General Health Conditions (U)

(U) Vietnam's major health problems include outbreaks of several infectious diseases, 250 000 war-wounded needing medical services, an exceedingly large number of prostitutes and drug addicts, and an acute shortage of medical personnel (medical manpower is concentrated in the large cities), materiel, and facilities. The incidence of malaria (including chloroquine-resistant falciparium malaria), plague, leprosy, tuberculosis, venereal disease, intestinal helminthiasis, dengue, and dysentery (all forms) is abnormally high; skin infections are prevalent. Living conditions are poor, and sanitation facilities and food supplies are inadequate. The life expectancy at birth in 1974 was 44 years; the death rate was 15 deaths per 1000 population.

B. POLICY AND DOCTRINE (U)

3. Policy (U)

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4. Doctrine (U).

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C. MILITARY AND CIVIL ORGANIZATION, TACTICS, AND TRAINING (U)

5. Military Organization (U)

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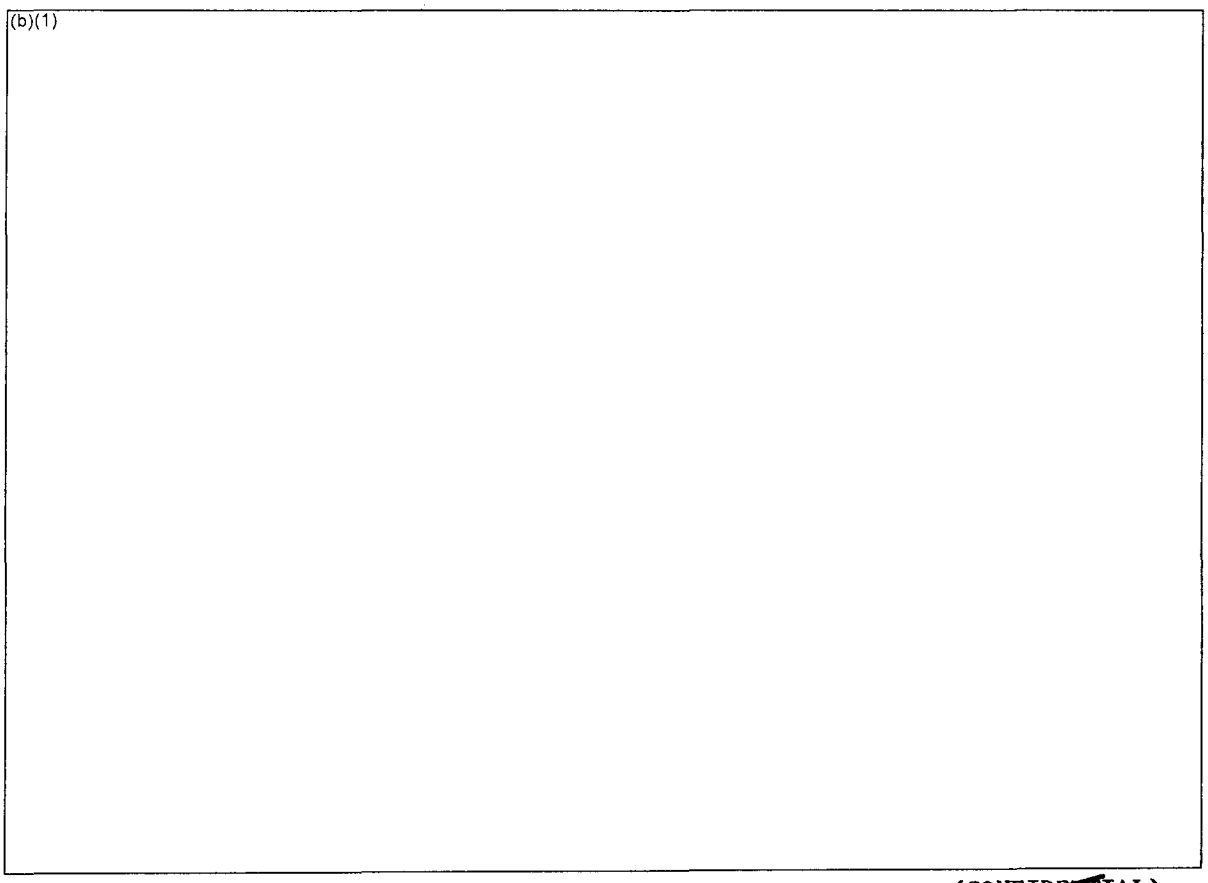

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★Figure 19. (U) CBW Organization, PAVN

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c/6. Assignments and/or Attachment of Army Units and Troops (U)

(b)(1)

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Table V. (U) NVA Chemical Units

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(b)(1)

Table V. (U) NVA Chemical Units (Continued)

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(b)(1)

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(b)(1)

7. Reserved for Future Use

Table VI. Use of Flamethrowers by NVA/VC (U)

(b)(1)

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(b)(1)

Table VII. Use of CS and CW Agents by NVA/VC (U)

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8. (C-NOFORN) **Training Programs within the Armed Forces**

a. (C) **Chemical Troops.**

(b)(1)

b. (C-NOFORN) **Other Troops.**

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★Table VIII. (U) Vietnamese Army CBW Training Activities

(CONFIDENTIAL-NOFORN)

(b)(1)

Table VIII. (U) Vietnamese Army CBW Training Activities (Continued)

(b)(1)

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(CONFIDENTIAL NOFORN)

★ (2) (U) During the 1981 training year, cadres of platoon and higher level chemical units received refresher training in chemical operations. The Chemical Bureau provided sufficient documents and training aids to all chemical units in the NVA to accomplish this training.[79]

9. Reserved for Future Use

D. AGENTS AND MUNITIONS (U)

c 10. General (U)

(b)(1)

c 11. Chemical and Biological Agents (U)

(b)(1)

(b)(1)

12. Chemical Delivery Systems (U)

★ a. ~~(C)~~ General Munitions (U). (b)(1)

(b)(1)

★ b. ~~(C)~~ Aerial Munitions (U). (b)(1)

(b)(1)

★ c. ~~(S-NOFORN)~~ Military Agreement (U). (b)(1)

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13. Biological Delivery Systems (U)

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24. (S-NOFORN-WNINTEL) Biological Warfare Agents

a. (S-NOFORN-WNINTEL) General.

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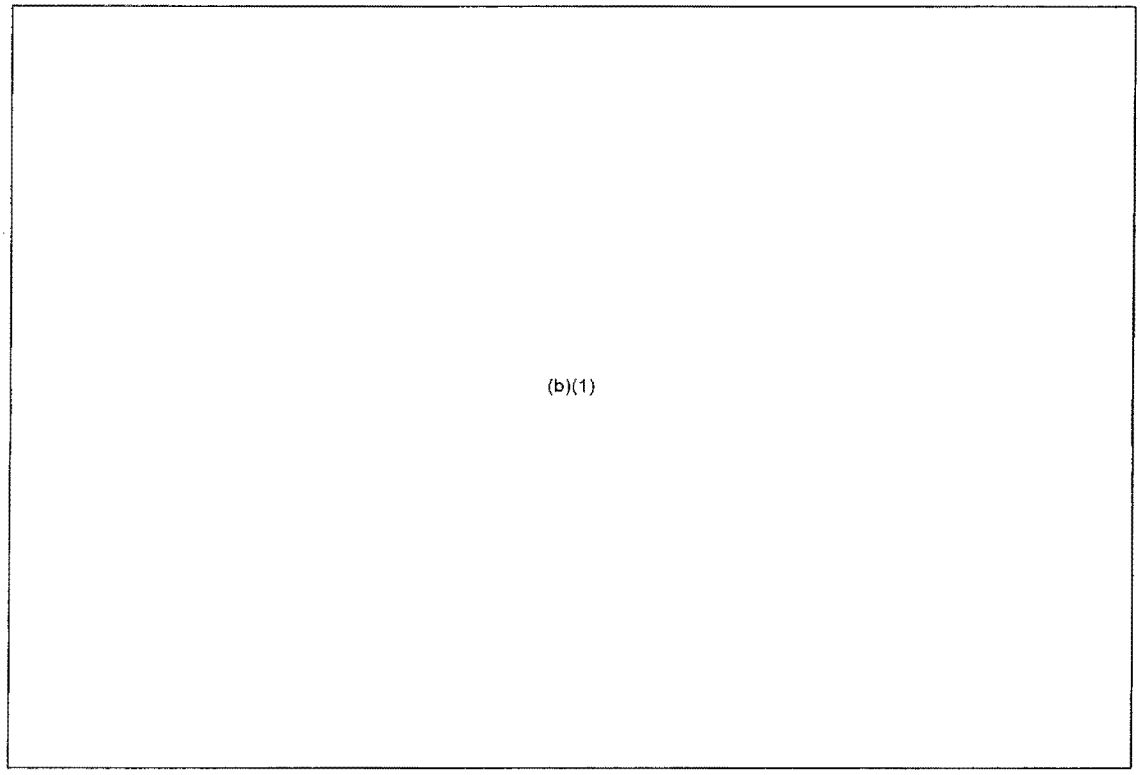
E. DEFENSE/PROTECTION

14. ~~(C)~~ General



15. (U) **Individual and Collective Protection**

a. **Protective Masks.** Protective masks, which are currently the most important category of defensive equipment, increased both in number and variety during the recent conflict; however, these masks were believed to be available for only a small portion of the NVA/VC.[6] Effective protective masks appeared to be in short supply. A captured ShM facepiece, which is of a strapless type that covers the head and face, imposes a heatload that cannot be tolerated for long periods in a hot climate. The facepiece is connected by a rubber hose to a Soviet Model MO-2 or MO-4U (the latest) canister; both models are excellent. Token quantities of the Soviet communication mask, which uses the same kind of hose and canister but which is equipped with headstraps and a speech diaphragm, were captured. These Soviet mask assemblies provide excellent protection

against all standard Western toxic CBW agents. A captured specimen of a mask not seen previously was tentatively identified as a Chinese product (see app II). The mask assembly consists of a molded rubber facepiece equipped with an elastic headharness, two lenses, and a filter element permanently installed in a pocket on the left cheek. The mask's effectiveness has not been determined; it may have been designed to protect against riot-control agents rather than lethal agents. The mask appeared to have been mass-produced. Protective masks made of nylon and filters consisting of sugar-cane charcoal mixed with soap and wrapped in silk, were locally produced; the filters were moistened before use. Improvised masks provided virtually no protection against CW agents.

b. **Protective Clothing.** The lightweight, two-piece protective suit, Model L-1, and one-piece suits that have a hood and boots molded on, would provide excellent overall body protection against percutaneously effective toxic agents.[6] Stocks of these suits were probably limited, however, even for distribution to chemical personnel. The suits, of rubberized material, cannot be worn for long periods in a hot climate because they quickly reduce the wearer's combat effectiveness. Soviet protective clothing supplied to the NVA include a chemically treated 92x140-cm sheet for covering the body and a bag for covering the head. These outfits are made of nylon and are used to protect the individual from poisonous CBW agents in the air or in contaminated areas. The outfit is always worn with a protective mask. Another Soviet-produced item was a three-piece rubber suit: hooded coat, combined pants and shoes, and gloves. It, too, is to be worn with the protective mask.

c. **Collective Protection.** Systems that provide protection for groups of people against CBW agents were not reported in Vietnam.[6] Captured tank crewmen stated that Soviet tanks, Models T-34 and PT-76, and the Chinese Model PT-63 did not have a CBW collective protection system, but that the crews were provided with CBW protective masks and protective clothing.

16. ~~(C)~~ **Chemical Warfare Detection Devices**

(b)(1)

(b)(1)

17. (C-NOFORN) Decontamination Equipment

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Table IX. CW Agent Detector Tubes Captured From NVA/VC Forces (U)

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18. (~~C~~) Prophylaxis and Therapy

a. (~~C~~) Chemical Warfare.

(b)(1)

(2) (U) Therapeutic procedures for victims of nerve gas poisoning included evacuation, decontamination of exposed areas by washing, and mouth-to-mouth resuscitation followed by injection with a cardiac or respiratory stimulant such as caffeine, lobeline, coramine, or atropine.[18] [33] Treatment described for victims of phosphorus burns included application of wet dressing over the burned area, covering with phenacetin-impregnated gauze, and injection of 1 000 000 units of penicillin.

(b)(1)

b. ~~(C)~~ **Biological Warfare.**

(b)(1)

19. (U) Other Defensive Materiel

a. The following Soviet items reported in NVN lack sufficient descriptions for identification by model numbers:[6]

- A "chemical laboratory truck" equipped for use in testing for chemical and biological contaminants.
- "Antiatomic radiation suit No. 1," described as a protective cape made of thick cellophane. It may be comparable to commonly used, disposable capes carried in protective mask carriers.
- A "laundry truck," described as a 10-wheeled truck equipped with a crane hoist and a steel tank 1 meter in diameter and 1.3 meters high (possibly the Soviet decontamination boiling installation BU-2). In use, the tank is lowered to the ground, filled with water and heated; the contaminated clothing is washed in it.
- "Anemometers" equipped with air-speed and air-direction indicators, a compass, and a thermometer are provided among CBR reconnaissance equipment.

b. American pilots flying combat missions over NVN encountered dense white smoke that was intended to defeat the accuracy of bombing attacks.[14] The pilots described the smoke as ineffective; its chemical composition is unknown.

c. Considerable emphasis is placed on locally produced, improvised self-treatment kits, as well as on training and literature that provide fundamental instruction in the use of this equipment.[6] Certain components of the self-treatment kits (such as soap solutions, soap powder, ether, potassium permanganate, chlorinated lime, sodium bicarbonate, and copper sulfate) are known to be useful against chemical and biological contaminants; other components are too primitive to be evaluated. Readily available substances, such as lime and urine, are among those recommended by the NVA/VC for decontamination. Cloth and plastic sheeting are used in several types of improvised protective masks. A version of a mask captured in 1971, Model KT-69, is the first improvised mask identified by a model designation. In field tests the KT-69 gave adequate protection for 5 minutes in heavy concentrations of CS. In troop training, the improvised masks were advocated for use against herbicides, defoliants, and riot-control agents (all considered lethal according to some NVA/VC training literature). The majority of the improvised masks provide virtually no protection against CW agents, are difficult to breathe through, and seriously restrict vision; however, they tend to enhance the soldier's sense of security.

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CHEMICAL AND BIOLOGICAL WARFARE CAPABILITIES— ASIAN COMMUNIST COUNTRIES (U)

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Title page	Title page
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ix thru xx	ix thru xx
1 thru 22	1 thru 22.2
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41 thru 46	41 thru 46
49 and 50	49 and 50
51 thru 64	51 thru 64.4
67 thru 70.2	67 thru 70
83 thru 86	83 thru 86.4
101 thru 108	101 thru 108.2
111 and 112	111 and 112
113 and 114	113 and 114
117 thru 124	117 thru 124
129 and 130	129 thru 130.1
135 thru 142.2	135 thru 142.2
142.5 thru 142.8	142.5 thru 142.8
243 thru 245 (Reverse Blank)	243 thru 246

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F. PRODUCTION AND STOCKPILES (U)

20. Production (U)

a. (C) General (U). (b)(1)

(b)(1)

★ b. (C) Offensive (U). (b)(1)

(b)(1)

★ c. (C) Defensive (U). (b)(1)

(b)(1)

21. Stockpile/Storage Facilities (U)

(b)(1)

G. RESEARCH AND DEVELOPMENT (U)

22. Offensive Research and Development (U)

(b)(1)

23. Defensive Research and Development (U)

a. ~~(C)~~ Chemical Warfare (U). (b)(1)

(b)(1)

b. Biological Warfare (U).

(b)(1)

(b)(1)

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H. AEROSPACE AND NAVAL CHEMICAL AND BIOLOGICAL WARFARE CAPABILITIES (U)

24. Aerospace Chemical and Biological Warfare Capability (U)

(b)(1)

25. Naval Chemical and Biological Warfare Operational Capability (U)

a. (U) CBW Organization and Function (U). No information is available on the CBR organization of the Vietnamese Navy. Because of the heavy Soviet influence in what was formerly North Vietnam, however, any CBW organization aboard naval units from that section of the country is probably similar to the Soviet model.

b. (S) Weapon Systems Effective Against Naval and Marine Corps Targets (U). (b)(1)

(b)(1)

c. (C-NOFORN) CBR Protective Systems and Equipment (U). (b)(1)

(b)(1)

d. (U) Naval CBW Training (U). No information on CBW training in the Vietnamese Navy is available.

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Section III.

NORTH KOREA

A. INTRODUCTION AND BACKGROUND

1. (C) Introduction

(b)(1)

2. (C) Background

(b)(1)

2.1. (C) General Health Conditions

(U)

a. (U) The standard of living in North Korea is low, but compares favorably with that in other Far Eastern countries, except Japan. Conditions are better for the urban dweller than for the rural inhabitant. In the better sections of the urban areas housing is of stucco and tile construction, while in the poorer sections of the cities housing is of cardboard and straw matting construction. In the rural areas, houses are generally of mud wall and thatched roof construction; they provide minimum shelter, are poorly ventilated, and provide access to insect and rodent carriers of disease, thus facilitating the spread of communicable diseases. Dietary deficiencies, problems of disease control, and poor personal hygiene are other major factors in the spread of infectious diseases. Despite vector control programs fleas, flies, lice, and mosquitoes breed in drainage ditches and canals, garbage ditches, night soil deposits, and rice paddies.

b. (U) The most prevalent diseases include pulmonary tuberculosis and other respiratory diseases, the dysenteries (all forms) and other enteric infections, Japanese-B encephalitis, malaria, various helminthiases, cholera, childhood diseases, and nutritional disorders. Principal environmental health problems include polluted water sources, improper disposal of human waste and garbage, and overcrowded living conditions. These problems contribute to the spread of infectious diseases and make their control difficult.

c. (U) For the past 6 years the birth rate has increased slightly and the overall death rate has decreased slightly; average life expectancy for males is 52 and for females 55.

(b)(1)

(b)(1)

B. POLICY AND DOCTRINE

3. (~~C~~) Policy

(b)(1)

4. (~~S~~) Doctrine

(b)(1)

C. MILITARY/CIVIL ORGANIZATION, TACTICS, AND TRAINING

5. (S-NOFORN) Military Organization

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B. POLICY AND DOCTRINE (U)

3. Policy (U)

(b)(1)

4. Doctrine (U)

(b)(1)

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C. MILITARY AND CIVIL ORGANIZATION, TACTICS, AND TRAINING (U)

5. Military Organization (U)

(b)(1)

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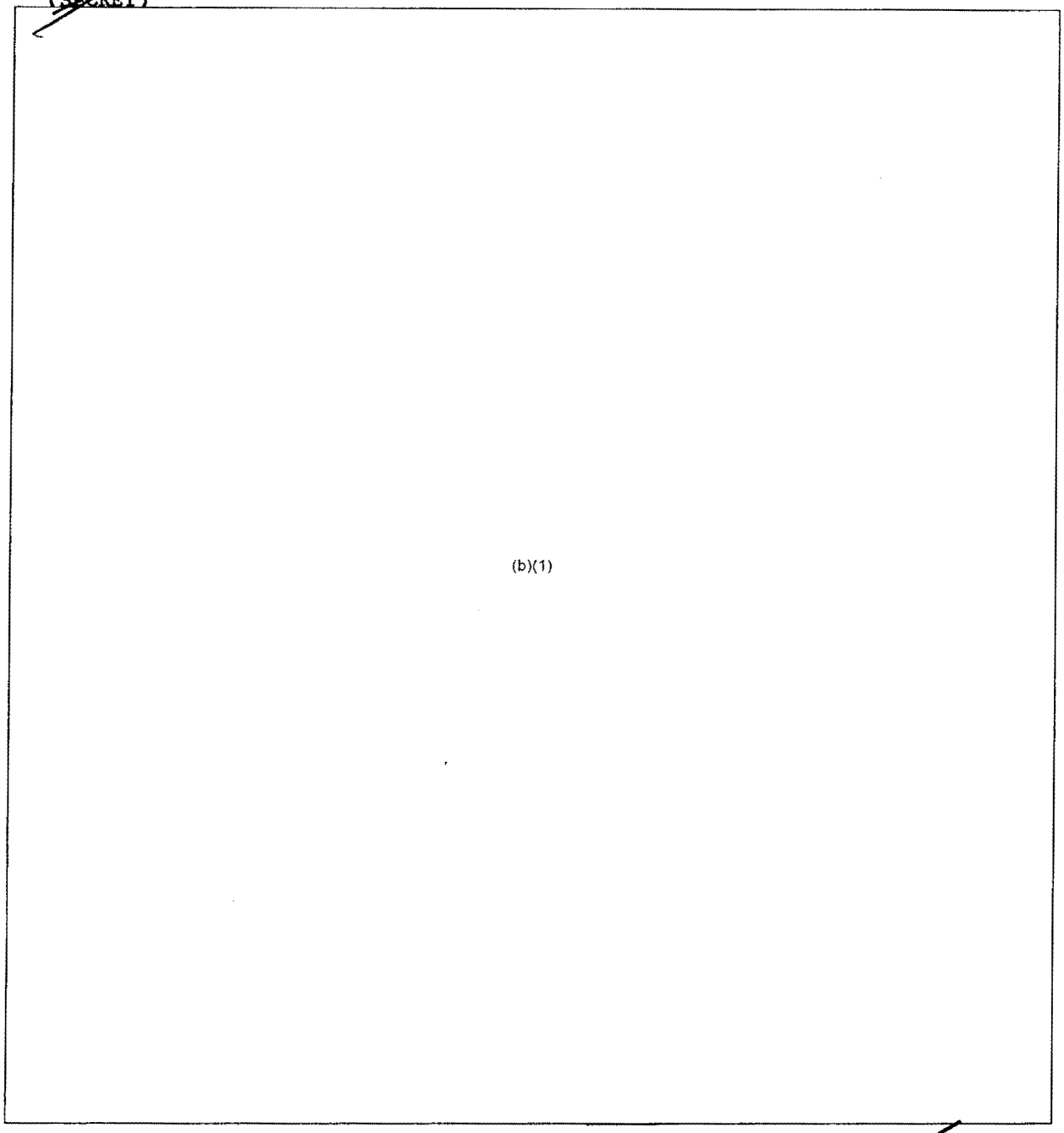

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Figure 22. (U) CBR Organization of NKA Chemical Battalion

★ Table XII. (S) (b)(1)

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★ b. (S-NOFORN) (b)(1)

(b)(1)

6. Assignment and/or Attachment of Chemical Units and Troops (U)

a. (S-NOFORN) Corps (U). (b)(1)

(b)(1)

★ b. (S) Division (U). Each division has an organic chemical company

(b)(1)

★ c. (S) Regiment (U). (b)(1)

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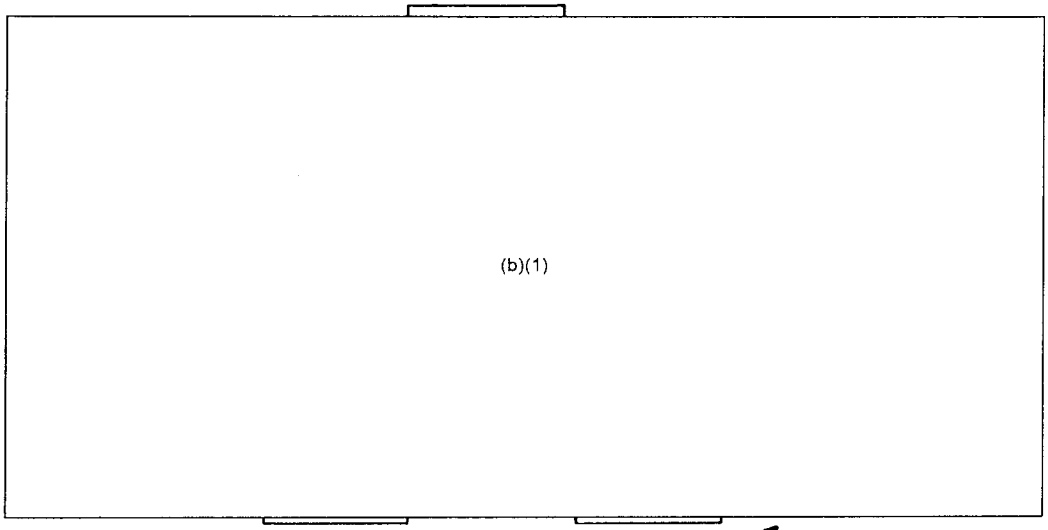

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Figure 23. (U) Organization of NKA Chemical Battalion

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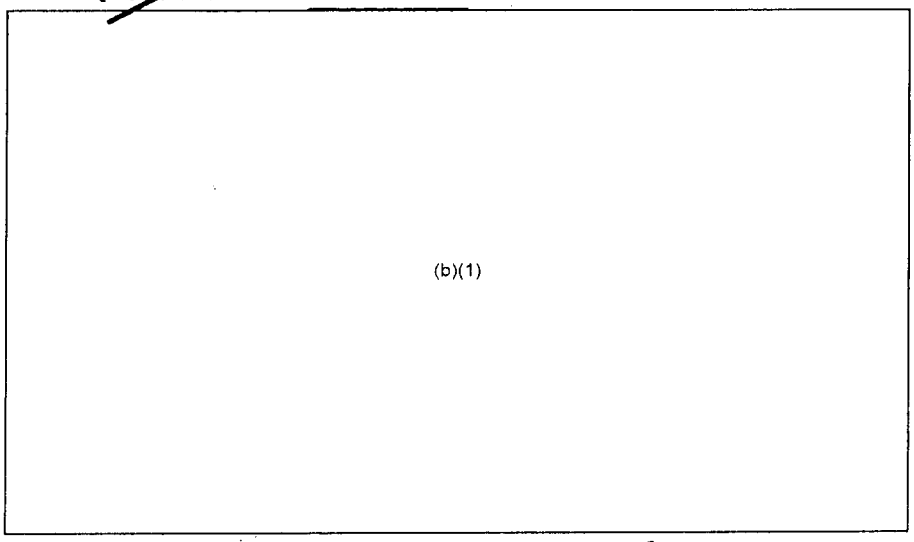

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Figure 24. (U) Organization of NKA Chemical Company

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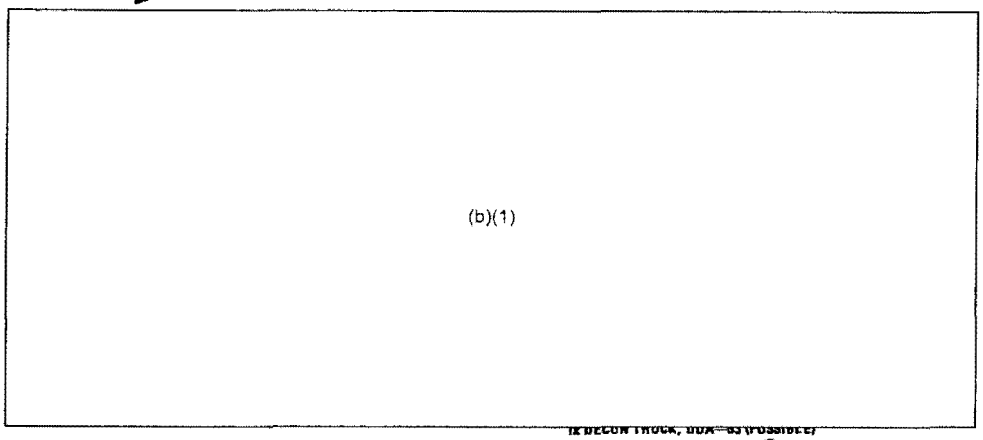

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Figure 25. (U) Organization of NKA Chemical Platoon

7. Strategy and Tactics (U)

a. (S) Offensive (U).

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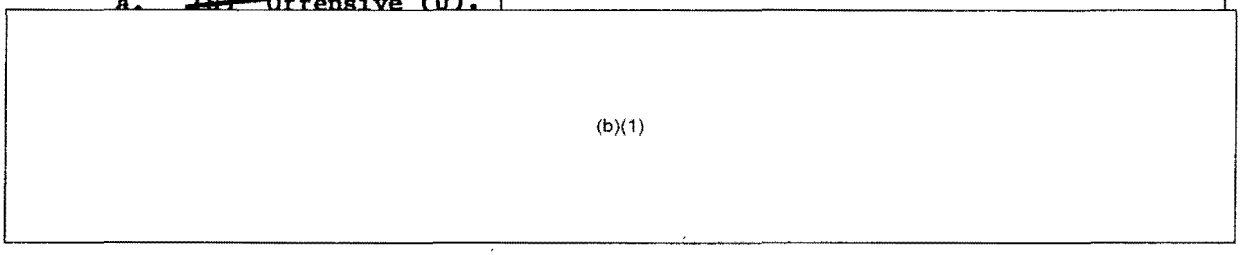

b. (S) Defensive (U).

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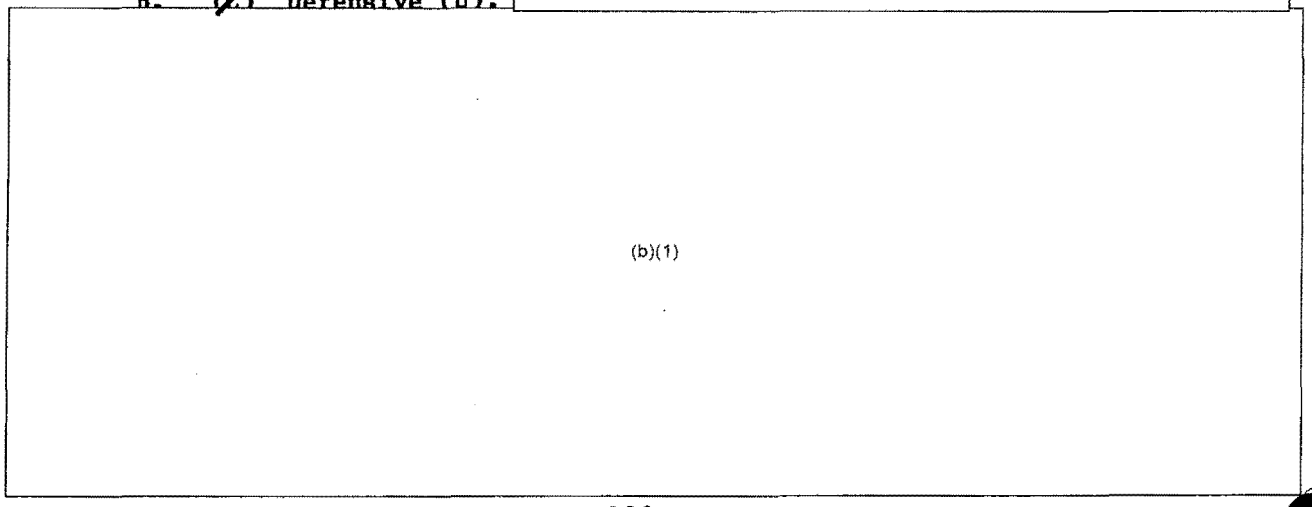

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8. Training Programs Within the Armed Forces (U)

a. (C) Chemical Troops (U).

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Table XIII. (U) CBW-Related Training in the NKA

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b. Other Troops (U).

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Table XIV. CBW Standards of Proficiency for the NKA (U)[13]

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Table XIV. CBW Standards of Proficiency for the NKA (U)[13] (Continued)

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c. (C) Exercises (U). (b)(1)

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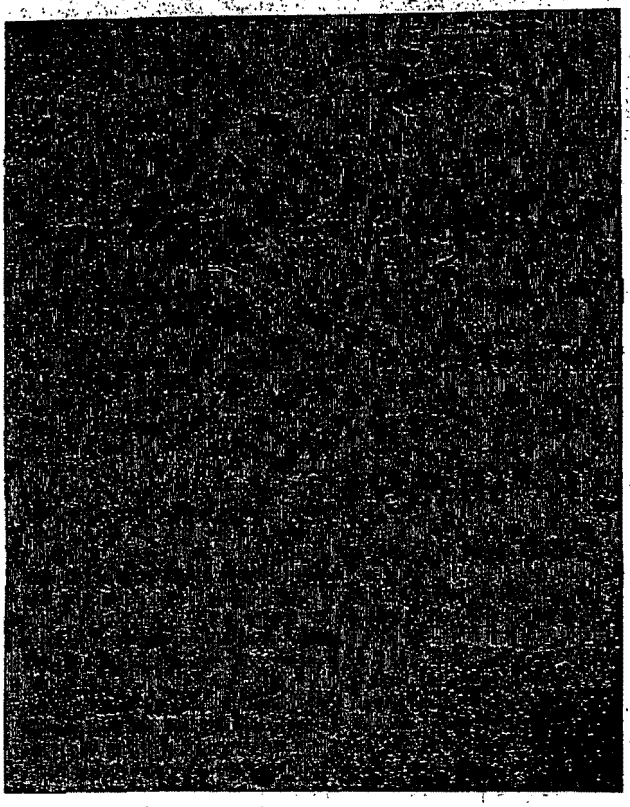

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Figure 26. (U) NKA Protective Mask Training

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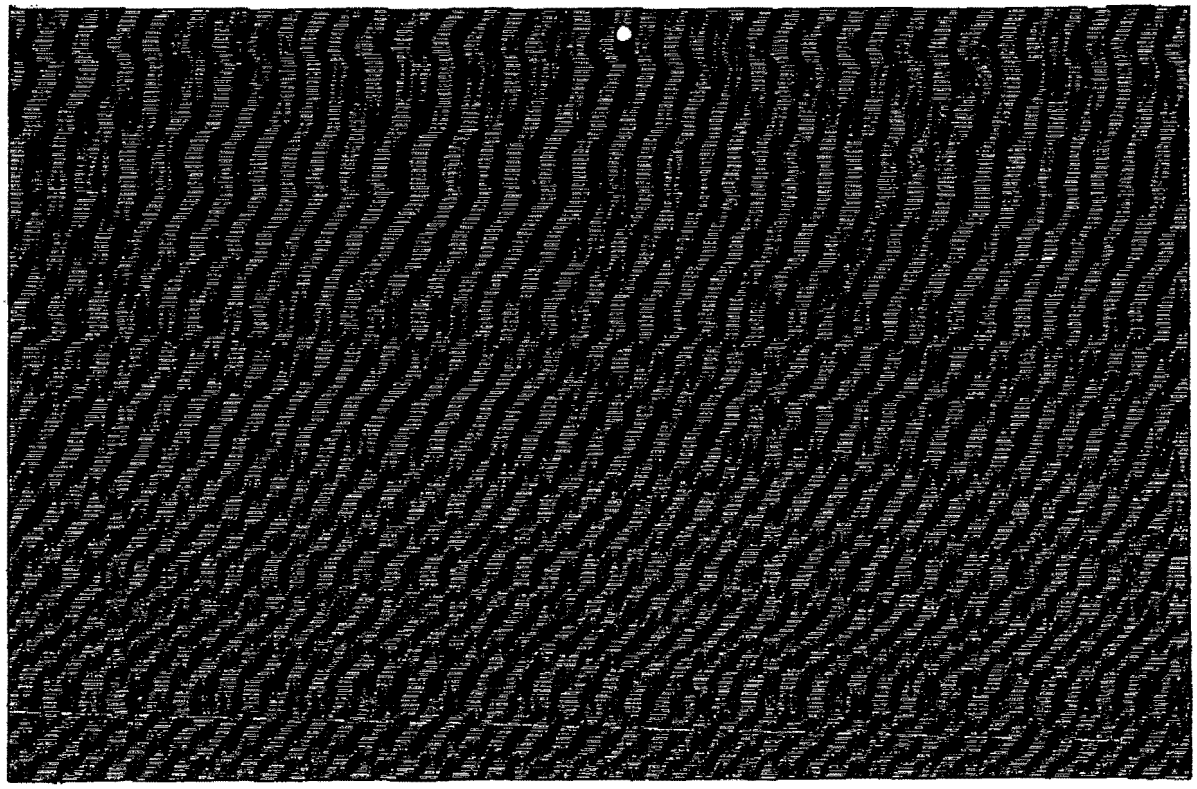

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Figure 27. (U) NKA Antiaircraft Training Under Simulated CBR Conditions

★ d. (C-NOFORN) Training Areas (U). (b)(1)

(b)(1)

9. Civil Defense (U)

a. (C) Organization (U). (b)(1)

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b. ~~(C)~~ Mission. (b)(1)

(b)(1)

c. ~~(S/NOFORN)~~ (b)(1)

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d. (C) Shelters (U). (b)(1)

(b)(1)

D. AGENTS AND MUNITIONS (U)

10. Chemical and Biological Agents (U)

(b)(1)

11. Chemical and Biological Delivery Systems (U)

★ a. (C) Possible Ground Weapons (U). (b)(1)

(b)(1)

★ b. (S) Possible Tactical Rocket Systems (U). (b)(1)

(b)(1)

c. (C) Flamethrowers and Flamethrower Fuel (U). (b)(1)

(b)(1)

(b)(1)

d. (C) Smoke Munitions (U). (b)(1)

(b)(1)

e. (C) Incendiaries (U). (b)(1)

(b)(1)

f. (C) Other Agent Munitions (U). (b)(1)

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E. DEFENSE OR PROTECTION (U)

12. General (U)

(b)(1)

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13. (C) Individual and Collective Protection

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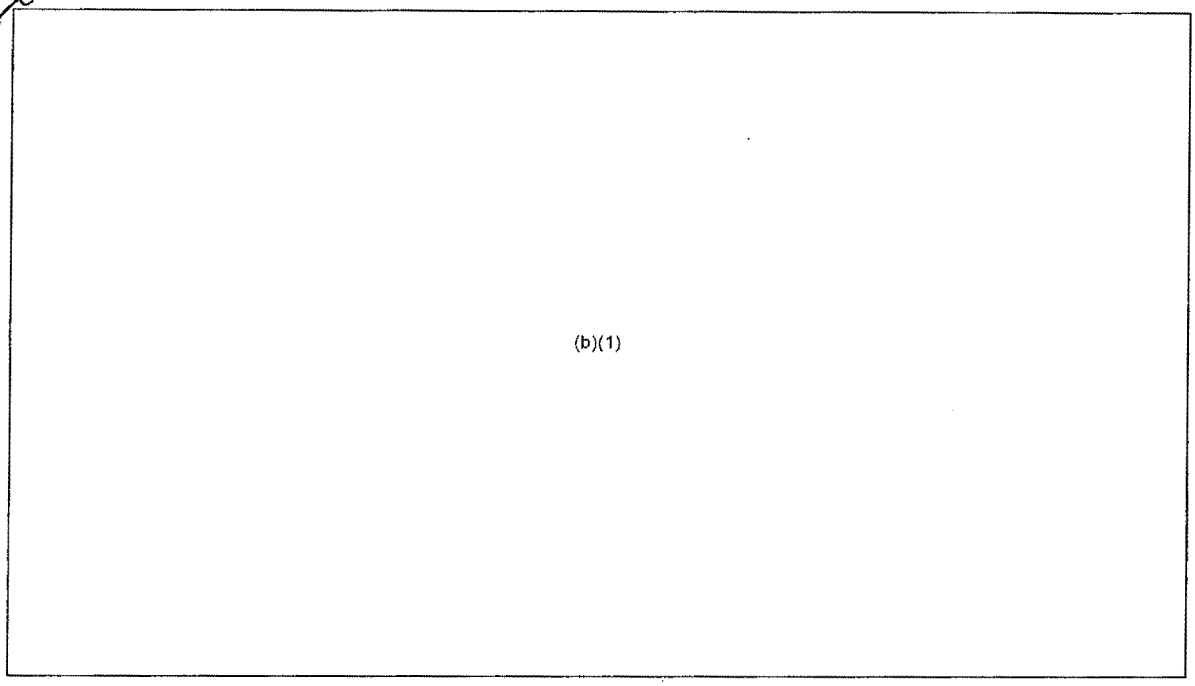
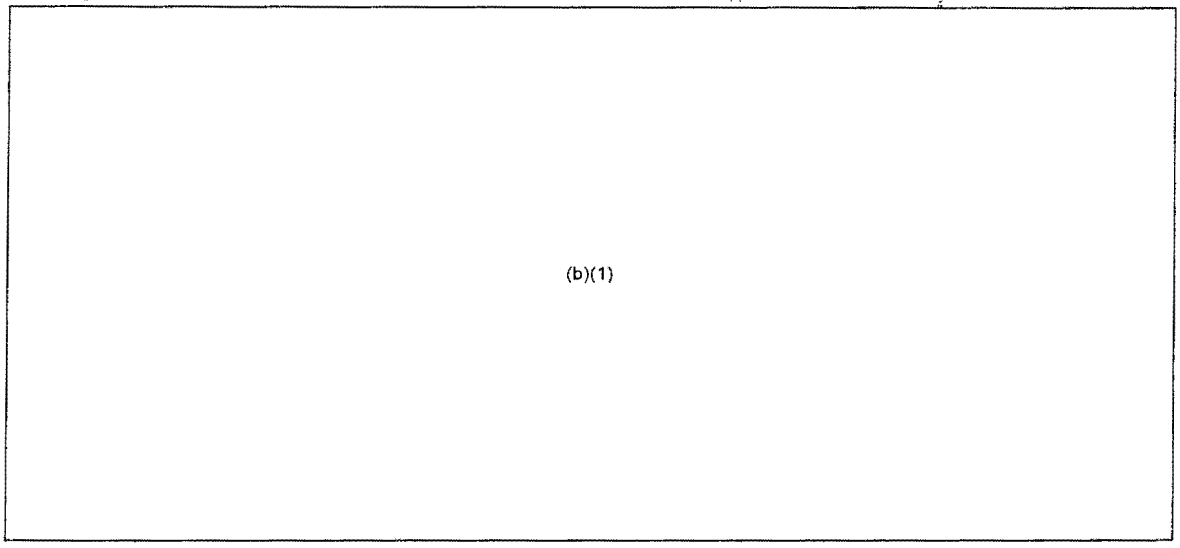


14. (C) **Detection and Reconnaissance**



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15. Decontamination (U)

a. (U) Chemical Decontaminants (U). The chemical decontaminants used in North Korea against CBW agents are probably identical with those commonly used in Soviet decontamination devices.[3] [20] These decontaminants are identified in appendix II, along with the equipment in which they are used.

b. Decontamination Kits (U).

(b)(1)

c. (U) Manpack Decontamination Apparatus (U). The Soviet Model RDP-4V, a hand-operated backpack spraying apparatus, has a working capacity of 8.5 L and weighs 20 kg when full.[21] [22] This device is used to apply liquid decontaminants against vesicants and nerve agents. The North Koreans are manufacturing an apparatus to replace the Soviet model. Models RDP-3 and RDP-4 manpack spray devices are also available.

★ d. (C-NOFORN) Vehicle-Mounted Decontamination Equipment (U). (b)(1)

(b)(1)

(b)(1)

16. Prophylaxis and Therapy (U)

(b)(1)

F. PRODUCTION AND STOCKPILES (U)

17. Production (U)

a. (U) Offensive (U). (b)(1)

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Figure 27.1. (S) (b)(1) (SECRET)
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b. Defensive (U)

(1) (C-NOFORN) General (U). (b)(1)

(b)(1)

(2) (C) Items and equipment (U). (b)(1)

(b)(1)

18. Stockpile and Storage Facilities (U)

a. (S-NOFORN) Stockpiles (U). (b)(1)

(b)(1)

(b)(1)

★ b. (S-NOFORN-WNINTEL) (b)(1)

(b)(1)

G. RESEARCH AND DEVELOPMENT (U)

19. General (U)

a. (C) (b)(1)

(b)(1)

b. (C-NOFORN) (b)(1)

(b)(1)

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20. Chemical Warfare Research and Development (U)

(b)(1)

b. (U) North Korean scientists are conducting research on OP insecticides.[38] Sin and Ryom were able to synthesize the precursor, $(MeO)_2P(S)SH$, in 75% to 80% yields for the preparation of the dithio insecticide Rogor. This research demonstrates a potential capability to synthesize CW nerve agents.

21. Biological Warfare Research and Development (U)

a. (C) (b)(1)

(b)(1)

b. (S-NOFORN) (b)(1)

(b)(1)

(b)(1)

c. ~~(C)~~ (b)(1)

(b)(1)

d. ~~(C)~~ (b)(1)

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H. AEROSPACE CHEMICAL AND BIOLOGICAL WARFARE CAPABILITY

22. (C) Policy, Doctrine, Organization, and Training

(b)(1)

23. (C) Agents and Munitions

(b)(1)

24. (C-NOFORN) Defense/Protection

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Sensitive Intelligence Sources
and Methods Involved

I. NAVAL CHEMICAL AND BIOLOGICAL WARFARE CAPABILITY

25. (C) Policy, Doctrine, Organization, and Training

(b)(1)

26. (C-WNINTEL) Agents and Munitions

(b)(1)

27. (S) Defense/Protection

a. (S) (b)(1)

(b)(1)

b. (C) (b)(1)

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SECTION IV

THE MONGOLIAN PEOPLES REPUBLIC (U)

1. Introduction and Background (U)

(U) The Soviet Union has provided technical assistance to the Mongolian Peoples Republic (MPR) in the development of health and sanitation programs and has helped to train medical personnel. Assistance has also been provided by the United Nations and the East European Communist Countries. The Ministry of Public Health (MPH), Ulan Bator, is modeled on that of the USSR. Although capable of planning and organizing effective health programs, the MPH has a number of deficiencies, including the lack of trained personnel, a shortage of funds, and considerable political intervention.[1] The Ministry of People's Affairs (Defense) has a medical department, but the armed forces appear to be heavily dependent upon the institutions and personnel of the MPH.[2] Mongolia lacks the technology as well as the R&D facilities to support an offensive CW program or to produce significant quantities of defense-related material.

1.1. General Health Conditions (U)

(U) Mongolia has several public health problems: there is a great need for trained paramedical personnel; the domestic capability to produce high-quality drugs and medical equipment is extremely limited; acute respiratory infections are reportedly high; control of animal diseases is a problem; sanitary engineering is poor; and sewerage systems are almost nonexistent. In addition, Mongolia has an inadequate food distribution system. Technical and financial assistance is provided by the USSR. The life expectancy at birth in 1974 was 61 years. The death rate in 1974 was 10 deaths per 1000 population.

2. Policy and Doctrine (U)

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★3. (b)(1) (C)

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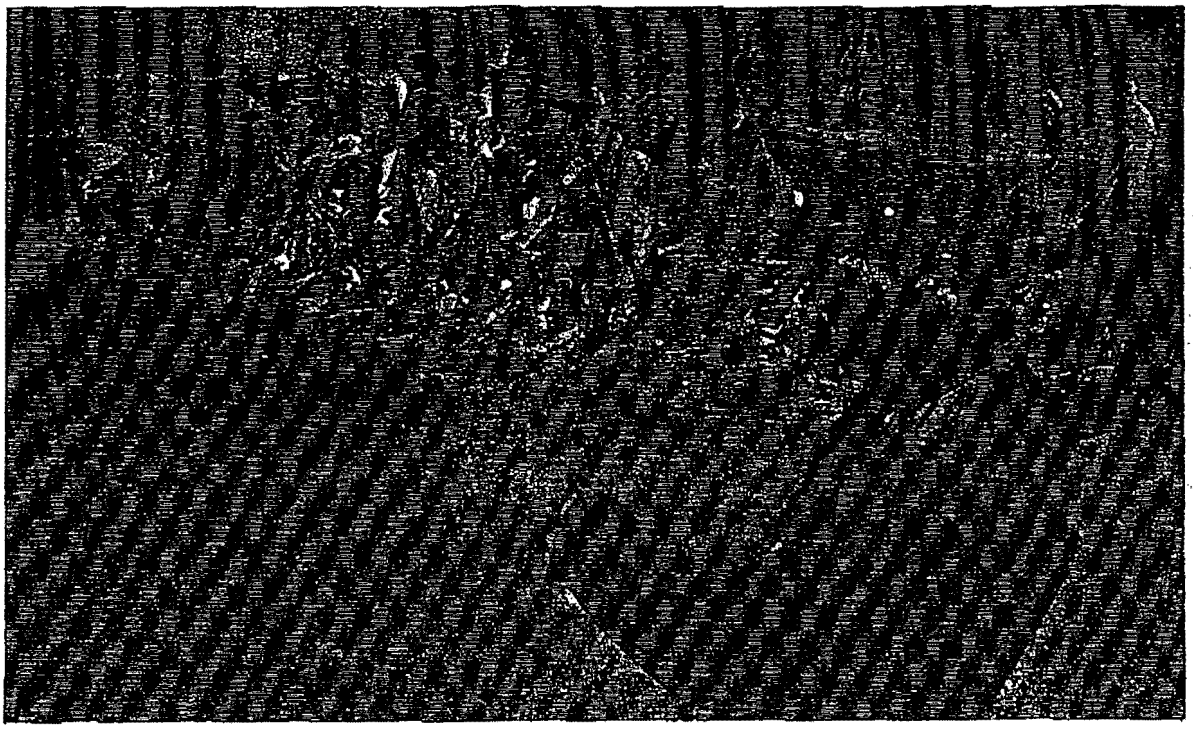

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Figure 28. (U) CBR Training in the Chemical Service, MPR

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Figure 29. Army training in CBR (U).

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Figure 30. CBR equipment instructions (U).

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4. (U) **Chemical and Biological Warfare Materiel**

The MPR lacks the scientific and technical capabilities to produce and stockpile CBW offensive and defensive materiel;[3] it relies on the Soviet Union to provide the necessary materials and equipment.

5. ~~(C)~~ U **Research and Development**

a. (U) No CW R&D capability has been identified. The MPRs very limited efforts in R&D have been directed toward an improvement of public health practices and have made possible the production of some vaccines and therapeutic compounds.[5] There is no apparent interest in the development of BW agents, and R&D devoted to defense-related studies are not apparent.

b. (U) A Bacteriological Research Office was formed in 1932 by combining several small laboratories in Ulan Bator.[5] This was the first facility under the MPH to conduct microbiological research. Diseases for which vaccines have been prepared at this facility include typhus, rabies, smallpox, dysentery, typhoid fever, and brucellosis. A Soviet specialist, L. S. Rezininkova, assisted in directing research programs for the development of vaccines and medicines during the late 1950s.

c. (U) The Office for Studying and Combating Especially Dangerous Infectious Diseases, an outgrowth of the Antiepidemic Office, now has five substations under its jurisdiction.[5] It is probably the largest Mongolian organization that supports studies of measures for preventing diseases such as anthrax, glanders, plague, poliomyelitis, and tularemia. During 1966, the organization prepared and administered vaccines to an estimated 150 000 persons.

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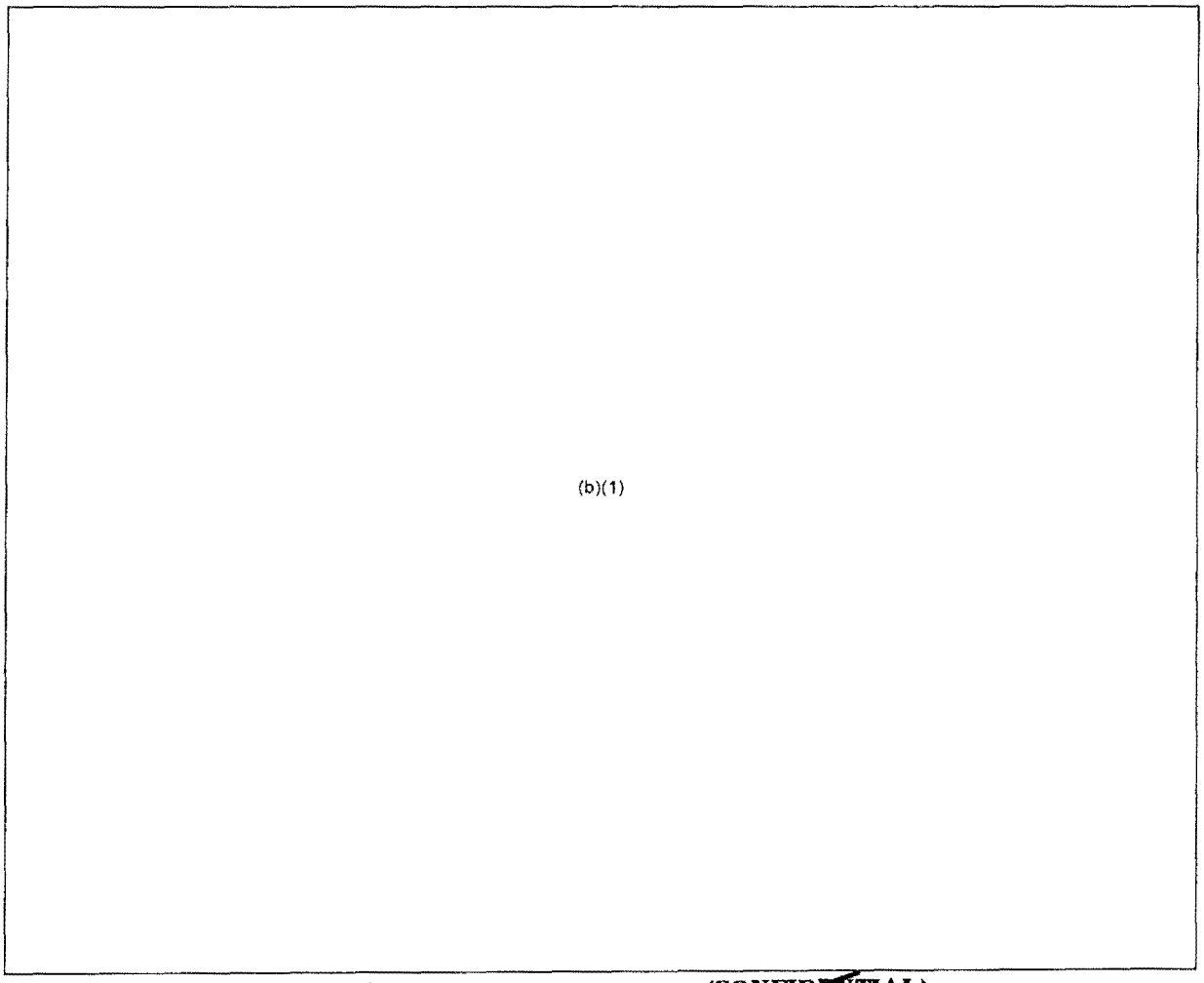

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Figure 31. Fermentor at the Songino Veterinary Plant, MPR (U).

6. ~~(C)~~ Trends and Forecast (10-year Projection)

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SECTION V

LAOS AND KAMPUCHEA (U)

1. Laos (U)

a. General Health Conditions (U).

(1) (U) All areas of Laos are medically understaffed and lacking in facilities. The shortage of adequately trained medical personnel seriously handicaps public health programs. Medical personnel are concentrated primarily in the principal towns and some of the more easily accessible villages. Most health services are performed by subprofessional medical personnel who are trained by the government with foreign economic and technical assistance. In the past, the Royal Lao Government depended heavily upon the Agency for International Development and other international organizations for assistance in providing medical care. The Hospital Division, Ministry of Public Health, controls government medical care facilities.

(2) (U) Laos has no capability to produce medical materiel and must depend on imports. Herbs and drugs used in traditional medicine are compounded locally.

★ b. ~~(S)~~ Policy, Doctrine, Organization, and Materiel (U). (b)(1)

(b)(1)

2. Kampuchea (U)

a. General Health Conditions (U).

(1) (U) Prior to the current regime there were not enough medical care facilities to serve the needs of the population. Most facilities were poorly equipped and understaffed, although the majority were government owned and operated. Conditions at present are unknown, since little or no information on health care facilities has been available since the fall of the Khmer Republic in 1975. There is no evidence that the shortage of medical personnel that existed prior to the current regime has been alleviated.

(2) (U) There were insufficient numbers of medical personnel and facilities prior to 1975. Facilities that were available were in poor condition. The public health services were able to provide only minimal medical care and preventive medical services to the urban population; they could not

(b)(1)

★ b. ~~(C)~~ Policy, Doctrine, Organization, and Materiel (U). (b)(1)

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SECTION VI

TECHNOLOGICAL THREAT (U)

A. SUMMARY OF CURRENT THREAT (U)

1. Overview (U)

(b)(1)

2. China (U)

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3. (C) North Korea (U)

(b)(1)

B. PROJECTED THREAT (U)

4. (C) China (U)

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b. (C) Chemical and Biological Warfare (U).

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5. (C) North Korea

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b. (C) Chemical and Biological Warfare.

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(2) (U) **Nerve/agents.** Organophosphorus insecticide and pesticide R&D in North Korea is at an adequate level to provide an indigenous R&D base for investigating the synthesis of the G- and V-series nerve agents. Within the next 5 years North Korean scientists should be capable of producing thickened and unthickened nerve agents on a pilot-plant scale. It must be recognized, however, that the North Koreans are not known to have established a CW munition design/development program; therefore, the threat of disseminating nerve agents is greatly reduced since they will have to purchase munitions from a foreign source. Should they be able to procure these munitions, they would also have to insure that adequate supplies of protective equipment, nerve agent decontaminants, and antidotes were available if they expected to exploit a CW nerve agent offensive.

(b)(1)

6. (C) Socialist Republic of Vietnam

(b)(1)

(b)(1)

7. The Mongolian Peoples Republic (U)

(b)(1)

8. Laos and Kampuchea (U)

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APPENDIX I

FACILITIES AND FIELDS OF INTEREST (U)

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Organization	Location	Activity

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Organization	Location	Activity

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Organization	Location	Activity

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Organization	Location	Activity
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APPENDIX I.1

OTHER REPORTED CHINESE FACILITIES (U)

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Facility	Location	Production
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Facility	Location	Produces
(b)(1)		

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Facility	Location	Produces

(b)(1)

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Facility	Location	Production
(b)(1)		

(S-NOFORN) Research and Production of BW Agents (U)

Organization	Location
(b)(1)	

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18 Organization Location

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★(S NOFORN) Research and Production of Detection Devices (U)

Facility	Location	Interest

(b)(1)

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Facility	Location	Interest
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APPENDIX II.

FOREIGN MATERIEL CATALOG ITEMS

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*FOMCAT pages included.

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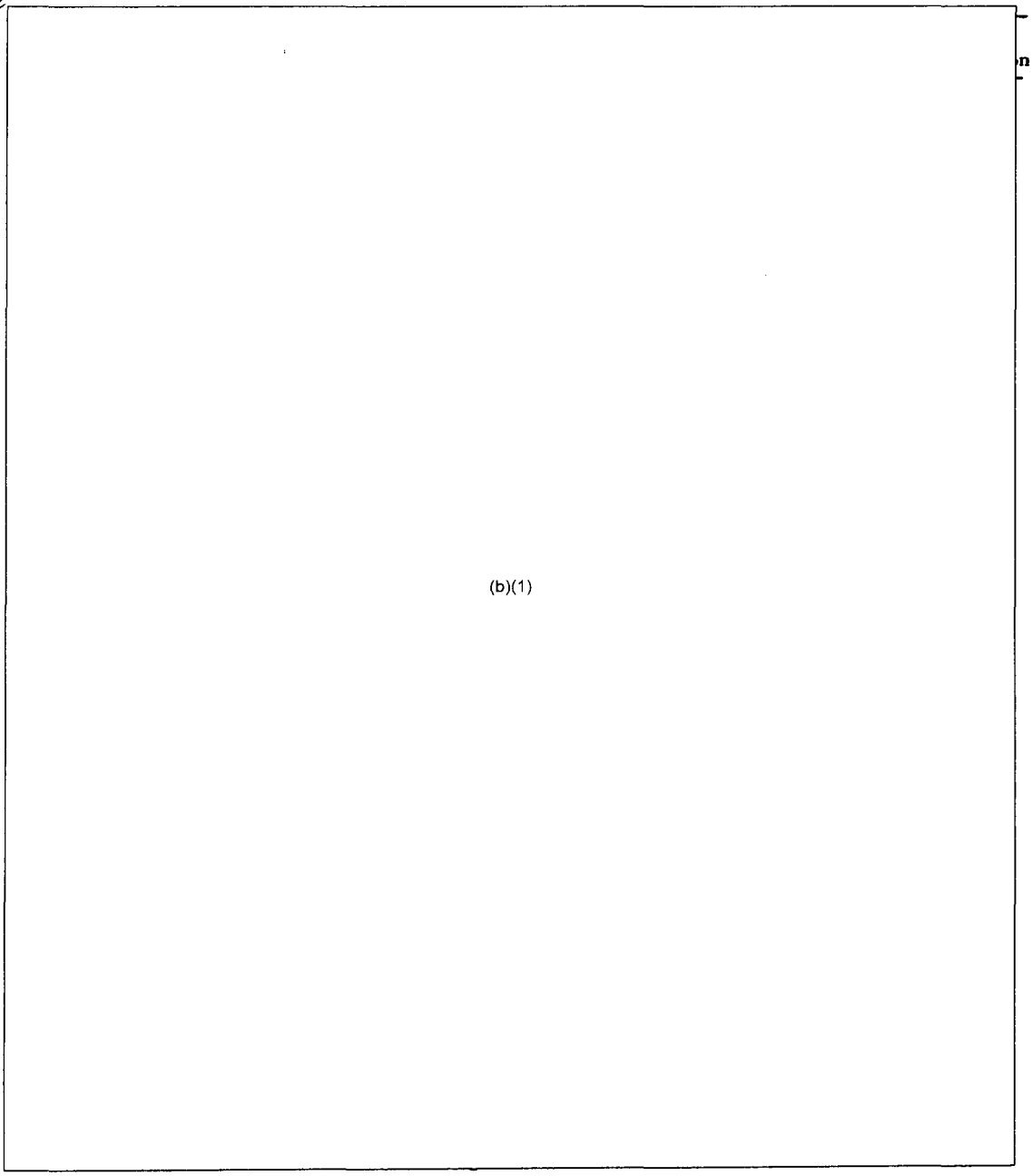
EXEMPTION CATEGORY: 2
DECLASSIFY ON: DECEMBER 2004



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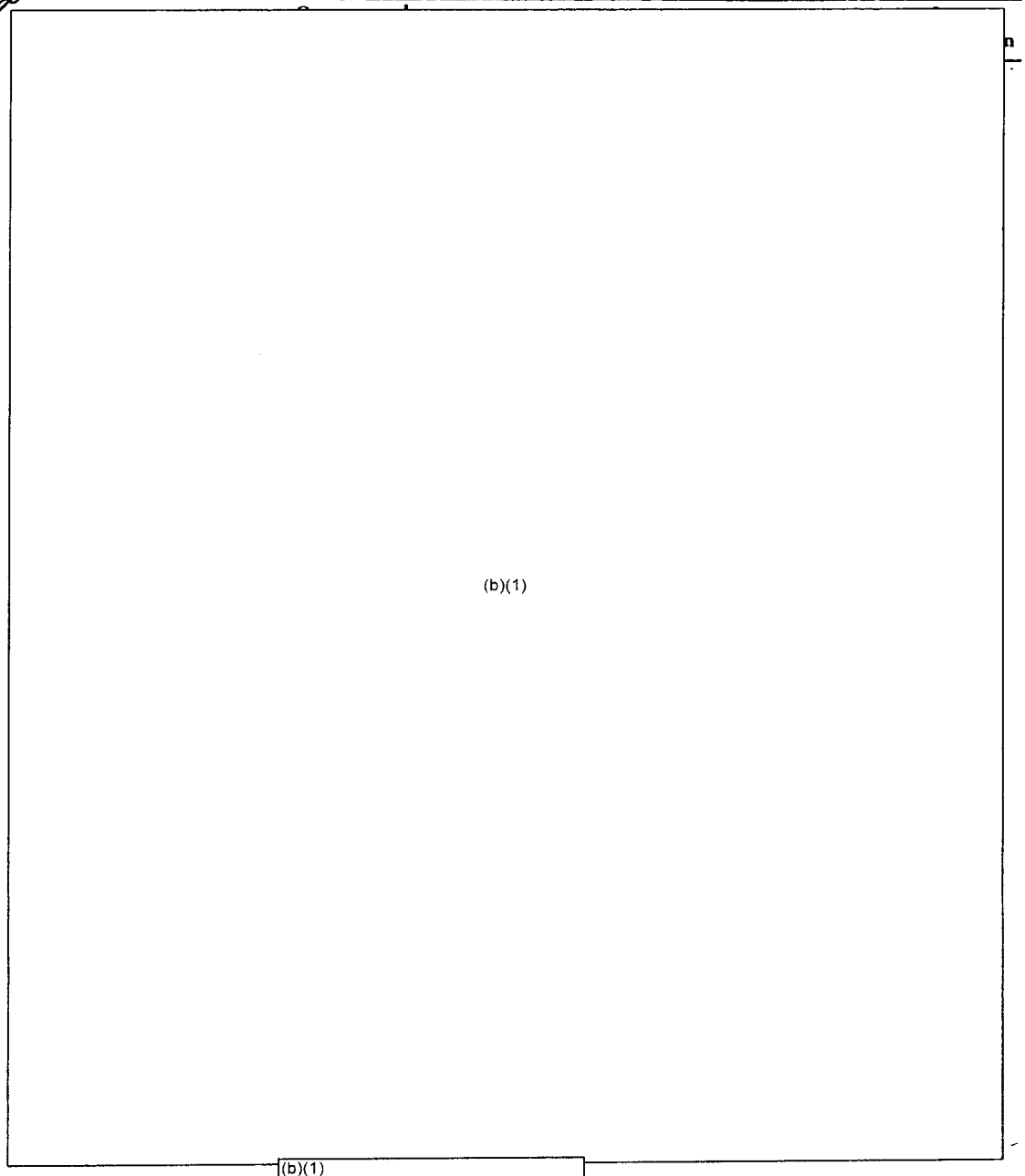
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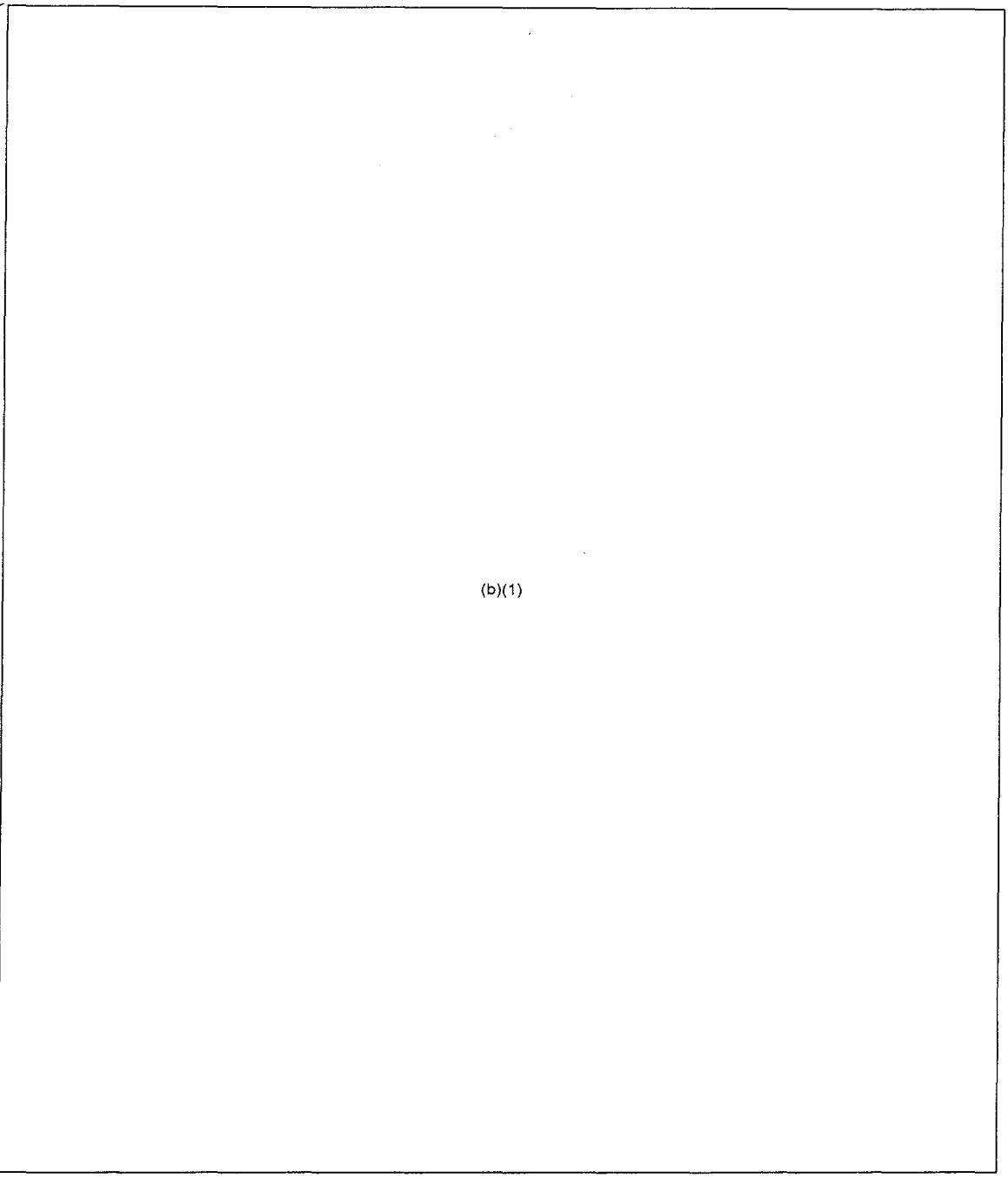
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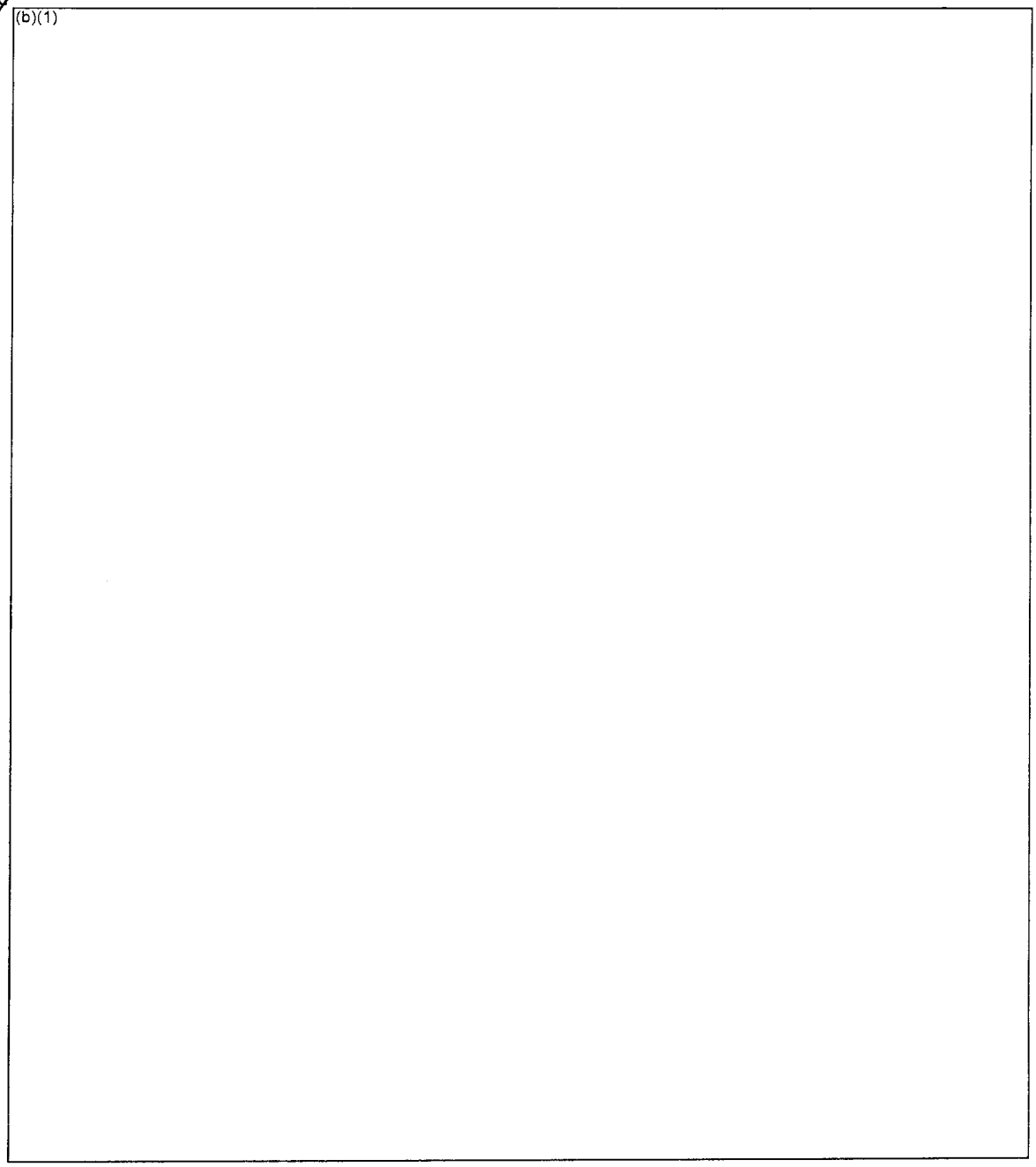


on

(b)(1)

Original DST-1600S-148-76-SUP 1

NOMEN: FLAMETHROWER, LIGHT, MODEL 58 (U) ITEM 2

NATIVE DES: ? FOM-1040-5-2-1-A
PRODUCED/ADOPTED: 1966 7/? COUNTRY: PRC

(U)THE MODEL 58 IS A COPY OF THE SOVIET MODEL LPO-50 (FOM-1040-2-2-3) WITH THE FOLLOWING MODIFICATIONS: (1)THE BIPOD IS EQUIPPED WITH A COILED SPRING, WHICH FORCES THE LEGS APART IN THE FIRING POSITION AND INTO A LATCH WHEN FOLDED. (2)A LUMINOUS CAPSULE IS FIXED TO THE REAR EDGE OF THE FRONT SIGHT. (3)THE FRONT SIGHT IS HOODED. (4)THE GUN HAS A CROSS-SLIDING SAFETY BUTTON, THE ENDS OF WHICH ARE EMBOSSED WITH CHINESE WORDS "OPEN" (ON) AND "CLOSED" (OFF, OR SAFE). (5)THE BACKPACK PAD IS MADE OF HEAVY, LEATHER-TRIMMED CANVAS TIGHTENED BY LACES. (6)A METAL STAND HAS BEEN ADDED AT THE BOTTOM OF THE TANK GROUP.

(U)TWO FITTINGS PROTRUDE FROM THE TOP OF EACH TANK. THE SMALLER FITTING IS A PRESSURE-RELIEF VALVE; THE LARGER FITTING CLOSES THE FILLING APERTURE AND IS CHAMBERED TO HOLD ELECTRICALLY FIRED PRIMER AND A PRESSURIZING CARTRIDGE THAT PROVIDES PRESSURE FOR PROPELLING THE FLAME FUEL. THREE SLOW-BURNING IGNITION CARTRIDGES ARE LOCATED AT THE GUN'S MUZZLE; AS A TANKFUL OF FUEL IS FORCED THROUGH THE GUN, ONE OF THE SLOW-BURNING CARTRIDGES IGNITES IT. A FUEL-TANK-PRESSURIZING CHARGE AND AN IGNITER ARE FIRED SIMULTANEOUSLY BY AN ELECTRICAL CURRENT. BY MEANS OF THE TRIGGER AND A SELECTOR SWITCH, EACH TANK MAY BE FIRED INDIVIDUALLY. EACH BURST OF FLAME LASTS 2 TO 2.5 SECONDS AND CONSUMES ALL THE FUEL IN ONE TANK. FOUR 1.25-VOLT DRY BATTERIES IN THE GUN'S STOCK POWER THE 5-VOLT SYSTEM. A FITTING AT THE BOTTOM OF EACH TANK CONTAINS A SPRING-LOADED VALVE THAT PERMITS THE FUEL TO LEAVE THE TANK AND PREVENTS THE ENTRY OF PRESSURE AND FUEL FROM ANOTHER TANK. TANKS ARE MADE OF HIGH-SILICON STEEL AND HAVE WELDED SEAMS; THE GUN BARREL IS MADE OF CARBON STEEL. THE TANK ASSEMBLY IS PADDED ON THE WEARER'S SIDE AND IS EQUIPPED WITH WEBBING SHOULDER STRAPS AND A WAIST STRAP.

(U)THE WEIGHTS OF THE MAJOR COMPONENTS ARE: TANK GROUP (EMPTY), 10.4 KG; GUN GROUP (WITH BATTERIES), 3.4 KG; AND HOSE, 0.7 KG. EQUIPMENT PROVIDED TO MAINTAIN THE FLAMETHROWER INCLUDES FUEL VISCOSITY METERS, REPAIR KIT (FOM-1040-5-4-2), PRESSURE TESTER (FOM-1040-5-4-3), AND TYPE OP-2 THICKENER (FOM-1365-2-2-1), GASOLINE (THE BASIC FUEL), AND TWO TYPES OF PYROTECHNIC CARTRIDGES.

(U)NORTH VIETNAMESE REFERENCES TO A MODEL K-50 (AND POSSIBLE K-5, AT-60 AND AT-64) RELATE TO THE CHINESE AND SOVIET VERSIONS OF THIS TYPE FLAMETHROWER.

DST-1600S-148-76-SUP 1 Original

NOMEN: FLAMETHROWER, LIGHT, MODEL 58 (U) ITEM 2

FOM-1040-5-2-1-A

PRODUCED/ADOPTED: 1966 ?/? COUNTRY: PRC

CURRENT STATUS: STANDARD

VEHICLE MOUNT: - N/A

FUEL: ---------- PETROLEUM W/THICKENER

CAPACITIES:
  FUEL (TOTAL) - *1
  IGNITERS-NO -- 3 (PERMIT 3 BURSTS)
PHYSICAL DATA:
  GUN LENGTH --- 96.5 CM
  HOSE LENGTH -- 81.3 CM
  TANK GROUP-
    -HEIGHT ----- 59.7 CM
    -WIDTH ------ 45 CM
    -DEPTH ------ 18 CM FRONT TO BACK
  WEIGHT-
    -FILLED ----- ?
    -EMPTY ------ 10.4 KG

PERFORMANCE:
  RANGE-
    -THICKENED FUEL ------ 70 M MAX *2
    -UNTHICKENED FUEL --- 18 M MAX *2
  DURATION OF BURST ------ 2 TO 2.5 S PER TANK
  RATE OF FIRE ---------- ?
  PRESSURE-
    -PRESSURE TANK ------- N/A
    -FUEL TANK ---------- 30 KG/SQ CM

REMARKS:
1/ MAXIMUM: 12 LITERS
   OPERATING: 10 LITERS

2/ THE WEAPON PERFORMED WELL IN TEST FIRINGS. THE RANGES AND OTHER CHARACTERISTICS OF FUELS USED IN TESTS ARE SHOWN IN FOM-1365-2-2-1. GASOLINE GELLED WITH 3% OP-2 THICKENER GAVE THE BEST RESULTS (ROD LENGTH, 32 METERS; BULK OF DEPOSIT, 45 TO 66 METERS; CENTER OF DEPOSIT, 62 METERS; AND MAXIMUM RANGE, 70 METERS). THE SOVIETS CLAIM THEIR MODEL LPG-50 HAS AN EFFECTIVE RANGE OF 41-50 METERS AND MAXIMUM RANGE OF 68 METERS.

Original

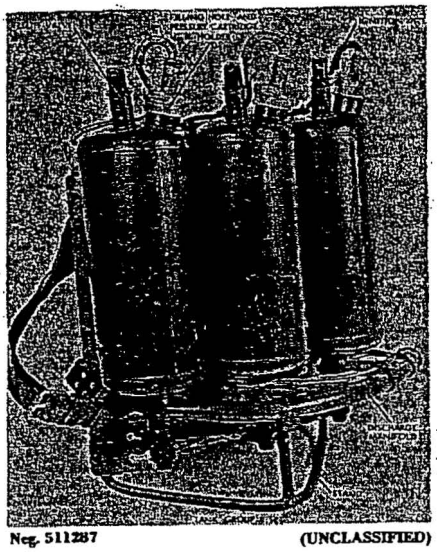
NOMEN: FLAMETHROWER, LIGHT, MODEL 58 (U)

FDM-1040-5-2-1-B

PRODUCED/ADOPTED: 1966 ?/?

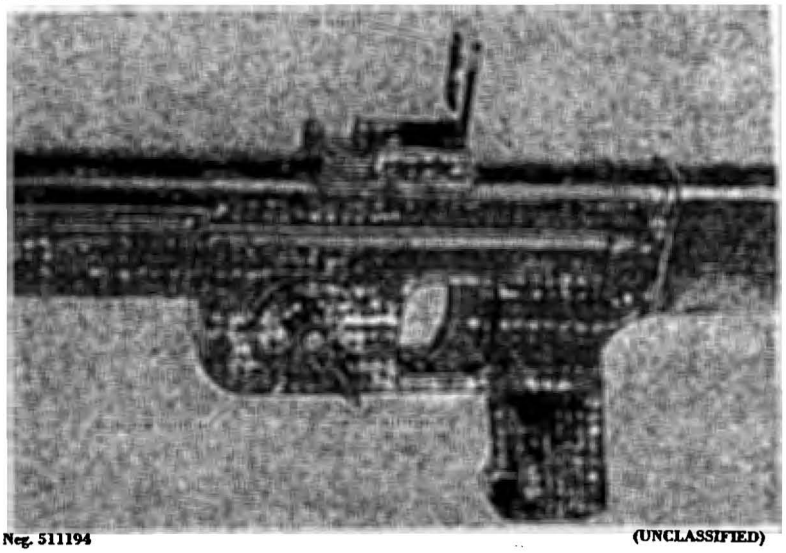
COUNTRY: PRC

Neg. 511288 (UNCLASSIFIED)

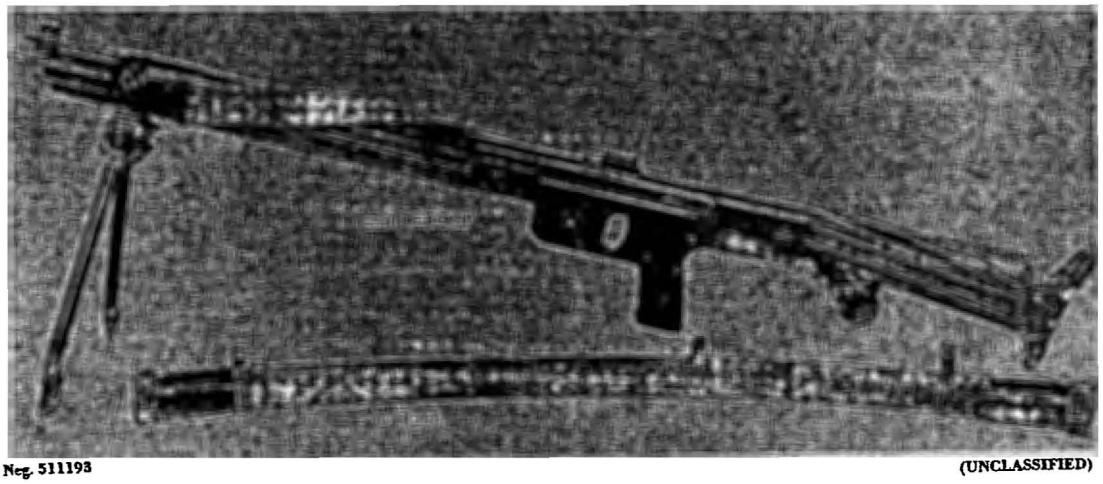


Neg. 511287 (UNCLASSIFIED)

DST-1600S-148-76-SUP 1 Original
NOMEN: FLAMETHROWER, LIGHT, MODEL 58 (U) ITEM 2
FOM-1040-5-2-1-B
PRODUCED/ADOPTED: 1966 7/7 COUNTRY: PRC



Neg. 511194 (UNCLASSIFIED)



Neg. 511193 (UNCLASSIFIED)

Original

DST-1600S-148-76-SUP 1

NOMEN: FLAMETHROWER PRESSURE-TESTING KIT, MODEL XB-250 (U) ITEM 6

NATIVE DES: XB-250 FOM-4950-5-3-2-A
PRODUCED/ADOPTED: 7/1970 ? COUNTRY: PRC

(U)THE XB-250 KIT IS USED TO TEST THE PRESSURE RELIABILITY OF THE HOSE, GUN GROUP, AND FUEL TANKS OF THE PRC MODEL 58 LIGHT FLAMETHROWER AND ITS SOVIET COUNTERPART, MODEL LPO-50. THE TESTS ARE PERFORMED AT STANDARD MAINTENANCE INTERVALS TO ASSURE DEPENDABLE AND SAFE PERFORMANCE.

(U) THE KIT'S PRINCIPAL ITEM IS A SMALL HAND-OPERATED PUMP; WHEN ASSEMBLED, THE PUMP IS ATTACHED TO A FITTING ON THE FLOOR OF THE CARRIER WHICH THUS SERVES AS THE PUMP'S MOUNT. THE PUMP DRAWS A NONFLAMMABLE LIQUIC FROM AN OPEN CONTAINER AND FORCES THE LIQUID, UNDER PRESSURE, INTO THE OBJECT BEING TESTED. THE KIT CONTAINS GASKETS, WASHERS, AND SPECIAL THREADED FITTINGS THAT REPLACE THE FLAMETHROWER'S STANDARD FITTINGS. THESE SPECIAL FITTINGS CLOSE THE NORMAL DISCHARGE EXITS AND PERMIT THE OBJECTS TO BECOME PRESSURIZED IN TESTS. A GAGE INDICATES THE PRESSURES DEVELOPED IN THE TESTS. A BUCKET OR A SIMILAR CONTAINER OF 3.8 OR 7.5 LITER CAPACITY CAN BE USED AS A RESERVOIR FOR THE TEST LIQUID.

(U)ALTHOUGH THE PRC SPECIFICATIONS ARE NOT KNOWN, THEY PROBABLY MATCH THE FOLLOWING SOVIET SPECIFICATIONS FOR TESTING IDENTICAL ITEMS: (1) THE SOVIET'S TEST SOLUTION IS POTASSIUM BICHROMATE IN WATER. (2) THE TESTING PRESSURES (IN KILOGRAMS PER SQUARE CENTIMETER) ARE: FUEL TANK, 80; FUEL HOSE, 60; AND FLAME GUN GROUP, 150. (3) THE TESTS ARE REQUIRED WHEN THE FLAMETHROWER IS ISSUED TO A UNIT, EVERY SIX MONTHS WHILE IT IS UNIT EQUIPMENT, AND AFTER 150 DISCHARGES.

(U)THIS KIT'S SMALL SIZE AND LIGHT WEIGHT CONTRAST WITH THE BULKY SOVIET COUNTERPART MODEL GN-200, WHICH INCLUDES A LARGER RESERVOIR AND WEIGHS 65.8 KG.

DST-1600S-148-76-SUP 1 Original

NOMEN: FLAMETHROWER PRESSURE-TESTING KIT, MODEL X8-250 (U) ITEM 6

FOM-4950-5-3-2-A

PRODUCED/ADOPTED: 7/1970 ? COUNTRY: PRC

CURRENT STATUS: --- STANDARD

COMPONENTS: ------- SEE TEXT

PURPOSE: ---------- *1

MANUFACTURERS: ---- ?

MATERIALS: -------- METAL CARRIER WITH WEB
- SHOULDER STRAP

MARKINGS: --------- *2

DIMENSIONS:
LENGTH ---------- 31.2 CM
WIDTH ----------- 16.7 CM
HEIGHT ---------- 11.4 CM
WEIGHT ---------- 7.3 KG

REMARKS:
1/ PRESSURE TESTS ON COMPONENTS OF PRC AND SOVIET PORTABLE FLAMETHROWERS

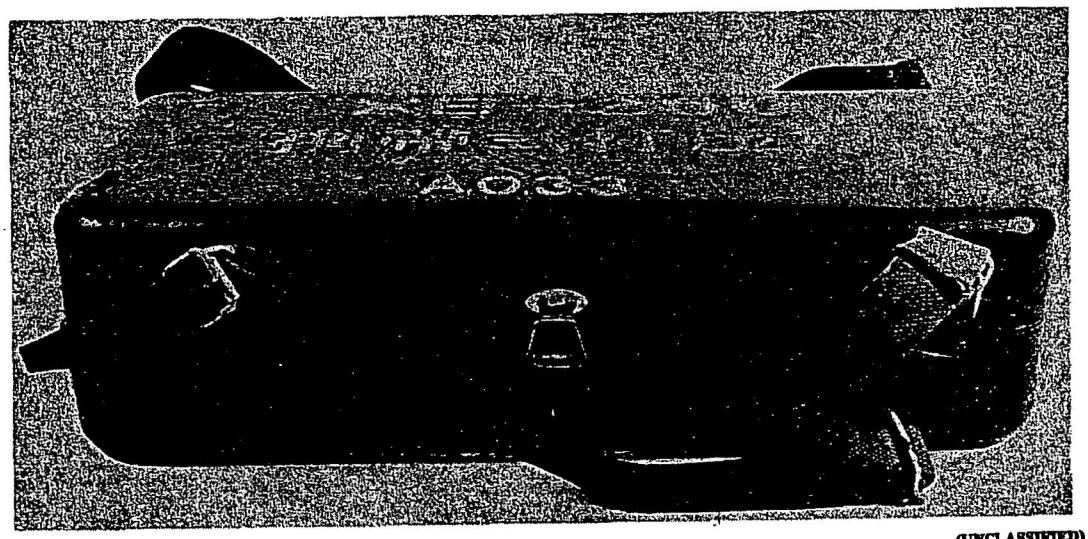
2/ SEE ILLUSTRATION (GREEN CARRIER WITH WHITE LETTERS).

Original

NOMEN: FLAMETHROWER PRESSURE-TESTING KIT, MODEL XB-25D (U)

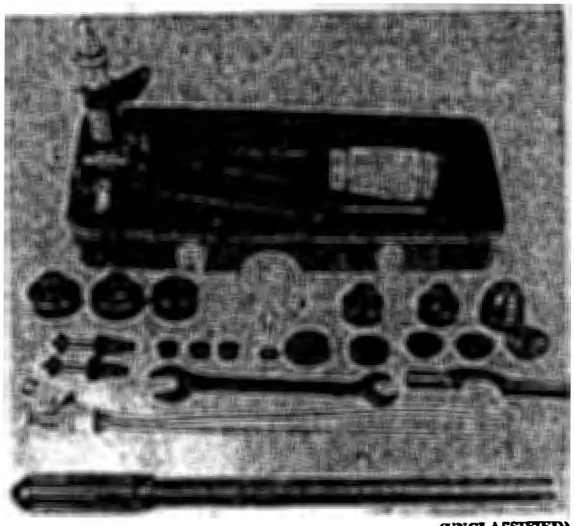
DST-1600S-148-76-SUP 1
ITEM 6
FOM-4950-5-3-2-B
COUNTRY: PRC

PRODUCED/ADOPTED: ?/1970 ?



Neg. 511585

(UNCLASSIFIED)



Neg. 511586

(UNCLASSIFIED)

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Original

DST-1600S-148-76-SUP 1

NOMEN: REPAIR KIT FOR MODEL 58 LIGHT FLAMETHROWER (U)

ITEM 8

NATIVE DES: ?

FOM-4950-5-3-3-A

PRODUCED/ADOPTED: ?/1969 ?

COUNTRY: PRC

(U)THIS KIT CONTAINS TOOLS, DEVICES FOR TESTING THE ELECTRICAL SYSTEM, AND SPARE PARTS FOR REPAIRING THE PRC MODEL 58 LIGHT FLAMETHROWER (FOM 1040-5-2-1). THE KIT IS BELIEVED TO BE EQUIPPED TO SERVICE 10 FLAMETHROWERS; IT MAY BE ISSUED ON THE BASIS OF THAT RATIO. THE KIT IS PROBABLY ALSO USED TO REPAIR THE SOVIET MODEL LPO-50 FLAMETHROWER (FOM1040-2-2-3), OF WHICH THE CHINESE VERSION IS A COPY IN MOST RESPECTS.

(U)SEPARATE KITS ARE PROVIDED FOR FLAMETHROWER MAINTENANCE AND TESTING; THEY INCLUDE (1) A PRESSURE TESTING DEVICE (FOM-4950-5-3-2) FOR DETERMINING WHETHER THE FLAMETHROWER WILL WITHSTAND NORMAL OPERATING PRESSURES, AND (2) FLAME FUEL VISCOSITY MEASURING DEVICES.

DST-1600S-148-76-SUP 1

Original

NOMEN: REPAIR KIT FOR MODEL 58 LIGHT FLAMETHROWER (U)

ITEM 8

FOM-4950-5-3-3-A

PRODUCED/ADOPTED: ?/1969 ?

COUNTRY: PRC

CURRENT STATUS: --- STANDARD

COMPONENTS: ------- *1

PURPOSE: ---------- REPAIR MODEL 58 AND
- SOVIET LPO-50 FLAMETHROWER

MANUFACTURERS: ---- ?

MATERIALS: -------- CONTAINER-WOODEN
- BOX

MARKINGS: --------- ON 1 CONTAINER, 178-8-6-4A;
- ON ANOTHER, A-H6-1

DIMENSIONS:

LENGTH	91.4 CM
WIDTH	30.5 CM
HEIGHT	27.9 CM
WEIGHT	42.7 KG

REMARKS:

1/

QUANTITY *2	ITEM
5	FUEL HOSES
3	FUEL FILLING PUMPS
2	SPECIAL PLIERS
5	SELECTOR SWITCHES
26	NON-RETURN VALVES
1	FUEL LEVEL INDICATOR
1	VOLT/OHMMETER
1	TEST LEADS
15	THRUST BUSHINGS
13	SMALL SCREWS
1	ELECTRICAL CONNECTOR
16	VALVE NUT CAPS
8	RUPTURE DISK PUNCH
10	ELECTRICAL WIRING HARNESS
5	BATTERY INSULATOR PADS
12	PRESSURE CARTRIDGE GRATE BARS
5	SAFETY VALVE BALL BEARINGS
15	IGNITION CARTRIDGE HOLDERS
25	NON-RETURN VALVE SPRINGS
4	ELECTRICAL CONNECTOR SCREWS
30	PLASTIC INSULATORS
20	BRASS WASHERS, 3.9 CM DIAMETER
15	BRASS WASHERS, 1 CM DIAMETER
5	ELECTRICAL SWITCHES
1	BIPOD

2/ OBSERVED IN TWO POSSIBLY INCOMPLETE KITS; THE STANDARD INVENTORY OF A COMPLETE KIT IS UNKNOWN.

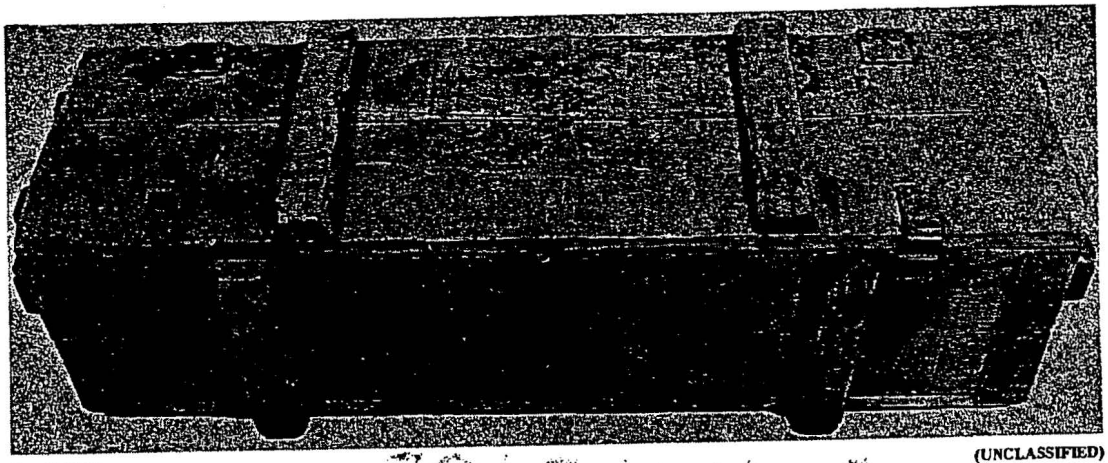
Original

NOMEN: REPAIR KIT FOR MODEL 58 LIGHT FLAMETHROWER (U)

DST-1600S-148-76-SUP 1
ITEM 8
FOM-4950-5-3-3-8

PRODUCED/ADOPTED: ?/1969 ?

COUNTRY: PRC



Neg. 511549

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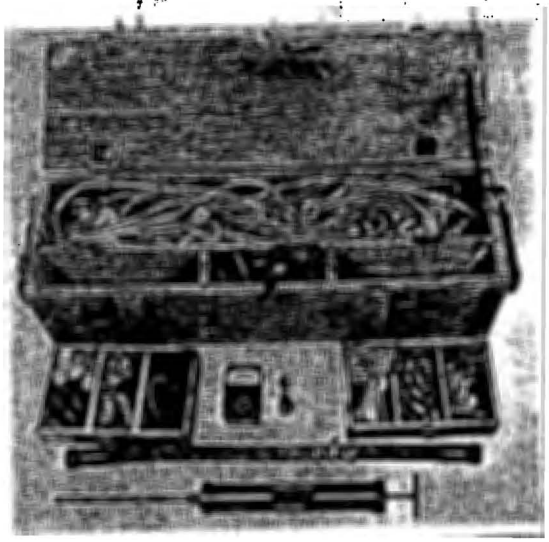

Neg. 511191

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Original

DST-1600S-148-76-SUP 1

NOMEN: GRENADE, HAND, TEAR AGENT CS, MODEL T-766B ? (U)

ITEM 10

NATIVE DES: ?
PRODUCED/ADOPTED: ?/1966

FOM-1330-9-1-7-A
COUNTRY: NORTH VIETNAM

(U)THE MODEL T-766B (?) HAND GRENADE IS A CYLINDRICAL CANISTER FILLED WITH THE CHEMICAL AGENT CS AND FITTED WITH A THROWING HANDLE AND A FIRING AND BURSTING ASSEMBLY. THE THIN SHEET-METAL CANISTER HAS A SOLDERED SEAM AND CRIMPED-ON ENDS. THE WOODEN HANDLE AND THE CANISTER END TO WHICH IT IS ATTACHED ARE WAX-COATED TO EXCLUDE MOISTURE. A FILLING APERTURE AT THE OPPOSITE END OF THE CANISTER IS SEALED BY A METAL DISK AND AN UNDERLYING RUBBER DISK, WHICH ARE HELD IN PLACE BY FOUR FOLD-DOWN METAL TABS. THE FIRING MECHANISM, HOUSED PARTLY IN THE HANDLE AND PARTLY IN THE CANISTER, CONSISTS OF A PULL-WIRE, A POWDER-TRAIN DELAY, A BLASTING CAP, AND A METAL CONTAINER FILLED WITH A SMALL AMOUNT OF TNT AND TWO TNT PELLETS (11.3 G). THE GRENADE EXPLODES VIOLENTLY TO DISSEMINATE THE FILLING, WHICH QUICKLY INCAPACITATES UNMASKED PERSONNEL, BUT IS NOT LETHAL. EVEN IN LOW CONCENTRATIONS, CS CAUSES LACHRYMATION AND A BURNING SENSATION IN THE EYES, NOSE, AND THROAT AND ON EXPOSED BODY SURFACES.

(U)THIS GRENADE IS BELIEVED TO BE A CONVERTED HE OFFENSIVE-TYPE GRENADE, IN WHICH THE FILLING HAS BEEN REPLACED WITH CS; ITS SHAPE IS SIMILAR TO THAT OF THE STANDARD VIET-CONG HAND GRENADE. THE QUALITY OF CONSTRUCTION INDICATES A WELL-DEVELOPED MANUFACTURING PROCESS.

DST-1600S-148-76-SUP 1 Original

NOMEN: GRENADE, HAND, TEAR AGENT CS, MODEL T-7668 ? (U) ITEM 10

FOM-1330-9-1-7-A

PRODUCED/ADOPTED: 7/1966 COUNTRY: NORTH VIETNAM

CURRENT STATUS: --- IMPROVISED

CHARACTERISTICS:

TYPE	TEAR AGENT
WEIGHT	355 G
LENGTH	272 MM
MAX DIAMETER	69 MM
BODY MATERIAL/ SHAPE	SHEET METAL
FILLER-WEIGHT	145 G
-MATERIAL	#1
FUZE-TYPE	PULL FRICTION
-DELAY TIME	3 S
FRAGMENT SLEEVE -WEIGHT	N/A
-MATERIAL	N/A
-DIAMETER(OUTSIDE)	N/A
SMOKE COLOR	N/A
LAUNCHING METHOD -CARTRIDGE MODEL	N/A
CONE(MATERIAL/ ANGLE)	N/A
FINS-NO	N/A
IDENTIFYING MARKINGS	#2

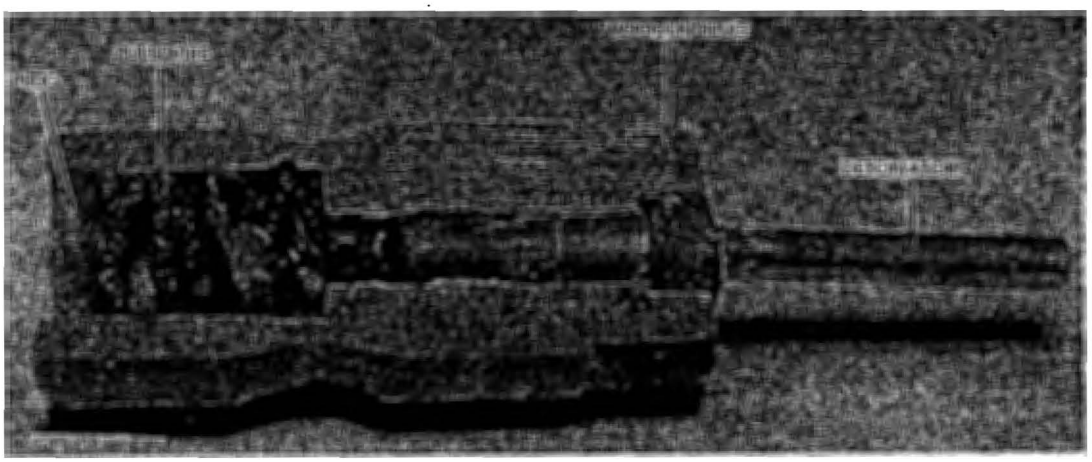
PERFORMANCE:

AVERAGE RANGE	?
EFFECTIVE FRAG RADIUS	N/A
PENETRATION	N/A
BURNING TIME	N/A

REMARKS:
1/ CS (O-CHLOROBENZYLMALONONITRILE)
2/ THE CANISTER IS PAINTED LIGHT GREEN, WITH A NARROW WHITE STRIPE ENCIRCLING EACH END NEAR THE CRIMPING. MARKINGS ON THE CANISTER (H.1) AND ON THE HANDLE (T-766) ARE WHITE ON BLACK.

Original
NOMEN: GRENADE, HAND, TEAR AGENT CS, MODEL T-766B ? (U)
PRODUCED/ADOPTED: 7/1966

DST-1600S-148-76-SUP 1
ITEM 10
FOM-1330-9-1-7-8
COUNTRY: NORTH VIETNAM



Neg. 511188

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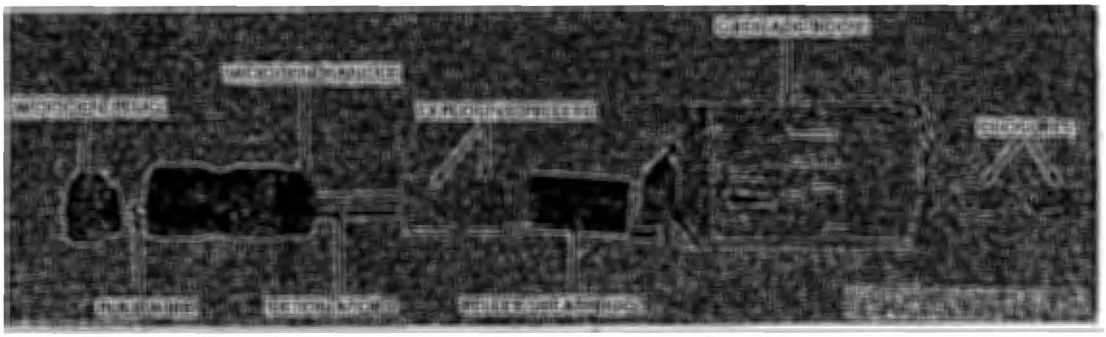


Neg. 511189

(UNCLASSIFIED)

Original

DST-1600S-148-76-SUP 1

NOMEN: GRENADE, HAND, TEAR AGENT CN, MODEL ? (U)

ITEM 11

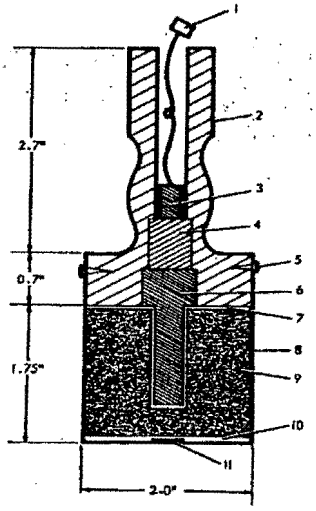
NATIVE DES: ?
PRODUCED/ADOPTED: ?/1968

FOM-1330-9-1-12-A
COUNTRY: NORTH VIETNAM

(U)THIS GRENADE ALLEGEDLY EMITS A CLOUD OF TEAR AGENT ON OVER A 23-METER RADIUS, UNDER NORMAL CONDITIONS OF WIND AND HUMIDITY. THE CN IS OBTAINED FROM U.S. DUD CHEMICAL MUNITIONS, SUCH AS THE MODEL M7A1 CN GRENADE. (THE M7A1 CONTAINS A MIXTURE OF CN, SUGAR, POTASSIUM CHLORATE, POTASSIUM BICARBONATE, AND A FINELY DIVIDED INERT SUBSTANCE--DIATOMACEOUS EARTH.)

(U)THE GRENADE'S WOODEN HANDLE, WHICH CONTAINS A PULLSTRING-ACTIVATED FRICTION IGNITER AND A PRIMER, EXTENDS INTO THE METAL CANISTER AND IS FASTENED BY FOUR NAILS FASHIONED FROM BARBED WIRE. THE CANISTER, MADE OF SHEET METAL 0.3 TO 0.7 MM THICK, HAS OVERLAPPING SEAM JOINTS AND IS EQUIPPED WITH A 7.6-MM-DIAMETER SMOKE EMISSION HOLE IN THE BOTTOM. A CARDBOARD DISK IN THE BOTTOM OF THE CANISTER COVERS THE HOLE, WHICH IS COVERED EXTERNALLY BY ADHESIVE TAPE TO EXCLUDE MOISTURE. SMOKE ESCAPES WHEN THESE CLOSURES ARE BURNED AWAY BY THE BURNING MIXTURE IN THE GRENADE. THE GRENADE IS MADE WATERPROOF BY PRETREATING THE WOOD WITH HOT PARAFFIN AND BY SEALING NAIL HOLES AND JOINTS WITH WAX.

(U)COMMUNIST FORCES IN SOUTH VIETNAM FABRICATE THIS GRENADE FROM CAPTURED U.S. CHEMICAL MUNITIONS AND OTHER MATERIALS AT HAND. THE GRENADE IS MADE IN FIELD WORKSHOPS, AND PROBABLY IN SMALL QUANTITIES. A CAPTURED ENEMY DOCUMENT, WHICH PROVIDES THE ONLY AVAILABLE DATA ON THE GRENADE, STATES THAT THE IGNITIONS SYSTEM MAY VARY SLIGHTLY (FROM THE ONE ILLUSTRATED), DEPENDING ON MATERIALS AVAILABLE.



Neg. 515281 (UNCLASSIFIED)

Original
ITEM 11

NOMEN: GRENADE, HAND, TEAR AGENT CN, MODEL ? (U)

FOM-1330-9-1-12-A

PRODUCED/ADOPTED: ?/1968

COUNTRY: NORTH VIETNAM

CURRENT STATUS: --- IMPROVISED

CHARACTERISTICS:

TYPE	TEAR AGENT
WEIGHT	0.9 KG ?
LENGTH	132 MM
MAX DIAMETER	50 MM
BODY MATERIAL/ SHAPE	#1
FILLER-WEIGHT	?
-MATERIAL	US-ARMY TEAR AGENT CN
FUZE-TYPE	BURNING, TIME-DELAY
-DELAY TIME	4-5 S
FRAGMENT SLEEVE -WEIGHT	N/A
-MATERIAL	N/A
-DIAMETER(OUT-SIDE)	N/A
SMOKE COLOR	N/A
LAUNCHING METHOD -CARTRIDGE MODEL	N/A
CONE(MATERIAL/ ANGLE)	N/A
FINS-NO	N/A
IDENTIFYING MARK-INGS	#2

PERFORMANCE:

AVERAGE RANGE	APPROX 30 M
EFFECTIVE FRAG RADIUS	N/A
PENETRATION	N/A
BURNING TIME	?

REMARKS:
1/ SHEET METAL CANISTER; WOODEN HANDLE.
2/ MAY HAVE RED BAND AND LETTERS CN ON BLUE BODY

Original

DST-1600S-148-76-SUP 1

NOMEN: GRENADE, HAND, SMOKE, TYPE 2 (U)

ITEM 12

NATIVE DES: ?

FOM-1330-5-1-17-A

PRODUCED/ADOPTED: ?/1970 ?

COUNTRY: PRC

(U)THE PEOPLE'S REPUBLIC OF CHINA TYPE 2 SMOKE HAND GRENADE HAS A GRENADE BODY WHICH CONSISTS OF A LIGHT BROWN WAXED FIBERBOARD CYLINDER 216 MM LONG AND 51 MM DIAMETER. MARKING IS WITH BLACK INK IN CHINESE SYMBOLS AND ARABIC NUMERALS. THE ENDS OF THE CYLINDER ARE CLOSED WITH OUTER CARDBOARD DISKS WHICH ARE FITTED WITH COTTON TAPE GRIPS TO FACILITATE THEIR REMOVAL. REMOVAL OF THE OUTER DISKS BARES INNER DISKS WHICH CONTAIN VENT HOLES TO ALLOW SMOKE EMISSION.

(U)THE IGNITER ASSEMBLY IS LOCATED APPROXIMATELY MIDWAY ALONG A 12-MM DIAMETER THIN PAPER SLEEVE, WHICH EXTENDS ALONG THE LONGITUDINAL AXIS OF THE CARDBOARD TUBE. THE IGNITER ASSEMBLY CONSISTS OF A PRIMARY IGNITER, A SECONDARY IGNITER, AND A CLAY PLUG. THE ASSEMBLY IS HELD IN PLACE BY PLASTIC DISKS. A COPPER IGNITER WIRE EXTENDS FROM THE IGNITION ASSEMBLY TO THE BASE OF THE GRENADE AND IS HELD THERE BY A GRIP FLAP. A LOOSELY COILED 0.6-MM COPPER WIRE EXTENDS FROM THE OPPOSITE END OF THE IGNITER ASSEMBLY.

(U)THE GRENADE IS FUNCTIONED BY REMOVING THE OUTER END DISKS AND PULLING ON THE IGNITER WIRE. THE DURATION OF SMOKE EMISSION IS APPROXIMATELY 50 SECONDS. IN A TEST, THE WHITE SMOKE CLOUD GREW TO A MAXIMUM SIZE OF 6 METERS HIGH X 6 METERS WIDE X 15 METERS LONG IN A BREEZE HAVING AN ESTIMATED SPEED OF 5 MI/H.

(U)THE GRENADE IS RELATIVELY INFERIOR AS A SMOKE PRODUCER. IT IS PROBABLY VERY DANGEROUS TO MANUFACTURE. POTASSIUM CHLORATE-RESIN MIXTURES ARE VERY SUSCEPTIBLE TO IGNITION FROM IMPACT SHOCK. THE RESIN USED IN THE GRENADE CONTAINS MANY COMPOUNDS, INCREASING THE PROBABILITY THAT THE MIXTURE IS SENSITIVE. THE GRENADE HAS POOR SHELF LIFE AND SERVICE LIFE CHARACTERISTICS, PARTICULARLY IN HIGH HUMIDITY ENVIRONMENTS. THE SMOKE PRODUCING COMPOSITION CONTAINS AMMONIUM AND CHLORATE IONS IN INTIMATE CONTACT WHICH WILL NORMALLY RESULT IN DECOMPOSITION OF CHLORATE TO FORM AN INERT CHLORIDE.

DST-1600S-148-76-SUP 1 Original

NOMEN: GRENADE, HAND, SMOKE, TYPE 2 (U) ITEM 12

FOM-1330-5-1-17-A

PRODUCED/ADOPTED: 7/1970 ? COUNTRY: PRC

CURRENT STATUS: --- STANDARD

CHARACTERISTICS:

TYPE	WHITE SMOKE
WEIGHT	490 G
LENGTH	216 MM
MAX DIAMETER	51 MM
BODY MATERIAL/ SHAPE	WAXED FIBERBOARD
FILLER-WEIGHT	470 G
-MATERIAL	#1
FUZE-TYPE	FRICTION
-DELAY TIME	?
FRAGMENT SLEEVE	
-WEIGHT	N/A
-MATERIAL	N/A
-DIAMETER(OUT-SIDE)	N/A
SMOKE COLOR	WHITE
LAUNCHING METHOD	
-CARTRIDGE MODEL	N/A
CONE(MATERIAL/ ANGLE)	N/A
FINS-NO	N/A
IDENTIFYING MARK-INGS	SEE PHOTOGRAPH

PERFORMANCE:

AVERAGE RANGE	?
EFFECTIVE FRAG RADIUS	N/A
PENETRATION	N/A
BURNING TIME	APPROX 50 S

REMARKS:
1/ 40% AMMONIUM CHLORIDE; 47% POTASSIUM CHLORATE + POTASSIUM CHLORIDE; 13% FUEL RESIN. THE POTASSIUM CHLORATE:POTASSIUM CHLORIDE RATIO IS ABOUT 4:1. APPARENTLY THE POTASSIUM CHLORIDE CONTENT REPRESENTS THE END PRODUCT OF CHLORATE DECOMPOSITION. THE FUEL RESIN IS AN AMORPHOUS MIXTURE PRESENT AS A POWDER. IT IS READILY SOLUBLE IN METHYLENE CHLORIDE AND ACETONE, MODERATELY SOLUBLE IN METHANOL AND ONLY PARTIALLY SOLUBLE IN HEXANE.

Original

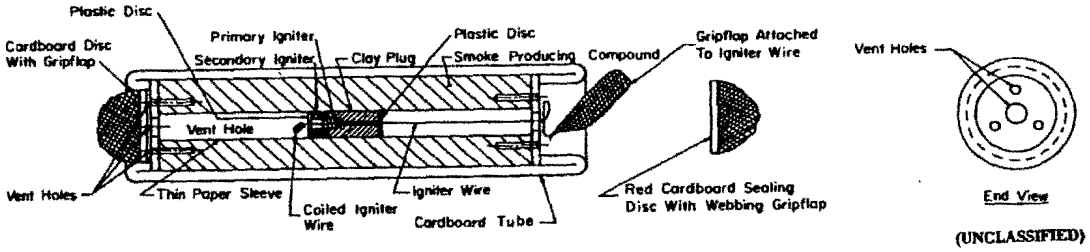
NOMEN: GRENADE, HAND, SMOKE, TYPE Z (U)

PRODUCED/ADOPTED: ?/1970 ?

DST-1600S-148-76-SUP 1
ITEM 12
FDH-1330-5-1-17-8
COUNTRY: PRC

(UNCLASSIFIED)

Neg. 511098



(UNCLASSIFIED)

Neg. 511295

NOMEN: GRENADE, HAND, WHITE PHOSPHORUS, MODEL T.F.L. 7 (U) ITEM 13

NATIVE DES: ? FOM-1330-9-1-9-A
PRODUCED/ADOPTED: ?/BEFORE 1966 COUNTRY: NORTH VIETNAM

(U)THIS BURSTING-TYPE GRENADE DISSEMINATES WHITE PHOSPHORUS (WP), WHICH IGNITES ON EXPOSURE TO AIR TO PRODUCE SMOKE AND INCENDIARY PARTICLES. NORTH VIETNAMESE/VIETCONG FORCES USED THE GRENADE IN 1967.

(U)A SPECIMEN TAKEN FROM A CAPTURED EXPLOSIVE FACTORY WAS FILLED WITH WP AND WAS DESCRIBED AS "HOMEMADE," ALTHOUGH IT REFLECTED GOOD WORKMANSHIP AND GOOD CONSTRUCTION. THE CANISTER IS FORMED WITH CRIMPED AND SOLDERED SEAMS AND IS PAINTED GREEN. A FILLING HOLE IS PROVIDED IN THE CENTER OF THE BOTTOM END, AND A FUZE ASSEMBLY IN THE TOP END. THE END PIECES ARE BELIEVED TO BE METAL. THE FUZE, ALSO DESCRIBED AS "HOMEMADE," HAS THE EXTERNAL CONFIGURATIONS OF THE ONE ILLUSTRATED AND PROBABLY IS IDENTICAL TO IT. THE FUZE IGNITES A BURSTER CHARGE COMPRISED OF PITCH AND AN UNIDENTIFIED EXPLOSIVE, WHICH EXPLODES THE CANISTER AND DISSEMINATES THE WP FILLING.

(U)DATA ON THE GRENADE ARE BASED ON THE FIELD EXPLOITATION OF ONE SPECIMEN, AUGMENTED BY LABORATORY EXPLOITATION DATA OF AN OFFENSIVE GRENADE (FOM-1330-9-1-1) THAT HAS SIMILAR CONFIGURATIONS BUT CONTAINS HE FILLING. (NOTEWORTHY DIFFERENCES ARE THE OFFENSIVE GRENADE'S WOODEN TOP AND LACK OF AN APERTURE IN THE BOTTOM.) THE WP GRENADE APPEARS TO HAVE BEEN CONVERTED FROM ANOTHER TYPE, SUCH AS THE OFFENSIVE GRENADE, BY REMOVING THE HE CHARGE THROUGH THE BOTTOM OPENING AND TAMPING IN WP INSTEAD. IN ADDITION TO THE WP FILLING, THE CANISTER CONTAINS A BURSTER CHARGE (ESTIMATED WEIGHT, .054 KG) COMPOSED OF TNT (85 PERCENT), RDX (11 PERCENT), AND PICRIC ACID (4 PERCENT).

DST-1600S-148-76-SUP 1 Original

NOMEN: GRENADE, HAND, WHITE PHOSPHORUS, MODEL T.F.L. ? (U) ITEM 13

FOM-1330-9-1-9-A

PRODUCED/ADOPTED: ?/BEFORE 1966 COUNTRY: NORTH VIETNAM

CURRENT STATUS: --- IMPROVISED ?

CHARACTERISTICS:

TYPE	WHITE PHOSPHORUS
WEIGHT	0.73 KG (ESTIMATED)
LENGTH	140. MM
MAX DIAMETER	66 MM
BODY MATERIAL/ SHAPE	SHEET METAL
FILLER-WEIGHT	0.177 KG (ESTIMATED)
-MATERIAL	WHITE PHOSPHORUS
FUZE-TYPE	PERCUSSION
-DELAY TIME	4 S ?
FRAGMENT SLEEVE -WEIGHT	N/A
-MATERIAL	N/A
-DIAMETER(OUTSIDE)	N/A
SMOKE COLOR	WHITE
LAUNCHING METHOD -CARTRIDGE MODEL	N/A
CONE(MATERIAL/ ANGLE)	N/A
FINS-NO	N/A
IDENTIFYING MARKINGS	RED LETTERS T.F.L. ON HANDLE

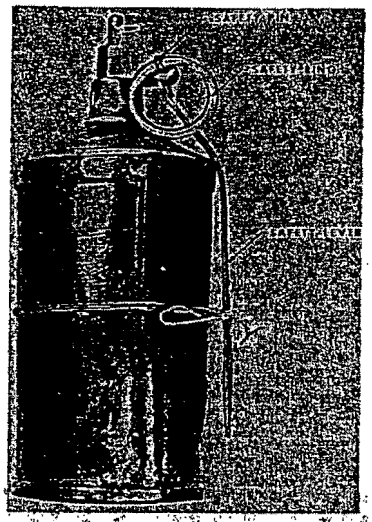
PERFORMANCE:

AVERAGE RANGE	?
EFFECTIVE FRAG RADIUS	?
PENETRATION	N/A
BURNING TIME	N/A

REMARKS:

Original
NOMEN: GRENADE, HAND, WHITE PHOSPHORUS, MODEL T.F.L. 7 (U)
PRODUCED/ADOPTED: ?/BEFORE 1966

DST-1600S-148-76-SUP 1
ITEM 13
FOM-1330-9-1-9-B
COUNTRY: NORTH VIETNAM



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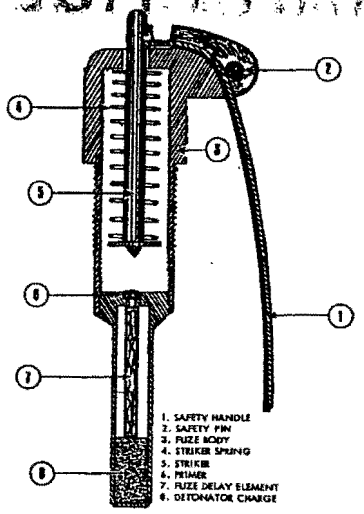


Neg. 511069 (UNCLASSIFIED)

Original

DST-1600S-148-76-SUP 1

NOMEN: GRENADE, HAND, WHITE PHOSPHORUS AND NAPALM, MODEL ? (U)

ITEM 14

NATIVE DES: ?
PRODUCED/ADOPTED: ?/BEFORE 1966

FOM-1330-9-1-22-A
COUNTRY: NORTH VIETNAM

(U)THIS NORTH VIETNAMESE INCENDIARY GRENADE IS FILLED WITH A WHITE PHOSPHORUS AND NAPALM MIXTURE. THE LIGHT METAL CYLINDER IS EQUIPPED WITH A FUZE ASSEMBLY WHICH PROTRUDES FROM THE TOP END AND A LEAD PLUG WHICH IS INSERTED IN AN OPENING IN THE BOTTOM END. THE FUZE, A "SETBACK" TYPE, IS ACTIVATED BY REMOVING A SMALL NAIL OR PIN AND STRIKING THE BOTTOM OF THE GRENADE AGAINST THE GROUND; THE FORCE CAUSES A STRIKER TO COMPRESS A RETAINING SPRING AND STRIKE A DETONATOR IN THE FUZE ASSEMBLY. THE GRENADE CAN BE THROWN BY HAND OR PROPELLED BY A HOMEMADE LAUNCHER ADAPTED TO THE FRENCH MAS-36 RIFLE. THE DEVICE WAS LAST REPORTED IN 1962.

DST-1600S-148-76-SUP 1 Original

NOMEN: GRENADE, HAND, WHITE PHOSPHORUS AND NAPALM, MODEL ? (U) ITEM 14

FOM-1330-9-1-22-A

PRODUCED/ADOPTED: ?/BEFORE 1966 COUNTRY: NORTH VIETNAM

CURRENT STATUS: --- STANDARD

CHARACTERISTICS:

TYPE	INCENDIARY
WEIGHT	0.5 KG EMPTY
LENGTH	27 CM
MAX DIAMETER	6 CM
BODY MATERIAL/ SHAPE	METAL
FILLER-WEIGHT	?
-MATERIAL	WHITE PHOSPHORUS AND NAPALM
FUZE-TYPE	"SETBACK" TYPE
-DELAY TIME	4 S
FRAGMENT SLEEVE	
-WEIGHT	N/A
-MATERIAL	N/A
-DIAMETER(OUTSIDE)	N/A
SMOKE COLOR	?
LAUNCHING METHOD	
-CARTRIDGE MODEL	N/A
CONE(MATERIAL/ ANGLE)	N/A
FINS-NO	N/A
IDENTIFYING MARKINGS	GREEN BODY

PERFORMANCE:

AVERAGE RANGE	?
EFFECTIVE FRAG RADIUS	N/A
PENETRATION	N/A
BURNING TIME	?

REMARKS:

Original

DST-1600S-148-76-SUP 1

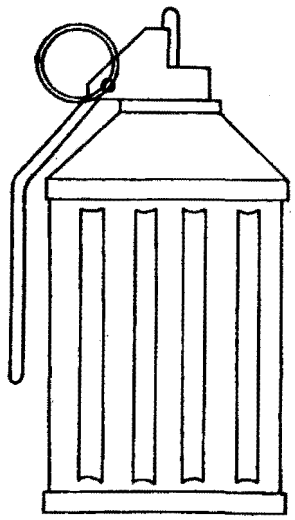
NOMEN: GRENADE, HAND, WHITE PHOSPHORUS, MODEL T.F.H. (U)

ITEM 15

NATIVE DES: ?
PRODUCED/ADOPTED: ?/BEFORE 1966

FDM-1330-9-1-21-A
COUNTRY: NORTH VIETNAM

(U)THE FOLLOWING INFORMATION WAS OBTAINED FROM FIELD EXAMINATION OF THIS HOMEMADE HAND GRENADE CONTAINING PLASTICIZED WHITE PHOSPHORUS (PWP). THE GRENADE FUNCTIONS LIKE THE U.S. M15 AND M34 GRENADES. THE DETONATOR BURSTS THE BODY OF THE GRENADE AND SPREADS SMALL PARTICLES OF PWP. WHEN THESE SMALL PIECES OF PHOSPHORUS COME INTO CONTACT WITH AIR, THEY BURN AT A HIGH TEMPERATURE AND GIVE OFF A DENSE WHITE SMOKE. THE EFFECTIVE CASUALTY RADIUS IS APPROXIMATELY 15 M; HOWEVER, SOME OF THESE PARTICLES MAY BE THROWN AS FAR AS 30 M. THE PHOSPHORUS WILL BURN FOR ABOUT 60 S, IGNITING ANY FLAMMABLE SUBSTANCE IT TOUCHES. IN ADDITION TO THE BURN AND SMOKE EFFECT, THERE IS A SHRAPNEL HAZARD UP TO 20 TO 25 M.



Neg. 512066 (UNCLASSIFIED)

DST-1600S-148-76-SUP 1

Original

NOMEN: GRENADE, HAND, WHITE PHOSPHORUS, MODEL T.F.H. (U)

ITEM 15

FOM-1330-9-1-21-A

PRODUCED/ADOPTED: ?/BEFORE 1966

COUNTRY: NORTH VIETNAM

CURRENT STATUS: --- IMPROVISED

CHARACTERISTICS:

TYPE	OFFENSIVE HAND GRENADE
WEIGHT	?
LENGTH	11 CM
MAX DIAMETER	6 CM
BODY MATERIAL/ SHAPE	SHEET METAL
FILLER-WEIGHT	?
-MATERIAL	PLASTICIZED WHITE PHOSPHORUS
FUZE-TYPE	PERCUSSION TYPE (HOMEMADE)
-DELAY TIME	?
FRAGMENT SLEEVE -WEIGHT	N/A
-MATERIAL	N/A
-DIAMETER(OUTSIDE)	N/A
SMOKE COLOR	WHITE
LAUNCHING METHOD -CARTRIDGE MODEL	N/A
CONE(MATERIAL/ ANGLE)	N/A
FINS-NO	N/A
IDENTIFYING MARKINGS	"T.F.H." ON FUZE HANDLE

PERFORMANCE:

AVERAGE RANGE	APPROX 15 M
EFFECTIVE FRAG RADIUS	N/A
PENETRATION	N/A
BURNING TIME	60 S

REMARKS:

Original

DST-1600S-148-76-SUP 1

NOMEN: 82-MM MORTAR CS CARTRIDGE (U)

ITEM 16

NATIVE DES: ?
PRODUCED/ADOPTED: 7/1968

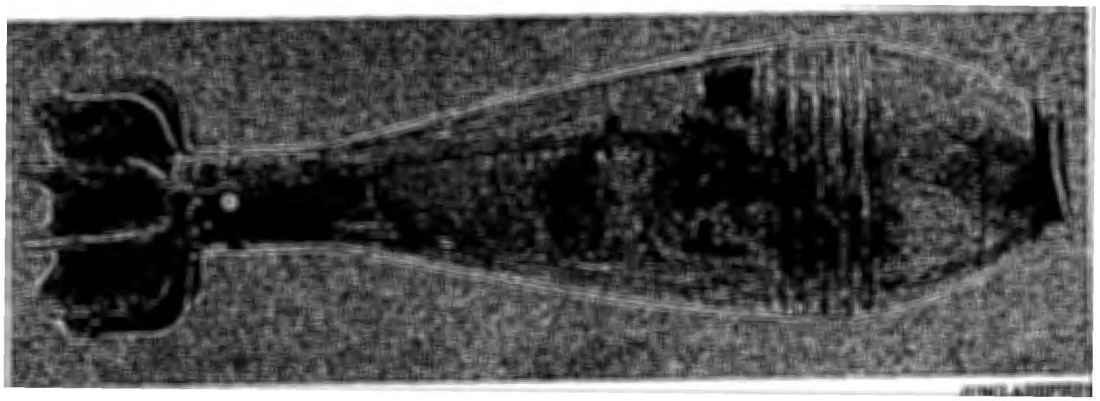
FOM-1311-9-1-82-1-A
COUNTRY: N. VIETNAM

(U)THIS NORTH VIETNAMESE MORTAR CARTRIDGE IS A MODIFICATION OF A CHINESE COMMUNIST HE ROUND. THE HE FILLER HAS BEEN REMOVED IN THE FIELD AND A CS FILLER SUBSTITUTED. THE CS WAS PROBABLY CAPTURED FROM U.S. SUPPLY SOURCES.

(U)WEIGHT OF THE ORIGINAL HE ROUND HAS BEEN REPORTED TO BE 3.3 KG. THE VIET CONG LINE THE BOTTOM OF THE EMPTIED CARTRIDGE WITH LEAD IN AN ATTEMPT TO BRING THE WEIGHT OF THE CS ROUND (APPROXIMATELY 2.86 KG) UP TO THAT OF THE HE ROUND.

(U)THE CARTRIDGE'S INTERIOR VOLUME IS 20.13 CUBIC INCHES. ABOUT 34 PERCENT TNT IN THE FILL WOULD BE NECESSARY TO SHATTER THE ROUND. THE VIET CONG ADD ABOUT 111 GRAMS OF TNT CHIPS AND FILL THE REMAINING VOLUME WITH ABOUT 60.7 GRAMS OF CS-1.

(U)MARKINGS VARY. SOME CAPTURED ROUNDS WERE MARKED, NEAR THEIR TOPS, WITH A HALF-INCH RED BAND AND WERE HAND-LETTERED "CS-1"; THE LETTER "H" WAS INSCRIBED ON SOME OTHERS. CAPTURED INSTRUCTIONS PRESCRIBED: THAT THE ROUNDS BE LABELED "USA"; THAT THEY BE MARKED WITH A RED BAND; THAT THEY BE LETTERED "CS-1"; AND THAT THEY BE MARKED WITH TWO BLUE (OR GREEN) BANDS, "WHICH STAND FOR NERVE GAS." THE PURPOSE OF THESE MISLEADING MARKINGS WAS NOT EXPLAINED IN THE INSTRUCTIONS.



Neg. 511558

DST-1600S-148-76-SUP 1 Original
NOMEN: 82-MM MORTAR CS CARTRIDGE (U) ITEM 16
FOM-1311-9-1-82-1-A
COUNTRY: N. VIETNAM

PRODUCED/ADOPTED: ?/1968

CURRENT STATUS: --- IMPROVISED

NATIVE USING WEAPONS: -

COMPLETE ROUND:
- CALIBER ---------- 82-MM
- TYPE ------------- CS-FILLED
- MODEL ------------ ?
- WEIGHT ----------- APRX 2.86 KG
- LENGTH OVERALL --- 280 MM
- BODY MATERIAL ---- STEEL
- FILLER
  - -WEIGHT -------- *1
  - -MATERIAL ------ CS-1 TNT
- FUZE
  - -TYPE ---------- POINT DETONATING
  - -MODEL --------- M-6 ?
- IDENTIFYING-
  - MARKINGS ------- SEE TEXT

PROPELLANT:
- TYPE ------------- ?
- WEIGHT FULL-
  - CHARGE --------- 68 G
- CONFIGURATION ---- ?

PERFORMANCE:
- EFF FRAG RADIUS - ?
- LETHAL AREAS ---- N/A

REMARKS:
1/ CS-1, APRX 60.7 GM; TNT, APRX 111 GM

NOMEN: PROJECTILE, 65-MM, MORTAR, CS-FILLED, W/PWD TIME DELAY FUZE (U) ITEM 17

NATIVE DES: ? FOM-1311-9-2-65-1-A
PRODUCED/ADOPTED: ?/1968 COUNTRY: N. VIETNAM

(U)THE 65-MM MORTAR PROJECTILE HAS THREE MAJOR COMPONENTS: (1) A SETBACK INITIATED DELAY FUZE, (2) A PROJECTILE BODY CONTAINING CS AGENT, AND (3) A FOUR-FIN STABILIZER ASSEMBLY. ALL COMPONENTS, WITH THE EXCEPTION OF THE CS, APPEAR TO BE OF LOCAL MANUFACTURE. A WAX COATING ON ALL INTERNAL AND EXTERNAL SURFACES MAKES THE PROJECTILE WATERPROOF. THE CS AGENT PROBABLY WAS CAPTURED OR OTHERWISE OBTAINED FROM U.S. SUPPLIES.

(U)THE PROJECTILE EMPLOYS A HOMEMADE, POWDER TIME DELAY FUZE THREADED INTO THE GRENADE BODY. UPON SETBACK, THE FIRING PIN OVERCOMES THE INERTIA OF THE RETAINING SPRING AND STRIKES THE IGNITER. THE IGNITER THEN INITIATES THE 8-SECOND DELAY ELEMENT, WHICH IGNITES A SMALL POWDER CHARGE PLACED WITHIN THE CENTER OF THE PROJECTILE BODY. THE HOMEMADE BLACK POWDER CHARGE (CHARCOAL, SALTPETER, AND SULFUR) IS CONTAINED WITHIN A WAX-IMPREGNATED PAPER CONE. THE LOW-ORDER DETONATION OF THIS CHARGE CAUSES THE PROJECTILE BODY TO SEPARATE AND TO DISPERSE THE CS AGENT.

(U)THE PROJECTILE IS FABRICATED FROM 0.6-MM GALVANIZED IRON OR STEEL; ALL SEAMS ARE ROLLED AND CRIMPED. THE BODY IS IN TWO SECTIONS; EACH SECTION HAS A METAL CYLINDER WITH A CONICAL END. THE CONE OF THE UPPER SECTION IS THREADED TO RECEIVE THE FUZE. THE CYLINDRICAL PORTION OF THE UPPER SECTION OF THE PROJECTILE BODY IS INSERTED WITHIN THE CYLINDRICAL PORTION OF THE LOWER SECTION. WHEN THE ROUND DETONATES, THE PROJECTILE BODY RUPTURES OR SEPARATES INTO THE UPPER AND LOWER SECTIONS. THE FORCE OF THE BLAST ALSO RUPTURES THE PLASTIC BAGS WHICH CONTAIN THE CS AGENT, AND THE AGENT IS DISPERSED. WIND VELOCITY AND TERRAIN CHARACTERISTICS DETERMINE THE DOWNWIND AREA THAT IS AFFECTED.

(U)THE FOUR-FIN STABILIZER ASSEMBLY IS ATTACHED TO THE PROJECTILE BODY BY A SCREW, WHICH PASSES THROUGH A WASHER IN THE CONE OF THE LOWER SECTION INTO THE TOP OF THE STABILIZER ASSEMBLY. THE BOOM OF THE STABILIZER ASSEMBLY IS FABRICATED FROM A BRASS CARTRIDGE CASE OF A U.S. 20-MM MACHINEGUN ROUND. FOUR STABILIZER FINS (TWO PAIRS) MADE OF 2-MM SHEET METAL ARE RIVETED TO THE CARTRIDGE CASE AT EQUIDISTANT POINTS.

(U)THE CONFIGURATION OF THE PROJECTILE INDICATES THAT IT IS FIRED FROM A HANDMADE SPIGOT, A CUP-TYPE GRENADE LAUNCHER, OR A HANDMADE MORTAR TUBE.

DST-1600S-148-76-SUP 1 Original

NOMEN: PROJECTILE, 65-MM, MORTAR, CS-FILLED, W/PWD TIME DELAY FUZE (U) ITEM 17

FOM-1311-9-2-65-1-A

PRODUCED/ADOPTED: ?/1968 COUNTRY: N. VIETNAM

CURRENT STATUS: --- IN MILITARY USE IN VIETNAM

NATIVE USING WEAPONS: - ?

COMPLETE ROUND:
- CALIBER ---------- 65 MM
- TYPE ------------- HANDMADE (CS FILLED)
- MODEL ------------ ?
- WEIGHT ----------- .626 KG
- LENGTH OVERALL -- 304.0 MM
- BODY MATERIAL --- GALVANIZED IRON OR STEEL
- FILLER
  - -WEIGHT ------- APPROX .11 KG
  - -MATERIAL ----- RIOT CONTROL AGENT CS
- FUZE
  - -TYPE ---------- POWDER TIME DELAY
  - -MODEL --------- HANDMADE
- IDENTIFYING-
  - MARKINGS ------ ?

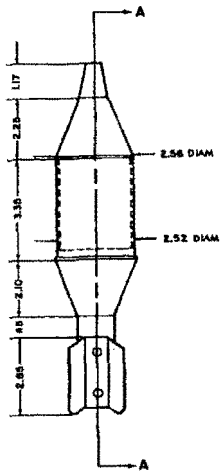
PROPELLANT:
- TYPE ------------- ?
- WEIGHT FULL-
  - CHARGE --------- ?
- CONFIGURATION ---- ?

PERFORMANCE:
- EFF FRAG RADIUS - ?
- LETHAL AREAS ---- N/A

REMARKS:

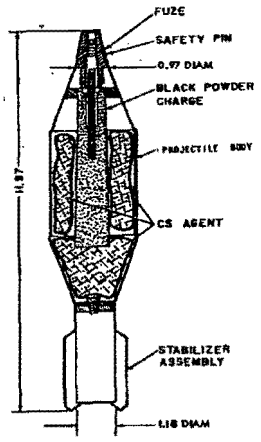
Original
NOMEN: PROJECTILE, 65-MM, MORTAR, CS-FILLED, W/PWD TIME DELAY FUZE (U)
PRODUCED/ADOPTED: 7/1968

DST-1600S-148-76-SUP 1
ITEM 17
FDM-1311-9-2-65-1-8
COUNTRY: N. VIETNAM



OVERALL VIEW

Neg. 515285 (UNCLASSIFIED)



SECTIONAL VIEW

Neg. 515286 (UNCLASSIFIED)

Original

DST-1600S-148-76-SUP 1

NOMEN: MINE, CHEMICAL, CS, IMPROVISED (U)

ITEM 18

NATIVE DES: LAUNCH BOMB 320 ?
PRODUCED/ADOPTED: ?/?

FDM-1345-9-1-14-A
COUNTRY: NORTH VIETNAM

(U)THIS MINE IS A CRUDE CS-FILLED DEVICE THAT CAN BE EXPLODED AT EMPLACED POSITIONS OR USED AS A PROJECTILE. IN EITHER CASE, THE CS IS WRAPPED IN NYLON AND BURLAP AND TIED INTO A COMPACT BUNDLE WITH ROPE OR WIRE. AS A PROJECTILE, THE DEVICE IS LAUNCHED BY AN EXPLOSIVE CHARGE PLACED IN THE BOTTOM OF A SHAPED PIT DUG IN THE GROUND; THE EARTH IS REPLACED IN THE PIT, AND THE CS-BUNDLE IS LAID ON THE SURFACE ABOVE THE EXPLOSIVE.

(U)SPECIFICATIONS FOR LAUNCHING 20 KG OF CS REQUIRE A PIT 1 M LONG, 0.4 M WIDE, AND 0.5 M DEEP AND A PROPELLANT CHARGE OF 4 KG OF SMALL TNT BLOCKS ARRANGED IN THREE ROWS. EXPLOSIVE ELEMENTS INCLUDE TNT, PRIMER, BLASTING CAP, AND A FUZE THAT CAN BE TIMED FOR AN AIR OR GROUND BURST. THE TNT IS FIRED ELECTRICALLY BY BLASTING CAPS FROM A SAFE DISTANCE. THE USUAL RANGE, ABOUT 297 M, CAN BE INCREASED TO 379 M. INSTRUCTIONS INCLUDE DETAILED GUIDANCE ON SHAPING THE LAUNCHING PIT AND ON AIMING. AT THE SURFACE, THE PIT IS RECTANGULAR; ITS FLAT WALLS SLOPE INWARD TOWARD THE FLAT BOTTOM, WHICH IS SLANTED 40 TO 50 DEGREES (PERPENDICULAR TO THE LINE OF TRAJECTION). THE PIT IS ORIENTED WITH A LINE OF AIMING STAKES.

Neg. 512065

(UNCLASSIFIED)

DST-1600S-148-76-SUP 1

Original
ITEM 18

NOMEN: MINE, CHEMICAL, CS, IMPROVISED (U)

FOM-1345-9-1-14-A

PRODUCED/ADOPTED: ?/?

COUNTRY: NORTH VIETNAM

CURRENT STATUS: --- IMPROVISED

COMPLETE MINE:
- TYPE ---------- CHEMICAL (CS)
- LENGTH ---------- ?
- WIDTH ---------- ?
- MAX DIAMETER ---- ?
- HEIGHT ---------- ?
- WEIGHT ---------- 20 KG ?
- ACTUATING FORCE - N/A

CASE:
- MATERIAL -------- ?
- THICKNESS ------- ?
- WEIGHT ---------- ?
- FUZE WELLS-NO --- NONE
- SERRATIONS-NO --- NONE

FILLERS:
- MAIN CHARGE
  - -TYPE --------- TNT
  - -WEIGHT ------- ?
- BOOSTER CHARGE
  - -TYPE --------- N/A
  - -WEIGHT ------- N/A
- PROPELLING CHARGE
  - -TYPE --------- ?
  - -WEIGHT ------- ?
- METAL FILLER
  - -TYPE --------- N/A
  - -WEIGHT ------- N/A

FUZE:
- MODEL ---------- ?
- TYPE ----------- ?
- SAFETY DEVICE(S) ?

PERFORMANCE:
- EFFECTIVE FRAG
  - RADIUS -------- N/A
- EFFECTIVE BLAST
  - RADIUS -------- N/A
- MAX PENETRATION - N/A
- HGT REACHED AT
  - DETONATION ---- ?

REMARKS:

Original

DST-1600S-148-76-SUP 1

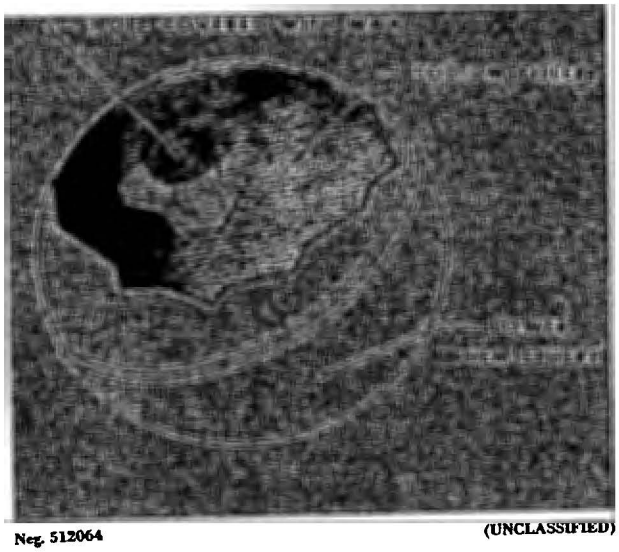
NOMEN: INCENDIARY DEVICE, SODIUM, MODEL ? (U)

ITEM 19

NATIVE DES: ?
PRODUCED/ADOPTED: ?/?

FOM-1345-9-1-13-A
COUNTRY: NORTH VIETNAM

(U)THIS INCENDIARY DEVICE IS A SABOTAGE WEAPON CONSTRUCTED OF TWO SHEET METAL HEMISPHERES OF APPROXIMATELY 8 MM DIAMETER WHICH HAVE BEEN WELDED TOGETHER. EACH HEMISPHERE HAS A HOLE COVERED WITH WAX AND PAPER TO EXCLUDE MOISTURE. THE DEVICE CONTAINS SODIUM SUSPENDED IN A TARLIKE SUBSTANCE. WHEN THE DEVICE IS EMPLACED IN WATER, THE WAX AND PAPER SEALS ARE REMOVED TO PERMIT MOISTURE TO ENTER. THE SUBSEQUENT WATER-SODIUM REACTION PRODUCES SMOKE AND FLAME THROUGH THE TWO HOLES FOR 4 TO 5 S TO A DISTANCE OF ABOUT 1 M. THE CASE, WHICH REMAINS INTACT AFTER THE CONTENTS HAVE BURNED OUT, SMELLS OF KEROSENE AND FEELS AS IF IT WERE COVERED WITH SOAP. THE DEVICE IS ESPECIALLY EFFECTIVE IN AREAS SUBJECT TO GAS OR OIL SEEPAGE AND MAY BE PLACED IN BOAT BILGES OR CONTAINERS OF WATER TO IGNITE FLAMMABLE MATERIALS IN DEPOTS.



Neg. 512064

(UNCLASSIFIED)

DST-1600S-148-76-SUP 1

Original
ITEM - 19

NOMEN: INCENDIARY DEVICE, SODIUM, MODEL ? (U)

FOM-1345-9-1-13-A
COUNTRY: NORTH VIETNAM

PRODUCED/ADOPTED: ?/?

CURRENT STATUS: - STANDARD

TYPE: ---------- INCENDIARY

PHYSICAL DATA:
LENGTH -------- N/A
DIAMETER------- 4 CM
WEIGHT -------- 43 G
FILLING ------- SODIUM IN TARLIKE SUBSTANCE

MARKING: ------- ?

REMARKS:

Original

DST-1600S-148-76-SUP 1

NOMEN: SMOKE POT, MODEL ?, COPY OF SOVIET DM-11 (U)

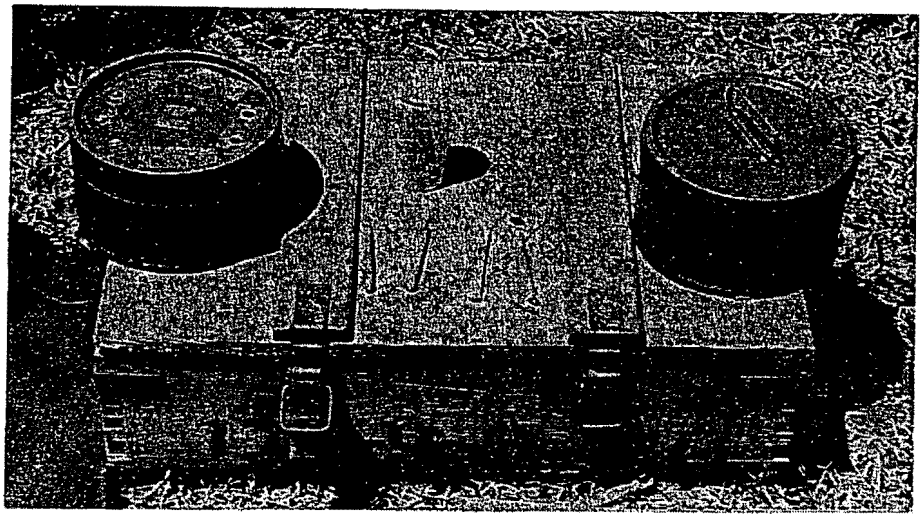
ITEM 29

NATIVE DES: ?
PRODUCED/ADOPTED: ?/1960 ?

FOM-1365-5-4-1-A
COUNTRY: PRC

(U)THIS SMOKE POT, CAPTURED FROM COMMUNIST FORCES IN SE ASIA, WAS IDENTIFIED IN THE FIELD AS A PRC VERSION OF THE SOVIET MODEL DM-11. EXTERNAL CHARACTERISTICS WERE IDENTICAL TO THE SOVIET PRODUCT, BUT MARKINGS WERE LACKING EXCEPT ON THE WOODEN PACKING CASE WHICH CONTAINED SIX POTS AND A PLASTIC VIAL OF 12 IGNITION MATCHES. THE CHEMICAL COMPOSITION OF THE SMOKE MIXTURE WAS NOT DETERMINED BUT WAS ASSUMED TO BE SIMILAR TO THE SMOKE MIXTURE IN THE SOVIET DM-11.

(U)THE SMOKE POT IS EQUIPPED WITH A REMOVABLE METAL LID; THE LID AND POT ARE HELD TOGETHER BY AN ENCIRCLING BAND OF BLACK TAPE. WHEN THE LID IS REMOVED, 10 SMOKE EMISSION HOLES AND A CENTRALLY LOCATED IGNITION HOLE ARE VISIBLE. THE HOLES ARE COVERED BY STRIPS OF SILVER COLORED TAPE UNTIL TIME OF USE. IN FIELD TESTS A POT PRODUCED SCREENING SMOKE FOR APPROXIMATELY 5 MINUTES.



Neg. 516527

(UNCLASSIFIED)

DST-1600S-148-76-SUP 1 Original

NOMEN: SMOKE POT, MODEL ?. COPY OF SOVIET DM-11 (U) ITEM 29

FOM-1365-5-4-1-A

PRODUCED/ADOPTED: ?/1960 ? COUNTRY: PRC

CURRENT STATUS: STANDARD

IGNITION METHOD ------- FRICTION MATCH

PHYSICAL DATA:
- MATERIAL
  - -CONTAINER -------- SHEET METAL
  - -FILLING ---------- ?
- WEIGHT
  - -TOTAL ----------- 2.3 KG
  - -FILLING ---------- 1.7 KG
- DIMENSIONS
  - -HEIGHT ---------- 11.4 CM
  - -DIAMETER --------- 16.5 CM

PERFORMANCE:
- DELAY TIME ---------- ?
- BURNING TIME -------- APPRCX 5 MIN
- SMOKE COLOR --------- BASICALLY WHITE

REMARKS:

Original

DST-1600S-148-76-SUP 1

NOMEN: MASK, PROTECTIVE, MODEL PK-1 (RESPIRATOR AND GOGGLES) (U)

ITEM 33

NATIVE DES: ?

FOM-4240-5-1-1-A

PRODUCED/ADOPTED: 7/1967 ?

COUNTRY: PRC

(U)THE MODEL PK-1 MASK ASSEMBLY PROVIDES NO PROTECTION AGAINST TOXIC VAPORS AND POOR PROTECTION AGAINST SUCH AEROSOLIZED CW PARTICLES, SMOKE AND RIOT-CONTROL AGENTS, AND AGAINST BW AGENTS. THE ASSEMBLY CONSISTS OF A PAIR OF GOGGLES AND A SMALL RESPIRATOR THAT BARELY COVERS THE NOSE AND MOUTH. BOTH ITEMS ARE MADE OF GLOSSY GREEN RUBBER AND ARE HELD ON BY HEADSTRAPS. SPECIMENS OF THE PK-1, CAPTURED IN VIETNAM IN 1967, WERE EQUIPPED WITH A SMALL DRUM-SHAPED FILTER CANISTER, PRC MODEL 66 (FOM-4240-5-2-1), WHICH HAS EXCELLENT PROTECTIVE CHARACTERISTICS.

(U)THE MASK AND GOGGLES LEAVE MUCH OF THE FACE AND HEAD EXPOSED. WHEN WORN SEPARATELY, EACH ITEM FITS SATISFACTORILY, BUT WHEN WORN TOGETHER THEY CONFLICT OR OVERLAP AT THE BRIDGE OF THE NOSE AND PERMIT AIR LEAKAGE. THE TIME REQUIRED TO DON AND ADJUST BOTH ITEMS IS ESTIMATED TO BE UP TO 30 SECONDS. BOTH ITEMS HAVE SPONGE RUBBER GASKETS GLUED AROUND THEIR INNER PERIPHERIES; IN THE SPECIMENS OBSERVED, THE GASKETS HAD BECOME UNGLUED SO THAT THEIR SEALING EFFECTS WERE INHIBITED. THE GOGGLES ARE NOT PROVIDED WITH ANY MEANS OF PREVENTING INTERNAL FOGGING OF THE LENS. THE RESPIRATOR IS EQUIPPED WITH THREE VALVES THAT CONTROL THE DIRECTION OF AIRFLOW. THE VALVE ASSEMBLIES, WHICH ARE SIMILAR TO THOSE IN SOVIET MASKS, CONTAIN DISKS OF THIN, FLEXIBLE RUBBER. ONE VALVE, LOCATED AT THE TOP OF THE AIR INLET, ADMITS FILTERED AIR. EXHALED AIR ESCAPES THROUGH A DOUBLE OUTLET VALVE IN THE FRONT OF THE MASK. (DOUBLE VALVES ARE MORE EFFECTIVE THAN SINGLE VALVES IN PREVENTING BACK LEAKAGE.) THE OUTERMOST DISK OF THE DOUBLE VALVE IS NOT PROVIDED WITH A GUARD TO PROTECT IT AGAINST INJURY OR FOREIGN OBJECTS THAT MIGHT INHIBIT SEATING. THE SCREW THREADS OF THE AIR INLET, WHICH ARE STANDARD FOR SOVIET (AND PRC) MILITARY CANISTERS AND HOSES, PERMIT THE USE OF VARIOUS TYPES OF CANISTERS IF PROVISIONS ARE MADE TO SUPPORT THEIR WEIGHT. ALTHOUGH THE PK-1 DISPLAYS SEVERAL VULNERABILITIES, IT IS SMALL, LIGHTWEIGHT, AND RELATIVELY INEXPENSIVE. TWO-PIECE ASSEMBLIES OF THIS TYPE ARE USED IN INDUSTRY, BUT MOST COUNTRIES CONSIDER THEM UNSUITED FOR CBR USE.

DST-1600S-148-76-SUP 1 Original

NOMEN: MASK, PROTECTIVE, MODEL PK-1 (RESPIRATOR AND GOGGLES) (U) ITEM 33

FOM-4240-5-1-1-A

PRODUCED/ADOPTED: ?/1967 ? COUNTRY: PRC

CURRENT STATUS: USED IN COMBAT

FACEPIECE, TYPE: HEAD HARNESS

MATERIALS:
- FACEPIECE ---------- RUBBER
- CANISTER ---------- SEE TEXT
- HOSE ---------- N/A
- BREATHING BAG ----- N/A
- REGENERATING CART - N/A
- CARRIER ---------- COTTON CLOTH

DIMENSIONS:
- FACEPIECE ---------- *1
- CANISTER ---------- SEE TEXT
- HOSE ---------- N/A
- CARRIER
  - -HEIGHT --------- 15.2 CM (ESTIMATED)
  - -WIDTH ---------- 22.9 CM (ESTIMATED)
  - -LENGTH --------- 10.1 CM (ESTIMATED)
- REGENERATING CART - N/A
- BREATHING BAG
  - -HEIGHT --------- N/A
  - -WIDTH ---------- N/A
  - -LENGTH --------- N/A
- OXYGEN CYLINDER --- N/A

WEIGHT:
- FACEPIECE ---------- *2
- CANISTER ---------- SEE TEXT
- HOSE ---------- N/A
- CARRIER ---------- 227 G (ESTIMATED)
- REGENERATING CART - N/A
- BREATHING BAG ----- N/A
- OXYGEN CYLINDER --- N/A
- TOTAL ---------- 454+ G

PERFORMANCE:
- VISIBILITY ---------- PROBABLY SATISFACTORY
- COMFORT ---------- ?
- COMMUNICATION ------- ?

FACEPIECE PENETRATION ?

LEAKAGE-
- -PERIPHERAL ------- HIGH
- -OUTLET VALVE ----- SATISFACTORY

EFFECT OF COLD-
- -HOSE ---------- N/A
- -EYEPIECE --------- SUSCEPTIBLE TO FOGGING
- -FACEPIECE -------- ?
- -DEFLECTOR TUBES--- N/A

ACTIVATING UNIT:
- INITIATOR ---------- N/A
- ACTIVATING CHEM ----- N/A

OXYGEN CYLINDER:
- VOLUME ---------- N/A
- FILLING PRESS ------- N/A
- OPN PRESSURE -------- N/A
- OXYGEN CAPACITY (STP) N/A

DURATION OF OXYGEN SUPPLY: N/A

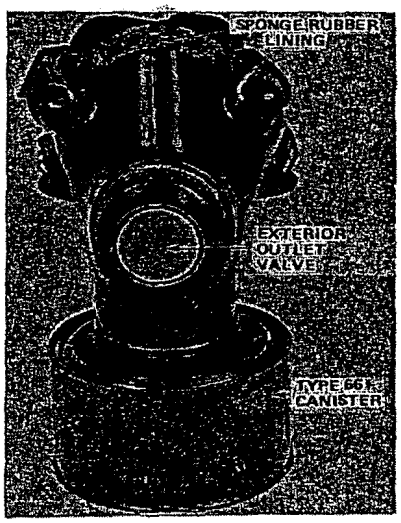
REMARKS:
1/ HEIGHT, 11.2 CM; WIDTH, 9.4 CM; DEPTH, 9.7 CM (APPROXIMATE)

2/ RESPIRATOR, 142 GRAMS, GOGGLES, 85.1 GRAMS

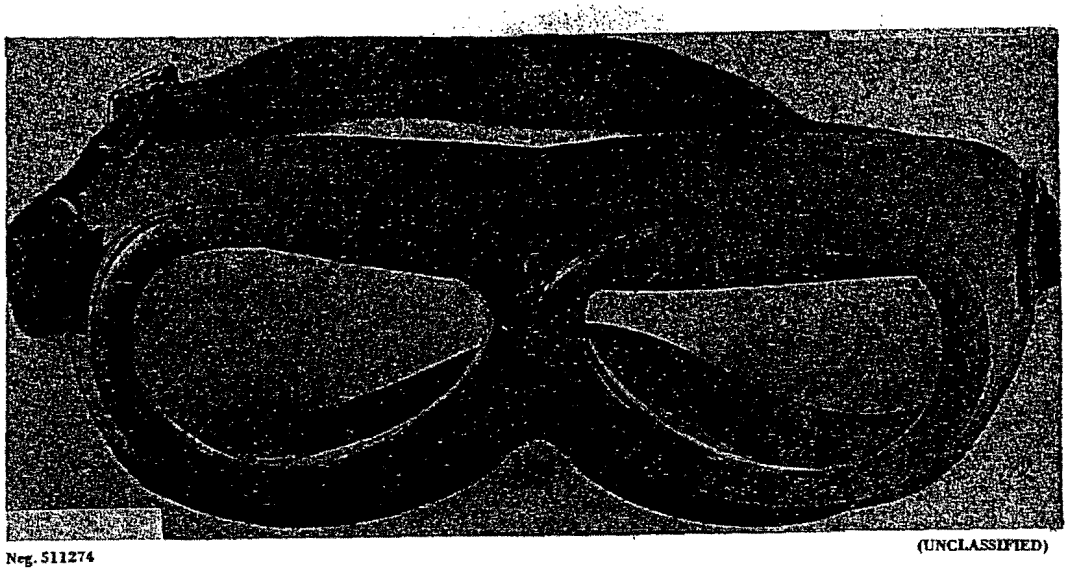
Original

NOMEN: MASK, PROTECTIVE, MODEL PK-1 (RESPIRATOR AND GOGGLES) (U)

PRODUCED/ADOPTED: ?/1967 ?



Neg. 511260 (UNCLASSIFIED)



Neg. 511274 (UNCLASSIFIED)

DST-1600S-148-76-SUP 1 Original

NOMEN: MASK, PROTECTIVE, MODEL PK-1 (RESPIRATOR AND GOGGLES) (U) ITEM 33

FOM-4240-5-1-1-B

PRODUCED/ADOPTED: 7/1967 ? COUNTRY: PRC

Neg. 511297 (UNCLASSIFIED)

Neg. 511548 (UNCLASSIFIED)

Original

DST-1600S-148-76-SUP 1

NOMEN: MASK, PROTECTIVE, INFLATABLE, WITH GREEN PLASTIC CANISTER (U) ITEM 34

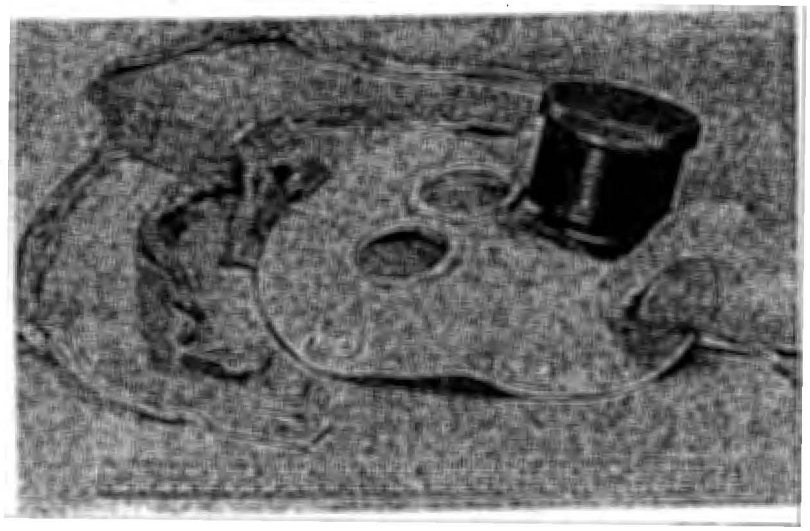
NATIVE DES: ?
PRODUCED/ADOPTED: ?/1968 ?

FOM-4240-1-1-1-A
COUNTRY: UNIDENTIFIED

(U)THIS MASK, USED BY NORTH VIETNAMESE VIET CONG FORCES IN 1968, PROVIDES POOR PROTECTION AGAINST CW AGENTS, INCLUDING RIOT CONTROL AGENTS. THE UNIT IS A HARNESS-TYPE RUBBER FACEPIECE TO WHICH A PLASTIC CANISTER IS ATTACHED. THIS MASK REPRESENTS AN AWARENESS OF THE NEED FOR CW PROTECTION AND AN EFFORT TO PROVIDE THIS PROTECTION. ALTHOUGH THIS MASK EXHIBITS AN ADVANCE IN IMPROVISATION OVER FIELD-FABRICATED MODELS, IT OFFERS NO SIGNIFICANT INCREASE IN PROTECTION. IT MAY, HOWEVER, ENCOURAGE INCREASED CONFIDENCE IN THE WEARER.

(U)WHEN THE CANISTER WAS TESTED WITH DOP AEROSOL, 82% LEAKAGE OCCURRED. SIGNIFICANT LEAKAGE WAS DETECTED AT THE OUTLET VALVE. WHEN CYANOGEN CHLORIDE AND CHLOROPICRIN WERE USED, CANISTER BREAKDOWN OCCURRED IN LESS THAN 12 SECONDS. ALTHOUGH THE CANISTER PROVIDES LITTLE OR NO PROTECTION, THE FACEPIECE MATERIAL HAS GOOD RESISTANCE TO PERMEATION OF LIQUID CW AGENTS. THE MASK REQUIRES APPROXIMATELY 125 CU CM OF AIR AT 0.03 KG/SQ CM TO INFLATE THE FACE-SEAL CHAMBER (BY MOUTH) IN 1 MINUTE; NO MEASURABLE AIR LEAKAGE OCCURRED IN THE 4-HOUR TESTING PERIOD.

(U)THE RUBBER MASK IS GRAY, HAS CIRCULAR GLASS EYE LENSES, AND HAS A GREEN PLASTIC ORO-NASAL INSERT HOUSED IN A POCKET OF THE FACEPIECE. TWO PARTS OF THE INSERT PROJECT THROUGH THE FACEPIECE--ONE, ON THE RIGHT SIDE, IS A PROJECTION TO WHICH A FLEXIBLE, FLUTTER-TYPE, OUTLET VALVE IS SECURED (BY A RUBBER BAND); AND A PROJECTION, AT THE LEFT CHEEK, ONTO WHICH A FILTER CANISTER SCREWS. AN INFLATABLE RUBBER AIR CHAMBER IS MOLDED TO THE INNER PERIPHERY OF THE FACEPIECE TO PROVIDE AN AIRTIGHT SEAL BETWEEN THE FACE AND THE MASK. THE CHAMBER IS INFLATED THROUGH A RUBBER TUBE LOCATED AT THE CHIN POSITION; THIS TUBE IS FOLDED OVER ITSELF AND BOUND WITH A RUBBER BAND TO SECURE AGAINST LEAKAGE. A HEAD HARNESS WITH ENCLOSED METAL SPRINGS IS ATTACHED TO FIVE O RINGS--TWO AT THE TEMPLES, TWO AT THE CHEEKS, AND ONE AT THE CENTER OF THE FOREHEAD.



Neg. 511275

(UNCLASSIFIED)

DST-1600S-148-76-SUP 1 Original

NOMEN: MASK, PROTECTIVE, INFLATABLE, WITH GREEN PLASTIC CANISTER (U) ITEM 34

FOM-4240-1-1-1-A

PRODUCED/ADOPTED: ?/1968 ? COUNTRY: UNIDENTIFIED

CURRENT STATUS: MILITARY USE, VIET NAM,

FACEPIECE, TYPE: HEAD HARNESS

MATERIALS:
- FACEPIECE ---------- RUBBER
- CANISTER ---------- PLASTIC (POLYETHYLENE)
- HOSE ---------- N/A
- BREATHING BAG ----- N/A
- REGENERATING CART - N/A
- CARRIER ---------- ?

DIMENSIONS:
- FACEPIECE ---------- 23.6 CM WIDE; 24.1 CM HIGH
- CANISTER ---------- 7.6 CM WIDE, 6.1 CM HIGH
- HOSE ---------- N/A
- CARRIER
  - -HEIGHT ---------- ?
  - -WIDTH ---------- ?
  - -LENGTH ---------- ?
- REGENERATING CART - N/A
- BREATHING BAG
  - -HEIGHT ---------- N/A
  - -WIDTH ---------- N/A
  - -LENGTH ---------- N/A
- OXYGEN CYLINDER --- N/A

WEIGHT:
- FACEPIECE ---------- 159 G
- CANISTER ---------- 62 G
- HOSE ---------- N/A
- CARRIER ---------- ?
- REGENERATING CART - N/A
- BREATHING BAG ----- N/A
- OXYGEN CYLINDER --- N/A
- TOTAL ---------- 221+ G

PERFORMANCE:
- VISIBILITY ---------- ?
- COMFORT ---------- FAIR
- COMMUNICATION ------- POOR

FACEPIECE PENETRATION #1

LEAKAGE-
- -PERIPHERAL -------- ?
- -OUTLET VALVE ----- SIGNIFICANT

EFFECT OF COLD-
- -HOSE ---------- N/A
- -EYEPIECE ---------- ?
- -FACEPIECE -------- FLEXIBLE AFTER 72 H AT 54 DEG C
- -DEFLECTOR TUBES--- N/A

ACTIVATING UNIT:
- INITIATOR ---------- N/A
- ACTIVATING CHEM ----- N/A

OXYGEN CYLINDER:
- VOLUME ---------- N/A
- FILLING PRESS ------- N/A
- OPN PRESSURE -------- N/A
- OXYGEN CAPACITY (STP) N/A

DURATION OF OXYGEN SUPPLY: N/A

REMARKS:
1/ GOOD RESISTANCE TO LIQUID AGENTS:
MUSTARD (HD), 77 AND 87 MIN; SARIN (GB),
210 MIN; VX, 480 AND 1440 MIN

Original DST-1600S-148-76-SUP 1

NOMEN: KIT, REPAIR PARTS TYPE 59, FOR SHM-1 PROTECTIVE MASK (U) ITEM 35

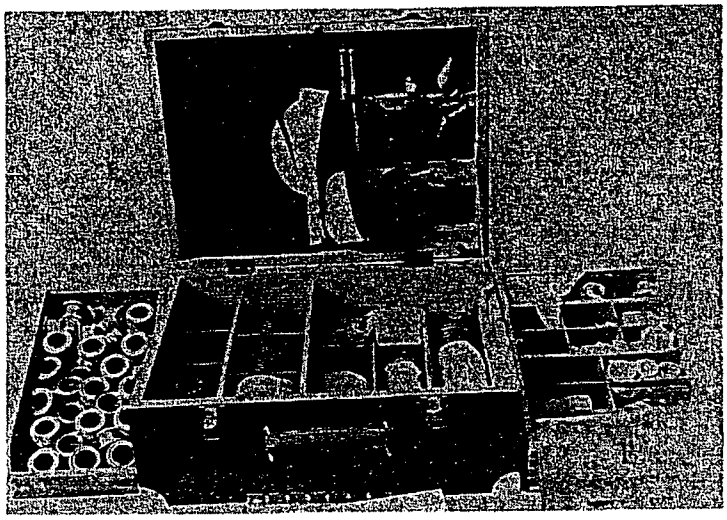
NATIVE DES: ? FOM-4950-5-3-4-1-A
PRODUCED/ADOPTED: ?/1962 ? COUNTRY: PRC

(U)THE MODEL 59 REPAIR PARTS KIT IS DESIGNED TO SUPPLY REPAIR PARTS AND SOME OF THE NECESSARY TOOLS FOR THE REPAIR OF THE SHLEM MASK (FOM-4240-2-1-1) AND THE MODIFIED SHLEM (BLACK-RUBBER) MASK. THIS KIT HAS ENOUGH SPARE PARTS, EXCEPT FACEPIECES, TO REPAIR 20 SHLEM MASKS. THE OTHER NECESSARY TOOLS ARE PROVIDED IN THE TYPE 59 MAINTENANCE AND TESTING KIT (FOM-4950-5-3-4-2).

(U)THE CARRYING CASE, CONSTRUCTED OF 1.3 CM PLYWOOD, IS PAINTED DARK GREEN, AND THE CORNERS ARE REINFORCED WITH METAL BRACES. THE LID IS ATTACHED TO THE BACK OF THE CARRYING CASE BY HEAVY METAL HINGES AND IS SECURED IN THE CLOSED POSITION BY TWO METAL TRUNK LATCHES. ALSO ATTACHED TO THE FRONT OF THE CARRYING CASE IS A STURDY LEATHER CARRYING STRAP.

(U)WHEN THE NECESSARY REPAIRS ARE COMPLETED, THE TYPE 59 TESTING KIT IS USED TO VERIFY THAT ALL LEAKS HAVE BEEN ELIMINATED.

(U)THIS KIT WAS CAPTURED IN SOUTHEAST ASIA.



Neg. 511073 (UNCLASSIFIED)

DST-1600S-148-76-SUP 1 Original
NOMEN: KIT, REPAIR PARTS TYPE 59, FOR SHM-1 PROTECTIVE MASK (U) ITEM 35
FOM-4950-5-3-4-1-A
PRODUCED/ADOPTED: 7/1962 ? COUNTRY: PRC

CURRENT STATUS: --- STANDARD

PURPOSE: ---------- TO PROVIDE REPAIR PARTS FOR
- THE SHM-1 PROTECTIVE MASK

MATERIALS: -------- CONTAINER, WOODEN
- BOX

DIMENSIONS:
LENGTH ---------- 45.7 CM
WIDTH ---------- 36.1 CM
HEIGHT ---------- 21.3 CM
WEIGHT ---------- ?

COMPONENTS: ------- *1
-

MANUFACTURERS: ---- ?
-

MARKINGS: --------- ?
-

REMARKS:
1/ QUANTITIES AND NOMENCLATURE OF COMPONENTS

QUANTITY	NOMENCLATURE
1	NEEDLENOSE PLIERS
1	REGULAR PLIERS
1	TRIANGLE FILE
1	SCREWDRIVER
2	BRUSHES
1	PACKING LIST
3 EA	EMERY CLOTH
1 M	TARPAULIN
0.3 M	ADHESIVE TAPE
100 G	RUBBER FOR PATCHES
150 G	0.8-MM IRON WIRE
200 G	GLUE
100 G	TALC POWDER
1 EA	GAS CAN
1 EA	0.5-LITER PAINT CAN
15 M	WEBBING STRAP
55 EA	ASSORTED WASHERS
15 EA	SCREW PLUGS
15 EA	ADAPTERS
15 EA	SHORT CONNECTING TUBES
10 EA	SPRINGS
10 EA	INLET-VALVE-FRAME ADJUSTER
20 EA	EYELENS FRAMES

REMARK 1 CONTINUED

30 PIECES	EYELENS
20 BOXES	EYELENS PROTECTIVE SHIMS
25 EA	CONNECTING RINGS
25 EA	VALVE HOUSING
10 EA	SEWING NEEDLES
2 SPOOLS	THREAD
20 EA	INTERNAL OUTLET VALVES
20 EA	EXTERNAL OUTLET VALVES
20 EA	EXTERNAL OUTLET VALVE HOUSING

Original

DST-1600S-148-76-SUP 1

NOMEN: CANISTER (8.1 CM DIAMETER), MODEL ? (U)

ITEM 36

NATIVE DES: ?
PRODUCED/ADOPTED: ?/1967 ?

FOM-4240-1-2-1-A
COUNTRY: UNIDENTIFIED

(b)(1)

(U)THE CAN-TYPE CONTAINER IS PAINTED GREEN AND HAS ONE SEAM AND BOTH ENDS SOLDERED. CHARCOAL FILLS THE UPPER PORTION, AND A PAPER (PARTICULATE) FILTER, THE LOWER PORTION. INFLUENT AIR ENTERS A CIRCULAR HOLE IN THE BOTTOM END OF THE CANISTER AND TRAVELS UPWARD SEQUENTIALLY THROUGH THE FOLLOWING ITEMS:

1. A METAL PLATE PERFORATED WITH 3.18 MM HOLES.
2. A CELLULOSE PAPER FILTER.
3. A METAL PLATE PERFORATED WITH 3.18 MM HOLES.
4. A CHARCOAL FILTER.
5. A LAYER OF COTTON (WHICH IMPEDES THE FLOW OF FINES CHARCOAL PARTICLES).
6. A LAYER OF WOVEN FABRIC.
7. A METAL PLATE PERFORATED WITH 3.18 MM HOLES.
8. THE FILTERED AIR EXITS THROUGH THE THREADED NECK.

(U)ALTHOUGH THE PLACE OF ORIGIN IS UNKNOWN, THE CANISTER REFLECTS CHARACTERISTICS OF SOVIET MODELS: THE NECK THREADS FIT STANDARD SOVIET PROTECTIVE MASKS; THE INTERNAL CONSTRUCTION IS SIMILAR TO THAT OF SOME SOVIET CANISTERS; AND THE CHARCOAL FILTER'S IMPREGNANTS, DISTRIBUTION, FORM, AND PARTICLE SIZE ARE SIMILAR TO CHARACTERISTICS FOUND IN THE CHARCOAL FILTER OF SOVIET CANISTER MODEL MO-4U (FOM 4240-2-2-6).

DST-1600S-148-76-SUP 1
NOMEN: CANISTER (8.1 CM DIAMETER), MODEL ? (U)

Original
ITEM 36

FOM-4240-1-2-1-A.

PRODUCED/ADOPTED: ?/1967 ?

COUNTRY: UNIDENTIFIED

(b)(1)

APPARENT DENSITY ---- 0.62 G/ML
SPECTROGRAPHIC ANAL - #3

REMARKS:

(b)(1)

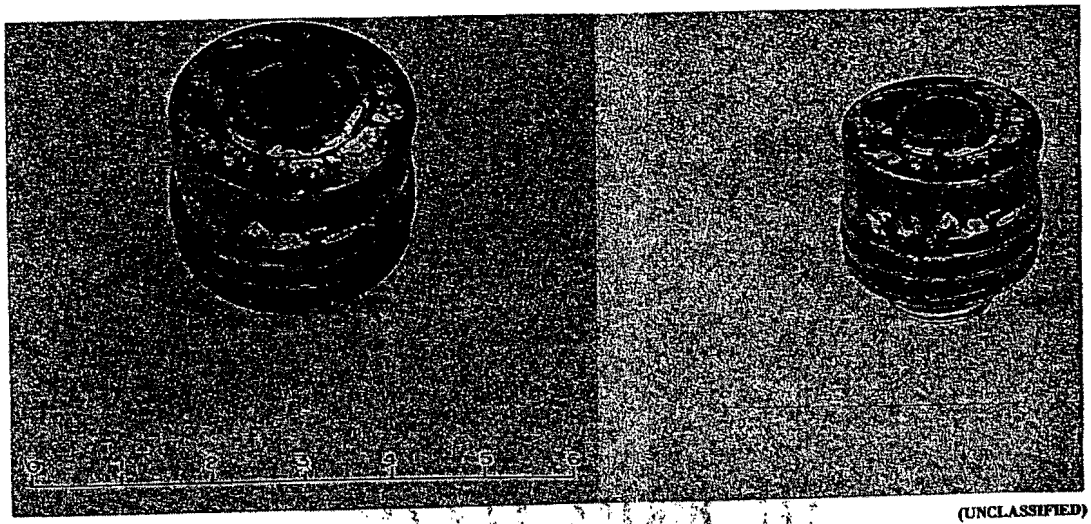
(b)(1)

Original

NOMEN: CANISTER (8.1 CM DIAMETER), MODEL 7 (U)

PRODUCED/ADOPTED: 7/1967 ?

DST-1600S-148-76-SUP 1
ITEM 36
FDN-4240-1-2-1-8
COUNTRY: UNIDENTIFIED



Neg. 509977 (UNCLASSIFIED)

Neg. 509976 (UNCLASSIFIED)

(Reverse Blank)

Original

DST-1600S-148-76-SUP 1

NOMEN: CANISTER, MODEL 66 (U)

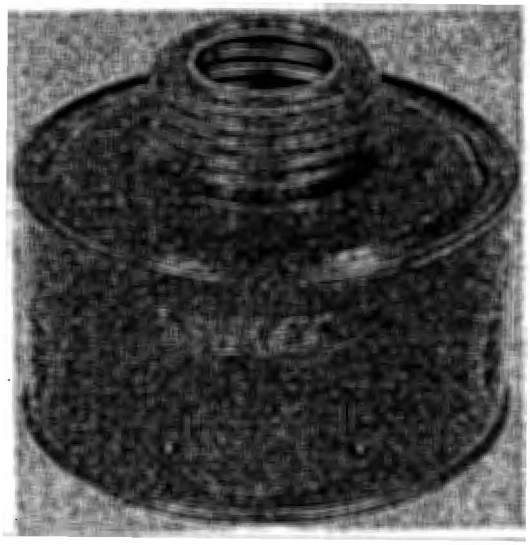
ITEM 37

NATIVE DES: ?
PRODUCED/ADOPTED: ?/1966

FOM-4240-5-2-1-A
COUNTRY: PRC

(U)THIS PRC CANISTER WAS USED BY NORTH VIETNAMESE FORCES IN COMBAT IN 1968. LABORATORY TESTS DISCLOSED THAT THE CANISTER WAS EFFECTIVE AGAINST ALL KNOWN TYPES OF CW STANDARD TOXIC AGENTS FOR SHORT PERIODS OF TIME AND THAT IT PROVIDED ADEQUATE PROTECTION AGAINST RIOT-CONTROL AGENT CS AND AGAINST SPORE-FORMING MICROORGANISMS CONSIDERED TO BE CANDIDATE BW AGENTS.

(U)THE SHEET-METAL CANISTER IS WELL CONSTRUCTED, IS PROVIDED WITH A SCREW CAP, AND IS PAINTED GREEN. THE CANISTER'S UPPER HALF CONTAINS CHARCOAL AND ITS LOWER HALF CONTAINS A PARTICULATE FILTER. THE CHARCOAL FILTER IS RETAINED BETWEEN TWO PERFORATED METAL PLATES: THE LOWER PLATE IS SEALED TO THE CANISTER WALL, AND THE UPPER PLATE IS PRESSED DOWNWARD AGAINST THE CHARCOAL BODY BY THREE COILED SPRINGS. THE CHARCOAL BODY COMPRISES A COARSE (LOWER) LAYER AND A FINE (UPPER) LAYER. THE PARTICULATE FILTER COMPRISES FIVE DOUBLE LAYERS OF COTTON CLOTH WITH A COTTON MAT FACE, AND PAPER AND METAL SEPARATORS. INFLUENT AIR ENTERS A HOLE IN THE BOTTOM OF THE CANISTER, TRAVELS LATERALLY THROUGH THE PARTICULATE FILTER, UPWARD THROUGH THE CHARCOAL, AND EXITS THROUGH THE THREADED NECK. THE NECK THREADS FIT THE PRC PROTECTIVE MASK MODEL PK-1 (FOM-4240-5-1-1) AND ALL KNOWN TYPES OF SOVIET MILITARY PROTECTIVE MASKS CURRENTLY IN USE.



Neg. 511253

(UNCLASSIFIED)

DST-1600S-148-76-SUP 1 Original

NOMEN: CANISTER, MODEL 66 (U) ITEM 37

FDM-4240-5-2-1-A

PRODUCED/ADOPTED: 7/1966 COUNTRY: PRC

CURRENT STATUS: STANDARD

WEIGHT ---------- 0.25 KG

MATERIALS:
- CONTAINER ---------- SHEET METAL
- ABSORBENT ---------- CHARCOAL

DIMENSIONS:
- LENGTH ---------- N/A
- WIDTH ---------- 8.9 CM
- HEIGHT ---------- 7.1 CM

ABSORBENT:
- TYPE ---------- *1
- WEIGHT ---------- 70.8 G
- VOLUME ---------- 17.8 KG
- HARDNESS ---------- ?
- IMPREGNANTS ---------- COPPER AND CHROMIUM
- APPARENT DENSITY ---- *2
- SPECTROGRAPHIC ANAL - *3

PARTICULATE FILTER:
- TYPE ---------- ACCORDION STACKED
- MATERIAL ---------- *4
- HEIGHT ---------- 1.9 CM
- EFFECTIVE AREA ------ ?

PERFORMANCE:
- DOP PENETRATION ----- *5
- AIR RESISTANCE ------ *5
- RESIST TO CHEM AGENTS *6

REMARKS:

1/ IMPREGNATED, EXTRUDED CHARCOAL

2/ UPPER LAYER, 0.572
LOWER LAYER, 0.632

3/ SIGNIFICANT AMOUNTS OF SILICON, IRON, ALUMINUM, COPPER AND CHROMIUM.

4/ LAYERS OF COTTON FABRIC AND COTTON MATTE

5/ THE RESULTS OF PENETRATION TESTS OF THREE CANISTERS, USING DIOCTYL PHTHALATE (DOP) PARTICLES OF 0.3 MICRON SIZE AND A FLOW RATE OF 32 LITERS PER MINUTE, WITH AIR RESISTANCE AT A FLOW RATE OF 85 LITERS PER MINUTE, ARE SHOWN BELOW:

CANISTER SPECIMENS	DOP PENETRATION %	AIR RESISTANCE (MM OF WATER)
A	0.005	59
B	0.015	58
C	0.008	60

6/ RESISTANCE TO CML AGENTS (TESTS OF 3 CANISTERS)

AGENT	AGENT CONCENTRATION (MG/L)	TYPE OF FLOW	FLOW RATE (L/MIN)	LIFE*** (MIN)
CK*	4.0	INTERMITTENT	50	0.45-0.68
PS**	50	CONSTANT	32	3.2 -4.1

*USED TO EVALUATE THE ABILITY OF CHARCOAL TO RESIST PENETRANTS.

**USED BECAUSE IT EXHIBITS ABSORPTION CHARACTERISTICS SIMILAR TO NERVE AGENTS BUT IS SAFE.

***THE RELATIVELY SHORT LIFE IS BELIEVED TO BE DUE TO THE THIN CHARCOAL FILTER RATHER THAN TO INEFFECTIVE IMPREGNANTS.

4

Original DST-1600S-148-76-SUP 1

NOMEN: MASK, CBR PROTECTIVE, TYPE ? (U) ITEM 40

NATIVE DES: ? FDM-4240-5-1-4-A
PRODUCED/ADOPTED: ?/1972? COUNTRY: PRC

(U)THIS MASK, TENTATIVELY IDENTIFIED AS A PRC PRODUCT, CONSISTS OF A GRAY FACEPIECE WITH TWO ELLIPTICAL PLASTIC EYELENSES AND ONE FILTER ELEMENT ENCLOSED IN AN ATTACHED RUBBER POUCH AT THE LEFT CHEEK. A TRIANGULAR HEAD PAD IS ATTACHED TO THE FACEPIECE BY SIX ADJUSTABLE HARNESS STRAPS, TWO AT THE FOREHEAD, TWO AT EYE LEVEL, AND TWO AT THE CHEEK POSITION. A DOUBLE-OUTLET VALVE WITH A THIN, GREEN RUBBER DISK FOR VOICE TRANSMISSION IS POSITIONED IN A GRAY PLASTIC HOUSING AT THE SNOUT POSITION. THE OUTLET VALVE AND THE VOICE TRANSMISSION DISK SLIP ONTO A CIRCULAR PLASTIC RING. THE OUTER PORTION OF THE RING HAS SLOTTED OPENINGS WITH AN ATTACHED CIRCULAR RUBBER GASKET FUNCTIONING AS THE SECOND OUTLET VALVE. DEFLECTOR TUBES DIRECT THE PATH OF THE INFLUENT AIR OVER EACH EYELENS. THE ENTIRE ASSEMBLY HAS A SCREWED-ON PLASTIC COVER WITH NUMEROUS CIRCULAR HOLES.

(U)THE FILTER ELEMENT IS ELLIPTICAL AND SUPPORTED BY AN ALUMINUM CAGE. THE ENTIRE ELEMENT CAN BE INSERTED OR REMOVED FROM THE POUCH HOUSING THROUGH A 6-CM HOLE IN THE FLEXIBLE RUBBER; HOWEVER, THE STRUCTURE DOES NOT APPEAR TO LEND ITSELF TO CHANGING THE FILTER IN THE FIELD. A POP-ON PLASTIC DISK WITH A CIRCULAR RUBBER CHECK VALVE COVERS THE OPENING TO THE CANISTER POUCH. THE FILTER ELEMENT CORE IS COMPOSED OF IMPREGNATED CHARCOAL BONDED TO PLASTIC AND SPUN GLASS FIBERS; THE CHARCOAL IS IMPREGNATED WITH LESS THAN 0.1% COPPER AND 0.90% CHROMIUM. AT A FLOW RATE OF 32 L/MIN, THE OVERALL DOP LEAKAGE WAS 0.005%. AIR RESISTANCE, AT A FLOW RATE OF 42.5 L/MIN, WAS 24 MM OF WATER.

(U)THIS MASK HAS EXCELLENT CAPABILITY TO FILTER AEROSOL PARTICLES AND SARIN VAPORS, BUT ITS ABILITY TO ABSORB CK VAPORS IS POOR. PROTECTION AGAINST SARIN IS 69 MIN, WHILE PROTECTION AGAINST CK IS LESS THAN 1 MIN.

NOMEN: MASK, CBR PROTECTIVE, TYPE ? (U)

Original
ITEM 40

PROCEDED/ADOPTED: ?/1972?

FOM-4240-5-1-4-A
COUNTRY: PRC

CURRENT STATUS: STANDARD

FACEPIECE, TYPE: HEAD HARNESS

MATERIALS:
- FACEPIECE ---------- GRAY RUBBER
- CANISTER ---------- N/A
- HOSE ---------- N/A
- BREATHING BAG ----- N/A
- REGENERATING CART - N/A
- CARRIER ---------- ?

DIMENSIONS:
- FACEPIECE ---------- 25X34 CM
- CANISTER ---------- FILTER ELEMENT IS 10X2X14 CM
- HOSE ---------- N/A
- CARRIER
  - -HEIGHT ---------- ?
  - -WIDTH ---------- ?
  - -LENGTH ---------- ?
- REGENERATING CART - N/A
- BREATHING BAG
  - -HEIGHT ---------- N/A
  - -WIDTH ---------- N/A
  - -LENGTH ---------- N/A
- OXYGEN CYLINDER --- N/A

WEIGHT:
- FACEPIECE ---------- 511 G INCLUDING FILTER
- CANISTER ---------- FILTER, 123 G
- HOSE ---------- N/A
- CARRIER ---------- ?
- REGENERATING CART - N/A
- BREATHING BAG ----- N/A
- OXYGEN CYLINDER --- N/A
- TOTAL ---------- 511 G

PERFORMANCE:
- VISIBILITY ---------- 50% UNIMPEDED
- COMFORT ---------- #1
- COMMUNICATION -------- 20 M MAXIMUM WITH NORMAL VOICE COMMANDS
- FACEPIECE PENETRATION MORE THAN 4 H FOR LIQUID MUSTARD
- LEAKAGE-
  - -PERIPHERAL -------- #1
  - -OUTLET VALVE ----- ?
- EFFECT OF COLD-
  - -HOSE ---------- N/A
  - -EYEPIECE ---------- FOGGING IS EXTENSIVE AT -18 DEG C
  - -FACEPIECE -------- ?
  - -DEFLECTOR TUBES--- ?

ACTIVATING UNIT:
- INITIATOR ---------- N/A
- ACTIVATING CHEM ----- N/A

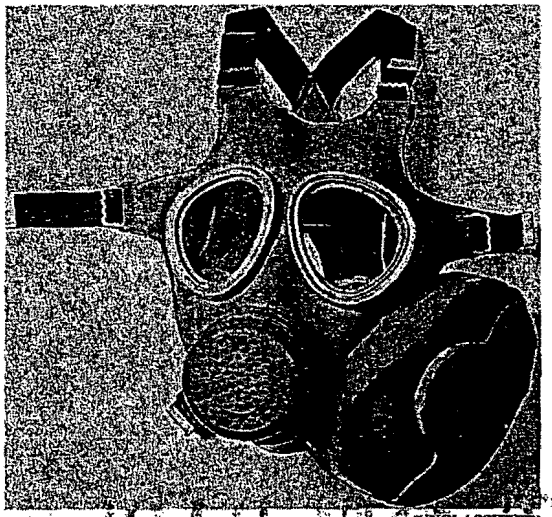
OXYGEN CYLINDER:
- VOLUME ---------- N/A
- FILLING PRESS -------- N/A
- OPN PRESSURE -------- N/A
- OXYGEN CAPACITY (STP) N/A

DURATION OF OXYGEN SUPPLY: N/A

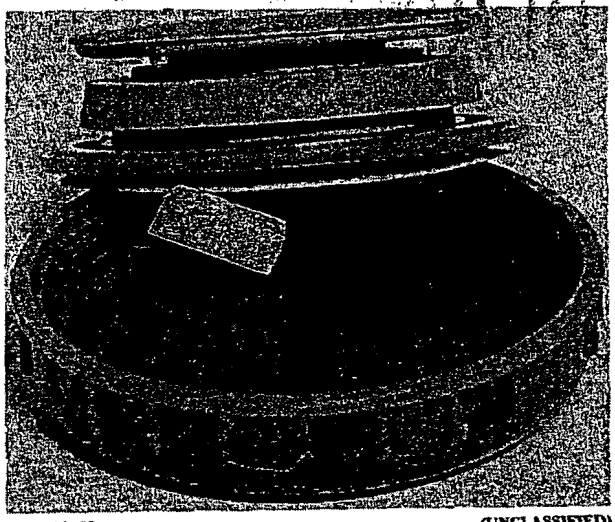
REMARKS:
1/ FIT AND COMFORT ARE GOOD FOR SUBJECTS WITH SMALL TO MEDIUM FACIAL FEATURES. NO PERIPHERAL LEAKAGE DETECTED WITH THESE SUBJECTS. SUBJECTS HAVING FACIAL FEATURES LARGER THAN MEDIUM WOULD HAVE A POOR AND UNCOMFORTABLE FIT WITH POSSIBLE PERIPHERAL LEAKAGE.

Original
NOMEN: MASK, CBR PROTECTIVE, TYPE 7 (U)
PRODUCED/ADOPTED: 7/1972?

DST-1600S-148-76-SUP 1
ITEM 40
FOM-4240-5-1-4-B
COUNTRY: PRC



Neg. 520122 (UNCLASSIFIED)



Neg. 520123 (UNCLASSIFIED)

Original

NOMEN: DETECTOR KIT, MODEL 1950 ? (U)

ITEM 48

NATIVE DES: ?
PRODUCED/ADOPTED: ?/1950 ?

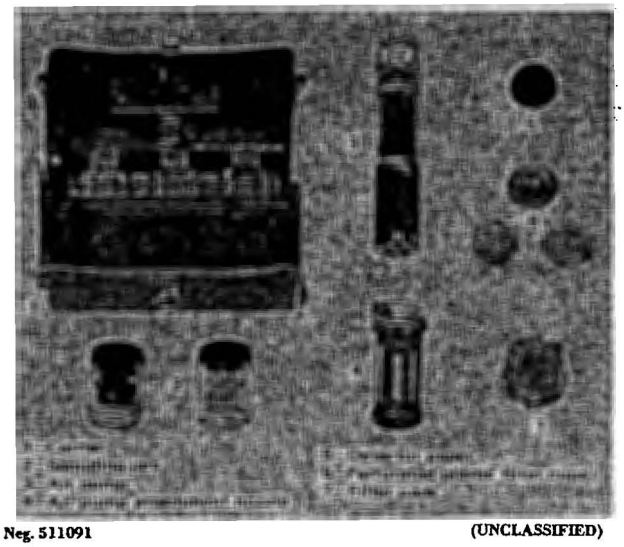
FOM-6665-5-3-1-A
COUNTRY: PRC

(U)THE PRC DETECTOR KIT, MODEL 1950?, CAN BE USED TO DETECT AND TO IDENTIFY A VARIETY OF CW AGENTS INCLUDING THE G-TYPE NERVE AGENTS; TO SAMPLE SMOKES AND UNIDENTIFIED TOXIC CHEMICALS IN THE AIR, ON TERRAIN, OR ON MATERIEL; AND TO IDENTIFY AN AGENT DETECTED BY AN AUTOMATIC DETECTOR.

(U)THE KIT CONTAINS: A HAND-OPERATED PISTON-TYPE AIRPUMP; NINE TYPES OF GLASS CW AGENT DETECTOR TUBES (10 TO A PACKET); TWO SAMPLING JARS; A PUMP ATTACHMENT NOZZLE; PERFORATED, PLASTIC FILTER CUPS; A PACKAGE OF ANTISMOKE FILTER PADS; AND A ROLL OF DETECTOR PAPER. THE KIT, CARRIED BY A SHOULDER STRAP, IS MOVED TO THE WEARER'S FRONT FOR TESTING.

(U)TO PERFORM A TEST BOTH ENDS OF THE DESIRED GLASS TUBES ARE BROKEN OFF. THE INTAKE END OF THE PUMP HAS FIVE HOLES FOR INSERTION OF THE DETECTOR TUBES FOR AGENT TESTING. THE ROTATION OF A KNURL (MARKED 1 TO 5) ABOVE A SPRING PERMITS SELECTION OF A SPECIFIC NUMBER OF INLET HOLES FOR TAKING MULTIPLE SAMPLES. THE OPPOSITE END OF THE PUMP HAS EIGHT HOLES WITH A METAL SPIKE INSIDE EACH HOLE FOR PIERCING THE AMPOULES IN THE TUBES. EACH HOLE IS COLOR MARKED FOR A SPECIFIC DETECTION TUBE. A REAGENT IN THE TUBE WILL UNDERGO A PREDICTABLE COLOR CHANGE IF A SPECIFIC CW AGENT IS PRESENT. THE TYPES OF TUBES INCLUDED IN THE KIT, THEIR COLOR-BAND CODES, AND OTHER CHARACTERISTICS ARE SHOWN IN TABLE 1.

(U)THE AIR PUMP, EXCEPT FOR SLIGHTLY DIFFERENT MEASUREMENTS, IS SIMILAR TO SOVIET MODELS DESCRIBED IN FOM-6665-2-3-8. THE KIT DIFFERS SLIGHTLY IN SIZE BUT IS GENERALLY SIMILAR TO THE SOVIET MODEL PKHR-54 (FOM-6665-2-3-1); HOWEVER, "1950", IMPRINTED ON THE LID, MAY INDICATE THAT THE PRC KIT IS A COPY OF AN EARLIER SOVIET MODEL. PACKETS OF DETECTOR TUBES IN THE KIT ARE MARKED WITH INSTRUCTIONS IN CHINESE.



Neg. 511091

(UNCLASSIFIED)

DST-1600S-148-76-SUP 1 Original
NOMEN: DETECTOR KIT, MODEL 1950 ? (U) ITEM 48
FDM-6665-5-3-1-A

PRODUCED/ADOPTED: ?/1950 ? COUNTRY: PRC

CURRENT STATUS: --- STANDARD PERFORMANCE: ------ EXCELLENT

TYPE: ---------- PORTABLE MAJOR COMPONENTS: - AIR PUMP, DETECTOR TUBES, - SAMPLING JARS,

PHYSICAL DATA:
APPEARANCE ------ *1
DIMENSIONS
-CASE --------- *2
-DETECTOR ----- *3
-PUMP --------- LG, 241 CM; DIAM, 3.3 CM
-WEIGHT ------- 2.2 KG

REMARKS:
1/ METAL CARRIER; PAINTED OLIVE GREEN

2/ HEIGHT: 14.5 CM
LENGTH: 24.1 CM
WIDTH: 10.2 CM

3/ GLASS TUBES: LENGTH 10 CM
OUTSIDE DIAMETER 6 MM

TABLE I. TUBE TYPES

RING COLOR CODE MARKINGS	AGENT DETECTED
ONE YELLOW	MUSTARD
TWO YELLOW	NITROGEN MUSTARD
THREE YELLOW	LEWISITE
ONE WHITE	CHLOROACETOPHENONE
TWO WHITE	ADAMSITE
ONE GREEN	PHOSGENE
TWO GREEN	CYANOGEN CHLORIDE
ONE RED	SARIN, SOMAN TABUN
ONE BLACK	HYDROGEN CYANIDE

Original

DST-1600S-148-76-SUP 1

NOMEN: DETECTOR KIT, TYPE 64 (U)

ITEM 49

NATIVE DES: ?

FDM-6665-5-3-2-A

PRODUCED/ADOPTED: 7/1964 ?

COUNTRY: PRC

(U)THE TYPE 64 DETECTOR KIT IS USED TO TEST WATER AND FOOD FOR CONTAMINATION BY TOXIC CHEMICAL AGENTS. ALTHOUGH ITS CAPABILITIES HAVE NOT BEEN VERIFIED, THE CHINESE CLAIM THE KIT CAN BE USED TO DETECT THE G-TYPE NERVE AGENTS; V-AGENTS; MUSTARD; NITROGEN MUSTARD; LEWISITE; ORGANOPHOSPHORUS INSECTICIDES; ARSENIC; MERCURY; LEAD; AND BARIUM. IN ADDITION TO THOSE, THE CHINESE CLAIM THE APPARATUS CAN DETECT "BIO-ALKALOID"; THIS TERM MAY BE THE RESULT OF A MISTRANSLATION OF CHINESE LANGUAGE INSTRUCTIONS CONTAINED IN A KIT. THE CHINESE TERM MAY MEAN "ALKALOID" SUBSTANCE, SUCH AS LYSERGIC ACID (A DERIVATIVE OF ERGOT).

(U)THE KIT HAS A SLIDING DRAWER IN THE LOWER PORTION WHICH CONTAINS: 2 FLAT GLASS BOTTLES, 1 EMPTY PLASTIC BOTTLE, 1 PIPETTE, 1 PENCIL, 1 THERMOMETER, 1 TEST TUBE CLEANING BRUSH, 1 METAL TEST TUBE HOLDER-CLAMP, 1 PAIR TWEEZERS, 1 SPATULA, AND 1 PLASTIC BOX FILLED WITH MATCHES.

(U)THE CARRIER'S HINGED LID CONTAINS A RACK WITH SPACES FOR 12 TEST TUBES, SOME CLOSED WITH GLASS STOPPERS, SOME WITH RUBBER-BULB DROPPERS. INSIDE ONE TEST TUBE IS A SMALLER SEALED GLASS TUBE WHICH CONTAINS WHAT APPEARS TO BE LITMUS PAPER.

(U)THE LOWER PART OF THE UPPER PORTION OF THE KIT IS DIVIDED INTO 5 SMALL OPEN COMPARTMENTS; 1 LARGER OPEN COMPARTMENT, AND 1 NARROW OPEN COMPARTMENT RUNNING THE LENGTH OF THE KIT, IN THE FRONT. THE LATTER CONTAINS, AT ONE END, A FOAM PLASTIC CUSHIONING MATERIAL WITH HOLES FOR 10 SEALED GLASS CHEMICAL TUBES.

(U)THE KIT ALSO CONTAINS BOTTLES CONTAINING TEST SOLUTIONS. THESE SOLUTIONS ARE IDENTIFIED BY THE TEST SOLUTION ONLY.

DST-1600S-148-76-SUP 1 Original
NOMEN: DETECTOR KIT, TYPE 64 (U) ITEM 49
FDN-6665-5-3-2-A
PRODUCED/ADOPTED: ?/1964 ? COUNTRY: PRC

CURRENT STATUS: --- STANDARD

TYPE: ---------- PORTABLE

PHYSICAL DATA:
APPEARANCE ------ METAL CARRIER
DIMENSIONS
-CASE --------- 24 X 13.5 X 14 CM
-DETECTOR ----- SEE TEXT
-PUMP --------- N/A
-WEIGHT ------- ?

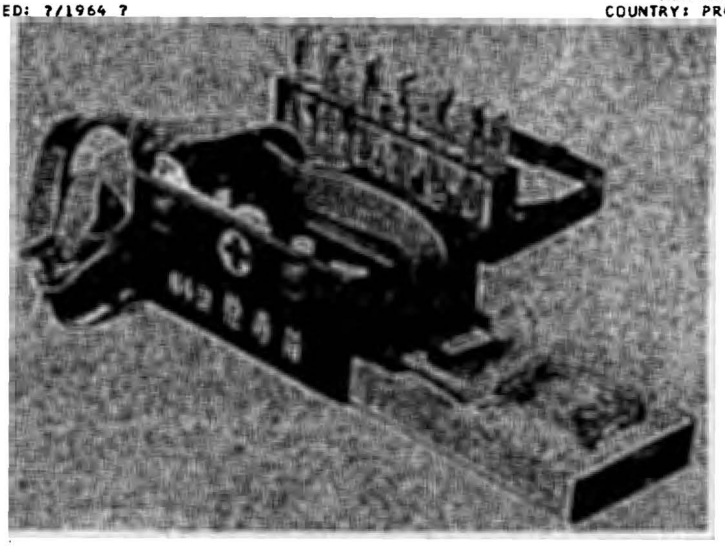
PERFORMANCE: ------ SATISFACTORY

MAJOR COMPONENTS: - TEST TUBES, LITMUS PAPER,
- THERMOMETER, MATCHES, SPATULA

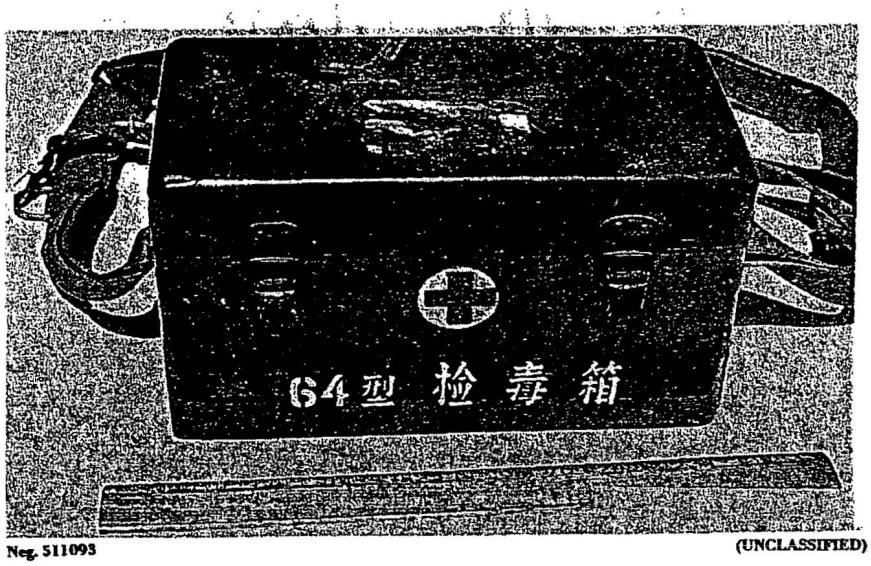
REMARKS:

Original
NOMEN: DETECTOR KIT, TYPE 64 (U)
PRODUCED/ADOPTED: ?/1964 ?

DST-1600S-148-76-SUP 1
ITEM 49
FDM-6665-5-3-2-B
COUNTRY: PRC



Neg. 511092 (UNCLASSIFIED)



Neg. 511093 (UNCLASSIFIED)

Original DST-1600S-148-76-SUP 1

NOMEN: DETECTOR KIT, CHEMICAL AGENT, TYPE 65 (U) ITEM 50

NATIVE DES: ? FOM-6665-5-3-10-A
PRODUCED/ADOPTED: ?/1965? COUNTRY: PRC

(U)THE TYPE 65 CHEMICAL AGENT DETECTOR KIT CAN DETECT AND IDENTIFY SARIN, CYANIDE AND HYDROGEN CYANIDE, PHOSGENE AND DIPHOSGENE, MUSTARD, NITROGEN MUSTARD, LEWISITE, CHLOROACETOPHENONE, AND ADAMSITE AND SAMPLE SMOKES AND CHEMICALS IN THE AIR, ON TERRAIN, OR ON MATERIEL. IT IS EITHER A CHINESE IMPORTED SOVIET ITEM SIMILAR TO THE MODEL PKHR-54 OR A CHINESE COPY THEREOF. THE ONLY EVIDENT NATIVE CHARACTERIZATION IS THE USE OF CHINESE IDEOGRAMS IN THE INSTRUCTION SHEET AND LABELS ON THE CONTENTS.

(U)THE KIT CONSISTS OF A COVERED METAL CASE WITH SHOULDER STRAP CONTAINING BOTH SAMPLING AND ANALYZING COMPONENTS. CONTENTS OF THE KIT ARE LISTED IN THE INSTRUCTIONS AND SPECIFICATIONS SHEET AND INCLUDE AN AIR PUMP AND ATTACHMENT, SAMPLE JAR AND SPATULA, AMPOULE-PIERCING PIN, SMOKE FILTER PAPER, DETECTOR TUBES, PERFORATED PROTECTIVE CAPS, AND COLOR COMPARISON CHART. THE TYPE 65 KIT INCLUDES 10 EACH OF THE FOLLOWING DETECTOR TUBES: ONE BLACK BAND; ONE, TWO, AND THREE YELLOW BANDS; ONE AND TWO GREEN BANDS; ONE RED BAND; AND ONE AND TWO WHITE BANDS.

(U)DETECTOR TUBES ARE DESIGNED TO PRECLUDE THE NEED FOR PREPARATION OF ADDITIONAL REAGENTS. WHEN THE AMPOULES ARE BROKEN WITH A PIERCING PIN, THE REAGENT IS RELEASED. AIR SUSPECTED OF CONTAMINATION IS DRAWN IN THRCUGH A DETECTOR TUBE WHICH CONTAINS A LAYER OF SILICA GEL, AND THE AGENT VAPOR IS ADSORBED ON THE SURFACE OF THE SILICA GEL IN THE PRESENCE OF THE CHEMICAL REAGENT WHICH REACTS WITH THE TOXIC AGENT TO PRODUCE A COLOR CHANGE. TO PREPARE A DETECTOR TUBE FOR USE, BOTH ENDS ARE SNAPPED OFF, THE TUBE IS INSERTED IN ONE OF THE FIVE AIR INLET HOLES IN THE PUMP HEAD, AND THE PUMP IS STROKED TO DRAW AIR THROUGH THE TUBE.

(U)THE METAL INTAKE MANIFOLD HOUSING OF THE AIR SAMPLING PUMP HAS EVENLY SPACED NUMBERS TO INDICATE THE NUMBER OF INLETS THAT CAN ACCOMMODATE DETECTOR TUBES; FIVE TUBES CAN BE USED SIMULTANEOUSLY. SEVEN AMPOULE-PIERCING PIN WELLS COLOR CODED WITH SMALL PAINTED STRIPES CORRESPOND TO THE COLOR-CODED, PAINTED BANDS ON THE DETECTOR TUBES. INSTRUCTIONS ON THE TUBE CASSETTES INDICATE THE NUMBER OF STROKES REQUIRED, NORMALLY 50 TO 55 PER MINUTE; HOWEVER, PUMPING FREQUENCY SHOULD BE INCREASED WHEN USING SEVERAL TUBES SIMULTANEOUSLY. WHEN SAMPLING IS CONDUCTED IN 0 TO SUB-0 TEMPERATURES, AND WHEN USING THE PUMP ATTACHMENT, FILTER PAPER SHOULD BE USED WHEN DETECTING AGENT IN SMOKE.

(U)THE SOVIET RED-BAND-RED-DOT DETECTOR TUBE, WHICH IS NOT A COMPONENT OF THE KIT BUT WHICH MIGHT BE AVAILABLE TO THE CHINESE, WOULD GIVE THE KIT THE CAPABILITY TO DETECT G- AND V-TYPE AGENTS.

(U)SIMILAR SOVIET DEVICES (DETECTOR KIT, MODEL PKHR-54, AND AIR PUMP FOR PKHR-54 DETECTOR KIT) ARE DESCRIBED IN FOM-6665-2-3-1 AND FOM-6665-2-3-8.

DST-1600S-148-76-SUP 1 Original
NOMEN: DETECTOR KIT, CHEMICAL AGENT, TYPE 65 (U) ITEM 50
FOM-6665-5-3-10-A
PRODUCED/ADOPTED: ?/1965? COUNTRY: PRC

CURRENT STATUS: --- STANDARD

TYPE: ---------- PORTABLE

PHYSICAL DATA:
APPEARANCE ------ OLIVE GREEN, METAL CASE
DIMENSIONS
-CASE --------- 14 X 24 X 10 CM
-DETECTOR ----- ?
-PUMP --------- ?
-WEIGHT ------- ?

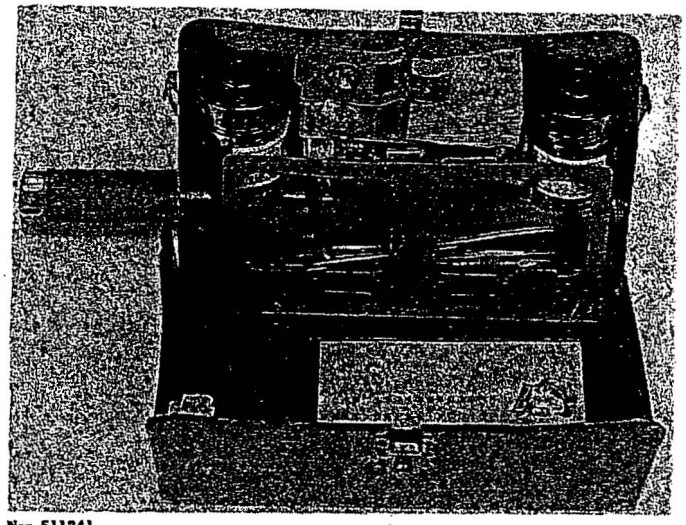
PERFORMANCE: ------ SATISFACTORY ?

MAJOR COMPONENTS: - DETECTOR TUBES, AIR PUMP
- FILTER COVER, SMOKE FILTERS

REMARKS:

Original
NOMEN: DETECTOR KIT, CHEMICAL AGENT, TYPE 65 (U)
PRODUCED/ADOPTED: ?/1965?

DST-1600S-148-76-SUP 1
ITEM 50
FOM-6665-5-3-10-8
COUNTRY: PRC



Neg. 511241 (UNCLASSIFIED)

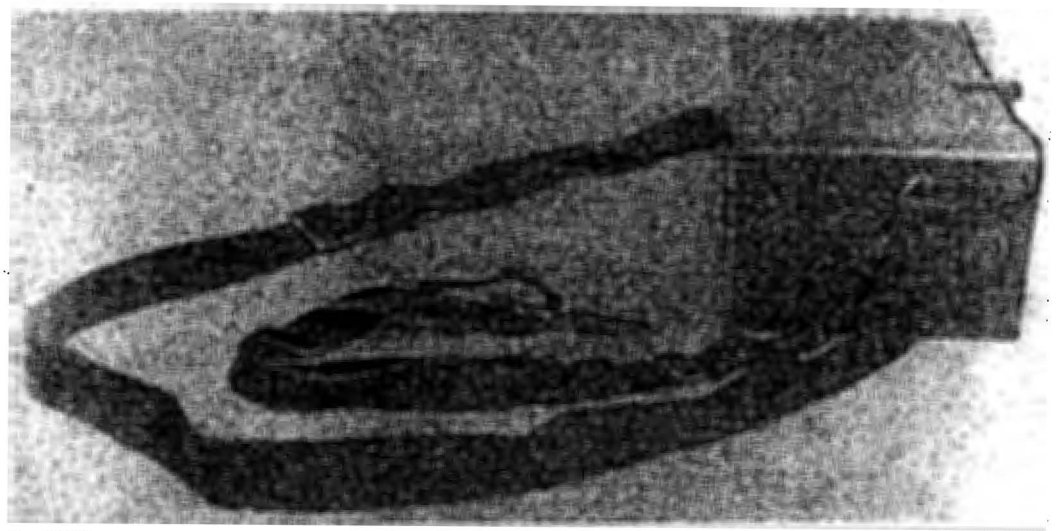
Neg. 511240 (UNCLASSIFIED)

DST-1600S-148-76-SUP 1

NOMEN: DETECTOR KIT, CHEMICAL AGENT, TYPE 65 (U)

PRODUCED/ADOPTED: ?/1965?

(Original)
ITEM 50
FOM-6665-5-3-10-B
COUNTRY: PRC



Neg. 511242

(UNCLASSIFIED)

Original DST-1600S-148-76-SUP 1

NOMEN: DECONTAMINATION KIT, INDIVIDUAL, 7 BLACK PACKETS (U) ITEM 57

NATIVE DES: ? FDM-4230-9-1-1-A
PRODUCED/ADOPTED: 7/1966 COUNTRY: NORTH VIETNAM

(U)THE INDIVIDUAL DECONTAMINATION KIT OF SEVEN BLACK PACKETS APPROXIMATES THE STATE-OF-THE-ART OF DECONTAMINATION APPARATUS OF ABOUT 1917. ALTHOUGH MOST OF THE DECONTAMINANT MATERIALS ARE OF HIGH QUALITY, THEY ARE ALL WELL-KNOWN SUBSTANCES WITH RATHER LIMITED EFFECTIVENESS.

(U)THIS KIT CONSISTS OF A PLASTIC BAG IN WHICH AN INSTRUCTION SHEET AND SEVEN PACKETS ARE CONTAINED. EACH PACKET HOLDS A DECONTAMINATING MATERIAL IN A SEALED SLEEVE OF PLASTIC WHICH IS SEALED, IN TURN, IN A BROWN RICE-PAPER ENVELOPE. THE BROWN RICE PAPER GRADUALLY TURNS BLACK WITH EXPOSURE AND AGE. THE INGREDIENT, AND ITS PROBABLE EFFECTIVENESS, OF EACH PACKET IS AS FOLLOWS:

(U)PACKET NO. 1 (LABELED: POWDERED LIME) CONTAINS HYDRATED LIME, EFFECTIVE MAINLY AS AN ABSORBENT MATERIAL, WHICH ABSORBS LIQUID MUSTARD (HD) AND G-AGENT AND, TO A LESSER EXTENT, V-AGENT THAT HAS BEEN DEPOSITED ON THE SKIN.

(U)PACKET NO. 2 (LABELED: LIME CHLORURE) HOLDS CALCIUM HYPOCHLORITE, WHICH IS A GOOD MATERIEL DECONTAMINANT FOR HD AND G-AGENTS, BUT HAS A LESSER EFFECT ON V-AGENTS.

(U)PACKET NO. 3 (LABELED: PERMANGANATE) CONTAINS POTASSIUM PERMANGANATE, AN ACCEPTED AID FOR AND EFFECTIVE AGAINST FUNGUS, POISON IVY, AND OTHER MATERIALS WHICH AFFECT THE SKIN SIMILARLY; IT HAS NO EFFECT AGAINST CHEMICAL WARFARE AGENTS.

(U)PACKET NO. 4 (LABELED: POWDERED SOAP) CONTAINS SOAP AND WATER, STANDARD DECONTAMINATING AIDS FOR THE PHYSICAL REMOVAL OF ALL CHEMICAL AGENTS AS WELL AS BIOLOGICAL WARFARE AGENTS.

(U)PACKET NO. 5 (LABELED: CARBONATE NATRI) IS IMPROPERLY LABELED; IT CONTAINS MAINLY SODIUM SULFATE WITH CHROMIUM IMPURITIES. SODIUM SULFATE IS NOT A PARTICULARLY EFFECTIVE DECONTAMINANT.

(U)PACKET NO. 6 (LABELED: COPPER SULFATE) CONTAINS COPPER SULFATE, A STANDARD MATERIAL THAT IS EFFECTIVE FOR CONTROL OF WHITE PHOSPHORUS BURNS.

(U)PACKET NO. 7 (LABELED: HYDROLIC COTTON) HOLDS COTTON, A STANDARD MATERIAL USED FOR REMOVAL OF CONTAMINANT FROM THE SKIN AND FOR THE APPLICATION OF DECONTAMINANTS.

DST-1600S-148-76-SUP 1 Original
NOMEN: DECONTAMINATION KIT, INDIVIDUAL, 7 BLACK PACKETS (U) ITEM 57
FOM-4230-9-1-1-A
PRODUCED/ADOPTED: 7/1966 COUNTRY: NORTH VIETNAM

CURRENT STATUS: IN MILITARY USE

CARRYING CASE:
MATERIAL ---------- PLASTIC (BAG)
DIMENSIONS:
-LENGTH ---------- *1
-WIDTH ---------- *1
-HEIGHT ---------- *1

WEIGHT ---------- 46 G

DECONTAMINANT:
TYPE ---------- SEE TEXT
QUANTITY ---------- *1 AND TEXT

REMARKS:

1/

COMPONENT	LENGTH (CM)	WIDTH (CM)	WEIGHT (G)
OUTER BAG	18.0	11.9	0.96
INSTRUCTION SHEET	26.3	18.3	2.69
PACKET NO.1 (GROSS)	---	---	7.62
PAPER ENVELOPE	7.9	4.8	0.61
PLASTIC BAG	8.1	5.1	0.22
CONTENTS (NET)	---	---	6.79
PACKET NO.2 (GROSS)	---	---	6.61
PAPER ENVELOPE	7.9	5.1	0.88
PLASTIC BAG	7.9	5.1	0.30
CONTENTS (NET)	---	---	5.43
PACKET NO.3 (GROSS)	---	---	4.88
PAPER ENVELOPE	7.1	5.1	0.52
PLASTIC BAG	8.1	6.9	0.31
CONTENTS (NET)	---	---	4.05
PACKET NO.4 (GROSS)	---	---	4.44
PAPER ENVELOPE	7.9	5.0	0.56
PLASTIC BAG	7.9	7.4	0.33
CONTENTS (NET)	---	---	3.55

1/ CONTINUED

COMPONENT	LENGTH (CM)	WIDTH (CM)	WEIGHT (G)
PACKET NO.5 (GROSS)	---	---	7.30
PAPER ENVELOPE	7.2	5.1	0.45
PLASTIC BAG	10.7	6.2	0.44
CONTENTS (NET)	---	---	6.41
PACKET NO.6 (GROSS)	---	---	9.89
PAPER ENVELOPE	7.9	5.1	0.67
PLASTIC BAG	7.9	7.6	0.35
CONTENTS (NET)	---	---	8.87
PACKET NO.7 (GROSS)	---	---	1.57
PAPER ENVELOPE	7.6	4.8	0.54
PLASTIC BAG	8.1	6.4	0.27
CONTENTS (NET)	---	---	0.76

Original

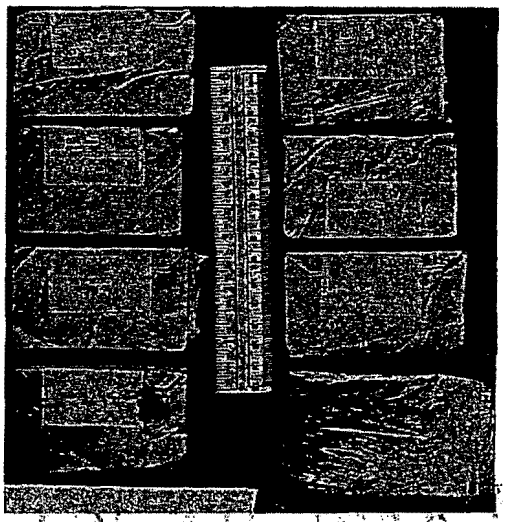
DST-1600S-148-76-SUP 1
ITEM 57

NOMEN: DECONTAMINATION KIT, INDIVIDUAL, 7 BLACK PACKETS (U)

FDN-4230-9-1-1-8

PRODUCED/ADOPTED: 7/1966

COUNTRY: NORTH VIETNAM



Neg. 511095 (UNCLASSIFIED)

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Original

DST-1600S-148-76-SUP 1

NOMEN: DECONTAMINATION KIT, INDIVIDUAL, FIVE RED PACKETS (U)

ITEM 58

NATIVE DES: ?
PRODUCED/ADOPTED: 7/1965

FOM-4230-9-1-2-A
COUNTRY: NORTH VIETNAM

(U)THE INDIVIDUAL DECONTAMINATION KIT OF FIVE RED PACKETS GENERALLY APPROXIMATES THE STATE-OF-THE-ART OF DECONTAMINATION APPARATUS OF ABOUT 1917. THE PACKETS, PROPERLY LABELED EXCEPT THAT THE LABELED WEIGHTS ARE NOT CORRECT, CONTAIN GENERALLY PURE-QUALITY, WELL-KNOWN MATERIALS.

(U)THE KIT CONSISTS OF AN OUTER PLASTIC BAG IN WHICH AN INSTRUCTION SHEET AND FIVE RED PLASTIC PACKETS ARE CONTAINED. FOUR OF THE SEALED PACKETS CONTAIN DECONTAMINATING MATERIAL AND THE FIFTH, A COTTON PAD. THE INGREDIENT, AND ITS PROBABLE EFFECTIVENESS, OF EACH PACKET IS AS FOLLOWS:

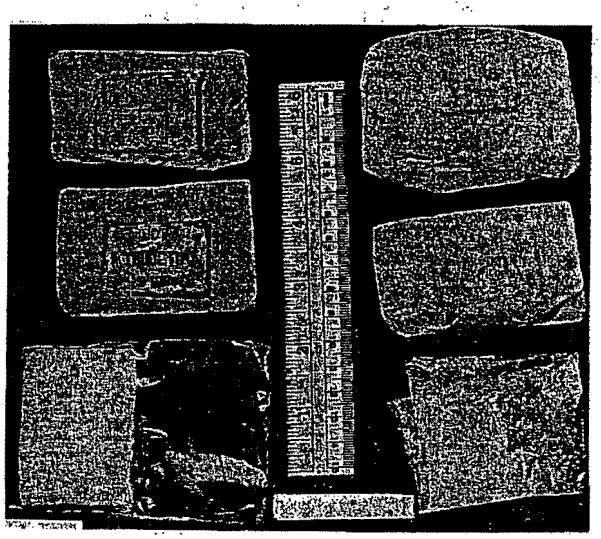
(U)PACKET NO.1 (LABELED: POWDERED LIME) CONTAINS TECHNICAL GRADE, HYDRATED LIME, EFFECTIVE MAINLY AS AN ABSORBENT MATERIAL, WHICH ABSORBS LIQUID MUSTARD (HD), G-AGENT, AND, TO A LESSER EXTENT, V-AGENT THAT HAS BEEN DEPOSITED ON THE SKIN.

(U)PACKET NO.2 (LABELED: PERMANGANATE) CONTAINS POTASSIUM PERMANGANATE, AN ACCEPTED AID FOR AND EFFECTIVE AGAINST FUNGUS, POISON IVY, AND OTHER MATERIALS THAT AFFECT THE SKIN SIMILARLY; IT HAS NO EFFECT AGAINST CHEMICAL WARFARE AGENTS.

(U)PACKET NO.3 (LABELED: ALKALINE SOAP) CONTAINS STRONG SOAP AND WATER, STANDARD DECONTAMINATING AIDS FOR THE PHYSICAL REMOVAL OF ALL CHEMICAL AS WELL AS BIOLOGICAL WARFARE AGENTS.

(U)PACKET NO.4 (LABELED: COPPER SULFATE) CONTAINS COPPER SULFATE, A STANDARD MATERIAL EFFECTIVE FOR CONTROL OF WHITE PHOSPHORUS BURNS.

(U)PACKET NO.5 (NO LABEL) CONTAINS AN ABSORBENT COTTON PAD, A STANDARD MATERIAL USED TO REMOVE CONTAMINANTS FROM THE SKIN AND TO APPLY DECONTAMINANTS.



Neg. 511078

(UNCLASSIFIED)

DST-1600S-148-76-SUP 1 Original

NOMEN: DECONTAMINATION KIT, INDIVIDUAL, FIVE RED PACKETS (U) ITEM 58

FOM-4230-9-1-2-A

PRODUCED/ADOPTED: ?/1965 COUNTRY: NORTH VIETNAM

CURRENT STATUS: IN MILITARY USE

CARRYING CASE:
- MATERIAL ---------- PLASTIC (BAG)

DIMENSIONS:
- -LENGTH ---------- *1
- -WIDTH ---------- *1
- -HEIGHT ---------- *1

WEIGHT ---------- 44 G

DECONTAMINANT:
- TYPE ---------- SEE TEXT
- QUANTITY ---------- *1

REMARKS:

1/

COMPONENT	LENGTH (CM)	WIDTH (CM)	WEIGHT (G)
KIT (ENTIRE)	---	---	44.27
OUTER BAG	20.1	9.9	0.94
INSTRUCTION SHEET	24.1	13.0	1.67
PACKET NO.1 (GROSS)	---	---	11.78
PAPER ENVELOPE	7.6	5.1	0.62
PLASTIC BAG	11.8	8.0	0.47
CONTENTS (NET)	---	---	10.69
PACKET NO.2 (GROSS)	---	---	6.84
PAPER ENVELOPE	7.6	5.1	0.53
PLASTIC BAG	6.9	6.4	0.48
CONTENTS (NET)	---	---	5.83
PACKET NO.3 (GROSS)	---	---	5.62
PAPER ENVELOPE	8.4	6.9	0.74
PLASTIC BAG	11.9	8.1	0.52
CONTENTS (NET)	---	---	4.36
PACKET NO.4 (GROSS)	---	---	14.92
PAPER ENVELOPE	7.4	4.6	0.58
PLASTIC BAG	10.2	9.1	0.97
CONTENTS (NET)	---	---	13.37

1/ CONTINUED

COMPONENT	LENGTH (CM)	WIDTH (CM)	WEIGHT (G)
PACKET NO.5 (GROSS)	---	---	2.50
PLASTIC BAG	9.8	8.4	0.91
CONTENTS (NET)	7.4	6.4	1.59

Original

DST-1600S-148-76-SUP 1

ITEM 59

NOMEN: DECONTAMINATION KIT, INDIVIDUAL, NR. 1-65 (U)

NATIVE DES: ?
PRODUCED/ADOPTED: ?/1965

FOM-4230-9-1-3-A
COUNTRY: NORTH VIETNAM

(U)THE QUALITY OF THE INDIVIDUAL DECONTAMINATION KIT, NO. 1-65, IS PRIMITIVE BY U.S. STANDARDS. THIS KIT CONTAINS NO FIRST AID ITEMS FOR CASUALTIES CAUSED BY NERVE AGENTS. THE KIT HAS A SMALL BAR OF SOAP, USED TO WASH LIQUID CONTAMINANTS SUCH AS MUSTARD FROM THE SKIN, AND A BOTTLE OF AQUEOUS SOAP, TO BE USED FOR THE TREATMENT OF PHOSPHORUS BURNS AND WHEN NO WATER IS AVAILABLE. EACH SOAP IS A SODIUM SALT OF SATURATED FATTY ACIDS AND CONTAINS SILICON, PROBABLY IN THE FORM OF SODIUM SILICATE. TWO AMPOULES CONTAIN DIETHYL ETHER FOR RELIEF FROM CHEMICAL AGENTS THAT INDUCE SNEEZING, LACHRYMATION, OR VOMITING. A BALL OF COTTON IS SUPPLIED TO BLOT OR TO REMOVE ANY TOXIC AGENT.

(U)THE KIT ALSO HOLDS POTASSIUM PERMANGANATE, A POWERFUL OXIDIZING AGENT WHICH MAY BE USED TO PREVENT INFECTION FROM PHOSPHORUS BURNS. ALTHOUGH POTASSIUM PERMANGANATE IS USUALLY DILUTED IN A 1 TO 5 SOLUTION FOR DISINFECTION, THE DIRECTION BOOKLET IN THIS KIT SUGGESTS USING 0.5 GRAMS OF POTASSIUM PERMANGANATE TO 500 MILLILITERS OF WATER (OR A 1 TO 1000 SOLUTION). ALTHOUGH THIS CONCENTRATION IS MUCH WEAKER THAN A 1 TO 5 SOLUTION, IT MAY BE EFFECTIVE AGAINST SOME INFECTIOUS ORGANISMS.

DST-1600S-148-76-SUP 1 Original

NOMEN: DECONTAMINATION KIT, INDIVIDUAL, NR. 1-65 (U) ITEM 59

FOM-4230-9-1-3-A

PRODUCED/ADOPTED: 7/1965 COUNTRY: NORTH VIETNAM

CURRENT STATUS: MILITARY USE IN VIETNAM

CARRYING CASE:
  MATERIAL ---------- CARDBOARD
DIMENSIONS:
  -LENGTH ---------- 7.1 CM
  -WIDTH ---------- 6.1 CM
  -HEIGHT ---------- 2.3 CM

WEIGHT ---------- 91 G

DECONTAMINANT:
  TYPE ---------- SOAP (LIQUID AND BAR)
  QUANTITY ---------- 10 ML

REMARKS:

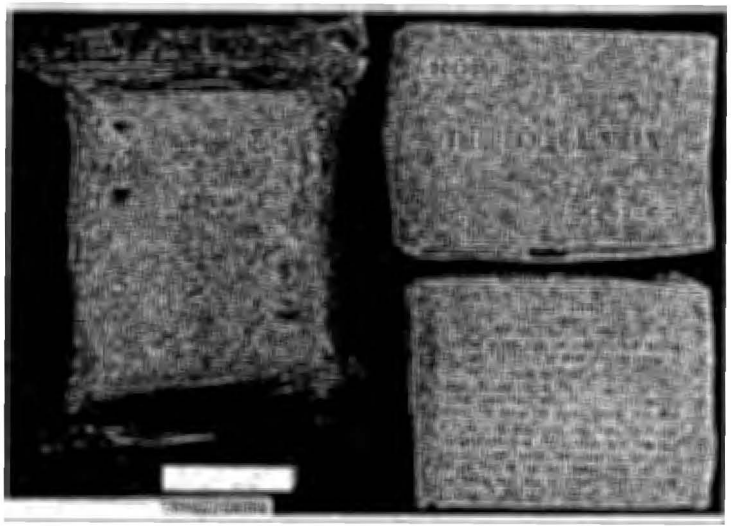
Original

NOMEN: DECONTAMINATION KIT, INDIVIDUAL, NR. 1-65 (U)

DST-1600S-148-76-SUP 1
ITEM 59

PRODUCED/ADOPTED: 7/1965

FOM-4230-9-1-3-B
COUNTRY: NORTH VIETNAM



Neg. 511583

(UNCLASSIFIED)

Neg. 512863

Original DST-1600S-148-76-SUP 1

NOMEN: DECONTAMINATION KIT, INDIVIDUAL, TYPE FANGHUHE (U) ITEM 60

NATIVE DES: ? FOM-4230-5-1-1-A
PRODUCED/ADOPTED: ?/1966 ? COUNTRY: PRC

(U)THIS PRC KIT IS USED TO DECONTAMINATE THE SKIN AND CLOTHING, TO COUNTER THE PHYSIOLOGICAL EFFECTS OF NERVE AGENTS, AND TO REDUCE PSYCHOLOGICAL TENSION. THE METAL BOX, PAINTED YELLOW WITH A RED CROSS AND CHINESE CHARACTERS MEANING SELF-AID KIT, CONTAINS INSTRUCTIONS, A NERVE AGENT SYRETTE, A VIAL OF DECONTAMINANT, A VIAL OF PILLS, AND A SURGICAL-TYPE GAUZE MASK, MODEL 64. LABORATORY TESTS HAVE BEEN RUN ON THIS KIT.

(U)THE SYRETTE COMPRISES A GLASS VIAL OF LIQUID (PRESSURIZED BY AN INERT GAS) AND A HOLLOW NEEDLE. THE SYRETTE IS COVERED BY FLEXIBLE PLASTIC, EXCEPT THAT THE FREE END OF THE NEEDLE HAS A SCORED GLASS SHEATH THAT, WHEN SNAPPED OFF, EXPOSES AN INCH OF THE NEEDLE. LIQUID IS RELEASED INTO THE NEEDLE WHEN THE VIAL IS CRUSHED BY SQUEEZING TWO BLUE RINGS PAINTED ON THE SYRETTE. A GAUZE FILTER TRAPS PARTICLES OF BROKEN GLASS. THE LIQUID, AN AQUEOUS SOLUTION (300 MILLIGRAMS OF PAM CHLORIDE AND POSSIBLY 1.2 MILLIGRAM OF ATROPINE) IS INJECTED INTO THE THIGH OR BUTTOCKS TO COUNTER THE EFFECTS OF NERVE AGENTS.

(U)THE DECONTAMINANT IS CONTAINED IN A PILLOW-SHAPED FLEXIBLE PLASTIC VIAL THAT IS CARRIED IN A GAUZE BAG TO WHICH A PIERCING NAIL IS ATTACHED. THE VIAL HOLDS A LIQUID AND A THIN-WALLED GLASS CONTAINER OF WHITE POWDER WHICH DISSOLVES WHEN THE PLASTIC IS SQUEEZED AND THE GLASS IS CRUSHED. THE PLASTIC VIAL IS PUNCTURED TO RELEASE THE SOLUTION, AND THE GAUZE BAG CAN BE USED AS AN APPLICATOR. THE LIQUID COMPRISES 65 PERCENT WATER, 30 PERCENT ETHANOL AND 5 PERCENT DETERGENT (SODIUM SALT OF AN ALKYL SULFONIC ACID); THE POWDER, CONTAINING 32 PERCENT ACTIVE CHLORINE, IS SIMILAR TO SUPERTROPICAL BLEACH (STB). THE SOLUTION WOULD BE EFFECTIVE AGAINST NERVE AGENTS AND VESICANT AGENTS.

(U)A GLASS VIAL WITH CORK STOPPER CONTAINS 12 YELLOW "ANTIPHOSPHORUS" PILLS WEIGHING 300 MILLIGRAMS EACH. THEIR PRINCIPAL INGREDIENT IS MEPROBAMATE (A TRANQUILIZER); THEY ALSO CONTAIN PYRIDOSTIGMINE BROMIDE AND CHLORPROMAZINE HYDROCHLORIDE BUT NO ANTICHOLINERGIC DRUGS NOR OXIMES SUCH AS PAM, WHICH ARE USED IN NERVE AGENT ANTIDOTES. THE TRANQUILIZER MAY REDUCE PSYCHOLOGICAL TENSION IN COMBAT.

(U)THE GAUZE MASK IS PROBABLY INEFFECTIVE AGAINST CW AGENTS.

DST-1600S-148-76-SUP 1 Original

NOMEN: DECONTAMINATION KIT, INDIVIDUAL, TYPE FANGHUHE (U) ITEM 60

FOM-4230-5-1-1-A

PRODUCED/ADOPTED: ?/1966 ? COUNTRY: PRC

CURRENT STATUS: STANDARD

CARRYING CASE:
  MATERIAL ---------- METAL
DIMENSIONS:
  -LENGTH ---------- 12.7 CM
  -WIDTH ---------- 8.4 CM
  -HEIGHT ---------- 4.3 CM

WEIGHT ---------- 237 G

DECONTAMINANT:
  TYPE ---------- *1
  QUANTITY ---------- 8.6 ML

REMARKS:
1/ THE DECONTAMINATION UNIT CONTAINS A CALCIUM HYPOCHLORITE (32.3% ACTIVE CHLORINE) WITH A LIQUID MEDIUM COMPRISED OF 65% WATER, 30% ETHANOL, AND 5% DETERGENT.

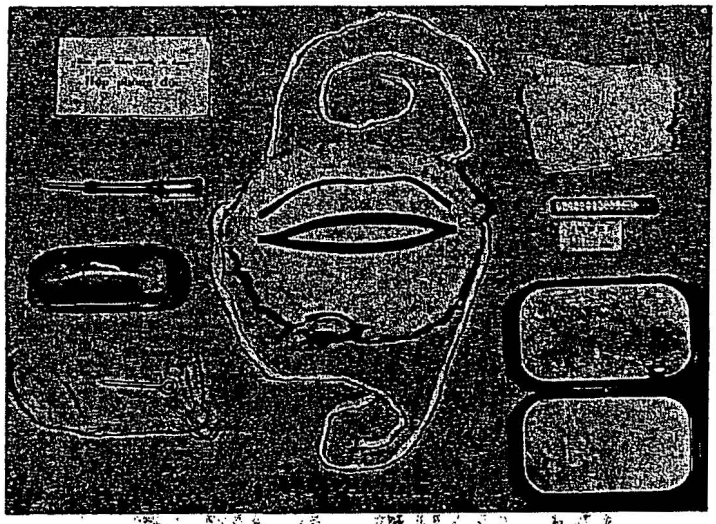
Original

NOMEN: DECONTAMINATION KIT, INDIVIDUAL, TYPE FANGHUHE (U)

DST-1600S-148-76-SUP 1
ITEM 60
FOM-4230-5-1-1-B

PRODUCED/ADOPTED: ?/1966 ?

COUNTRY: PRC



Neg. 511578

(UNCLASSIFIED)

Neg. 511587

(UNCLASSIFIED)

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Original

DST-1600S-148-76-SUP 1

NOMEN: DECON KIT,PERSONAL (WITH RUBBERIZED CARRIER)MODEL 7 (U) ITEM 65

NATIVE DES: ?
PRODUCED/ADOPTED: ?/1970 ?

FOM-4230-5-1-3-A
COUNTRY: PRC

(U)THIS KIT CONTAINS MATERIALS FOR REMOVING CBR CONTAMINANTS FROM THE SKIN AND CLOTHING AND A LIQUID THAT THE CHINESE MARKINGS IDENTIFY AS AN "ANTISMOKE AGENT." THE KIT'S PRINCIPAL ITEMS--SOAP AND GAUZE--PERMIT THE REMOVAL OF CONTAMINANTS BY WASHING AND WOULD BE USEFUL FOR REMOVING ALPHA (NOT BETA OR GAMMA) RADIOACTIVE PARTICLES, BIOLOGICAL ORGANISMS, AND MOST CW AGENTS; THEY WOULD NOT BE EFFECTIVE AGAINST NERVE AGENTS. TWO GLASS AMPOULES IN THE KIT RESEMBLE SOVIET "ANTISMOKE" AMPOULES IN MOST RESPECTS (FOM 4230-2-1-7) BUT THE LIQUID CONTENT IS SLIGHTLY DIFFERENT. THE CHINESE COMPOUND, PROBABLY USED AS AN ANTISEPTIC WASH, CONSISTS OF TWO PARTS ETHYL ETHER, ONE PART ETHYL ALCOHOL, AND ONE PART CHLOROFORM (AMMONIA WATER, PRESENT IN THE SOVIET COMPOUND, IS LACKING IN THE CHINESE COMPOUND). THE EFFECTIVENESS OF THE CHINESE COMPOUND IN TREATING SMOKE INHALATION DISCOMFORT IS UNKNOWN. THE CHINESE COMPOUND HAS ANTISEPTIC QUALITIES AND COULD, WITH THE KIT'S OTHER COMPONENTS, BE USED FOR GENERAL FIRST AID PURPOSES.

(U)THE PRC-MANUFACTURED KIT CONSISTS OF THE FOLLOWING: A RECTANGULAR RUBBERIZED FABRIC CARRIER EQUIPPED WITH A BELT LOOP AND A TIE STRING CLOSURE (COLORS VARY FROM LIGHT BROWN TO DARK GREEN); TWO GAUZE PADS, WRAPPED IN A WATERPROOF RUBBERIZED PACKAGE; A PLASTIC BOTTLE OF SOAP SOLUTION; TWO PACKAGES OF SOAP POWDER, AND INSTRUCTION SHEET AND A GAUZE PAD, ALL IN A SEALED PLASTIC WRAPPER; AND TWO SMALL VIALS OF THE ALLEGED ANTISMOKE COMPOUND PACKED IN A PAPER BOX. FIFTY KITS ARE PACKED IN A WOODEN SHIPPING BOX WHICH WEIGHS 16.8 KG WHEN FILLED; THE BOX MEASURES 48.3 X 40.6 X 24.9 CM.

DST-1600S-148-76-SUP 1 Original

NOMEN: DECON KIT,PERSONAL (WITH RUBBERIZED CARRIER)MODEL ? (U) ITEM 65

FOM-4230-5-1-3-A

PRODUCED/ADOPTED: ?/1970 ? COUNTRY: PRC

CURRENT STATUS: USED BY NVN FORCES

CARRYING CASE:
  MATERIAL ---------- RUBBERIZED FABRIC
DIMENSIONS:
  -LENGTH ---------- 10.9 CM
  -WIDTH ---------- 9.9 CM
  -HEIGHT ---------- 6.4 CM

WEIGHT ---------- 198 G

DECONTAMINANT:
  TYPE ---------- *1
  QUANTITY ---------- *2

REMARKS:
1/ POWDERED SOAP AND 0.4% SOAP SOLUTION
2/ POWDERED SOAP, 20 ML (10 ML/PACKAGE)
LIQUID SOAP, 40 ML; ANTISMOKE COMPOUND,
CONTENTS OF TWO GLASS VIALS (CRUSH-TYPE
AMPOULES) 3.8 CM LONG AND 0.9 CM
OUTSIDE DIAMETER.

Original

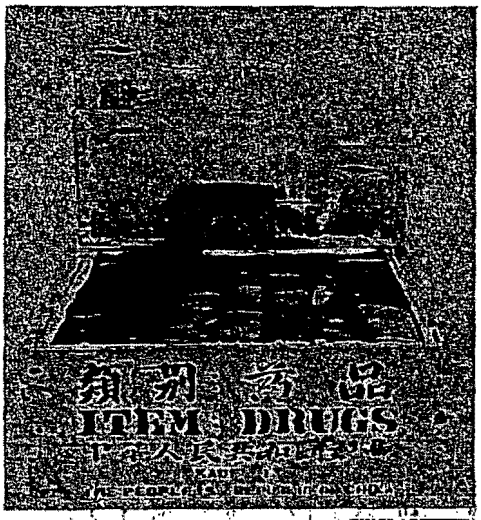
NOMEN: DECON KIT,PERSONAL (WITH RUBBERIZED CARRIER)MODEL 7 (U)

DST-1600S-148-76-SUP 1
ITEM 65

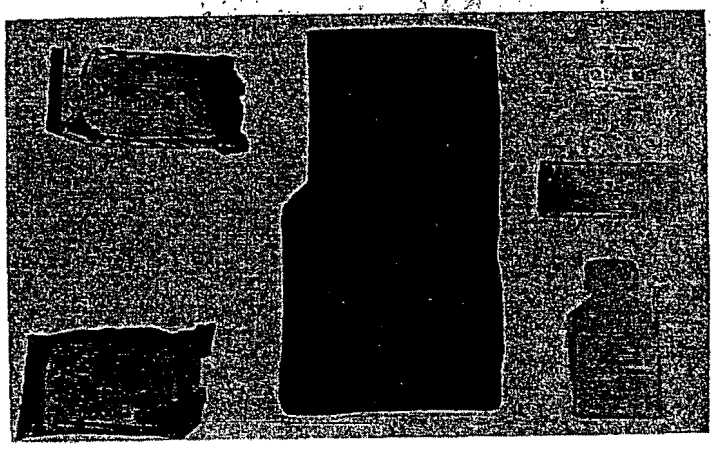
FOR-4230-5-1-3-8

PRODUCED/ADOPTED: ?/1970 ?

COUNTRY: PRC



Neg. 511561 (UNCLASSIFIED)



Neg. 511560 (UNCLASSIFIED)

NOMEN: DECONTAMINATION APPARATUS, MANPACK MODEL 7 (U) ITEM 69

NATIVE DES: ? FSN-4230-1-2-1-A
PRODUCED/ADOPTED: ?/? COUNTRY: UNIDENTIFIED

(U)THE MANPACK DECONTAMINATION APPARATUS IS USED TO DECONTAMINATE SMALL BUILDINGS, VEHICLES, CREW-SERVED AND INDIVIDUAL WEAPONS, AND TERRAIN. ALL TYPES OF LOW-VISCOSITY LIQUIDS INCLUDING DECONTAMINANTS, INSECTICIDES, HERBICIDES, AND LIGHT OILS CAN BE SPRAYED FROM THIS APPARATUS. THE APPARATUS CAN ALSO BE USED FOR VECTOR CONTROL OR FOR FIELD DISINFECTION OF AID STATIONS. THE SIZE OF THE DISCHARGE NOZZLE LIMITS THE DISCHARGE OF LIQUID TO A VERY FINE SPRAY, ALMOST A MIST. IF THE SPRAY NOZZLE IS REMOVED, IT IS POSSIBLE TO SPRAY HEAVIER DECONTAMINANTS SUCH AS BLEACH SLURRY.

(U)BASICALLY, THIS APPARATUS CONSISTS OF THE FOLLOWING: A TANK, WITH A FILLING OPENING 9.4 CM IN DIAMETER WHICH EXTENDS 2.9 CM ABOVE THE TANK; A BLACK PLASTIC SCREW CAP; SHOULDER STRAPS; A PISTON-TYPE PUMP, MOUNTED INSIDE THE TANK; AND A RUBBER DISCHARGE HOSE, CONNECTED AT THE BOTTOM OF THE TANK AND EQUIPPED WITH A NOZZLE AND A CONTROL VALVE. A LIP INSIDE THE FILLING WELL SUPPORTS A RED RUBBER CUP AND A WIRE MESH WHICH, TOGETHER, ACT AS A STRAINER WHEN AN AGENT IS POURED INTO THE TANK.

(U)THE PUMP IS MOUNTED INSIDE THE TANK ON THE LEFT SIDE, WITH THE PLUNGER ROD EXTENDING THROUGH THE TOP OF THE TANK. ON THE RIGHT SIDE OF THE TANK, LOCATED 4.4 CM FROM THE BOTTOM, IS 2.5 CM DIAMETER HOLE WITH A RED PLASTIC GROMMET. THE DISCHARGE HOSE IS INSERTED THROUGH THIS HOLE AND CONNECTED TO THE PUMP. THE PUMP MECHANISM HAS THREE CONNECTING PIECES: A HANDLE, WHICH IS INSERTED INTO A BRACKET ON THE TANK AND SECURED WITH A COTTER PIN; A HANDLE EXTENSION; AND A PLUNGER ROD.

(U)THE HOSE AND SPRAY ASSEMBLY CONSISTS OF A RUBBER HOSE 119 CM LONG, AN L-SHAPE CONNECTOR USED FROM THE HOSE TO THE PUMP, A HAND GRIP, AN ON-OFF VALVE, TWO EXTENSION TUBES, A SPRAY HEAD, AND A SPRAY NOZZLE. THE L-SHAPE CONNECTOR AND THE HAND GRIP ARE FITTED INTO THE HOSE AND SECURED BY A PIECE OF WIRE THAT IS WOUND TIGHTLY AROUND THE RUBBER HOSE. THE VALVE IS SCREWED INTO THE HAND GRIP. THE SPRAY HEAD IS ANGLED AT APPROXIMATELY 80 DEGREES.

(U)SPECIMENS OF THIS APPARATUS WERE CAPTURED IN 1969 FROM ENEMY FORCES IN SOUTH VIETNAM.

DST-1600S-148-76-SUP 1 Original

NOMEN: DECONTAMINATION APPARATUS, MANPACK MODEL ? (U) ITEM 69

FOM-4230-1-2-1-A

PRODUCED/ADOPTED: ?/? COUNTRY: UNIDENTIFIED

CURRENT STATUS: USED BY NORTH VIETNAM ARMY

MAJOR COMPONENTS:
- TANK ---------- METAL
- PUMP
  - -POWER DRIVEN ---- N/A
  - -HAND OPERATED ---- METAL
- HOSE ---------- RUBBER
- STRAPS ---------- CANVAS WEBBING

PHYSICAL DATA:
- CAPACITY
  - -MAXIMUM ---------- 11.5 L
  - -WORKING ---------- 9.5 L
- WEIGHT
  - -FILLED ---------- 17 KG
  - -EMPTY ---------- 5.7 KG
- DIMENSIONS
  - -LENGTH ---------- 46 CM
  - -WIDTH ---------- 30 CM
  - -HEIGHT ---------- 16.5 CM

DECONTAMINANTS: ------ SEE TEXT

PERFORMANCE:
- COVERAGE ---------- 4.65 SQ M ?
- DISCHARGE RATE ------ APPROX 0.47 L - PER MINUTE
- DISCHARGE TIME ------ 19 MINUTES ?
- OPERATING PRESSURE -- ?

PLUMBING SYSTEM: ------ ?

GENERAL DATA:
- CARRIER
  - -TYPE ---------- PERSON
  - -CAPACITY ---------- N/A
- CREW ---------- 1
- MISC EQUIPMENT ------ ?

REMARKS:

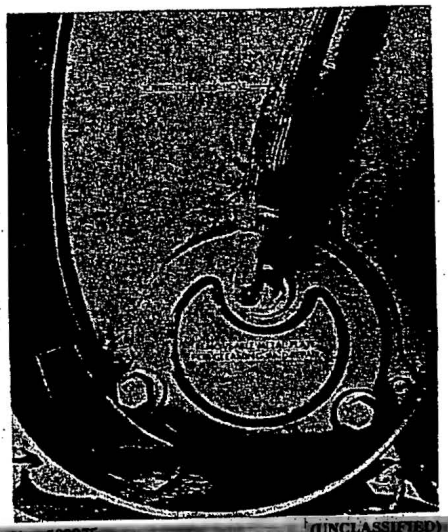
Original

DST-1600S-148-76-SUP 1
ITEM 69

NOMEN: DECONTAMINATION APPARATUS, MANPACK MODEL ? (U)

FOM-4230-1-2-1-8
COUNTRY: UNIDENTIFIED

PRODUCED/ADOPTED: ???



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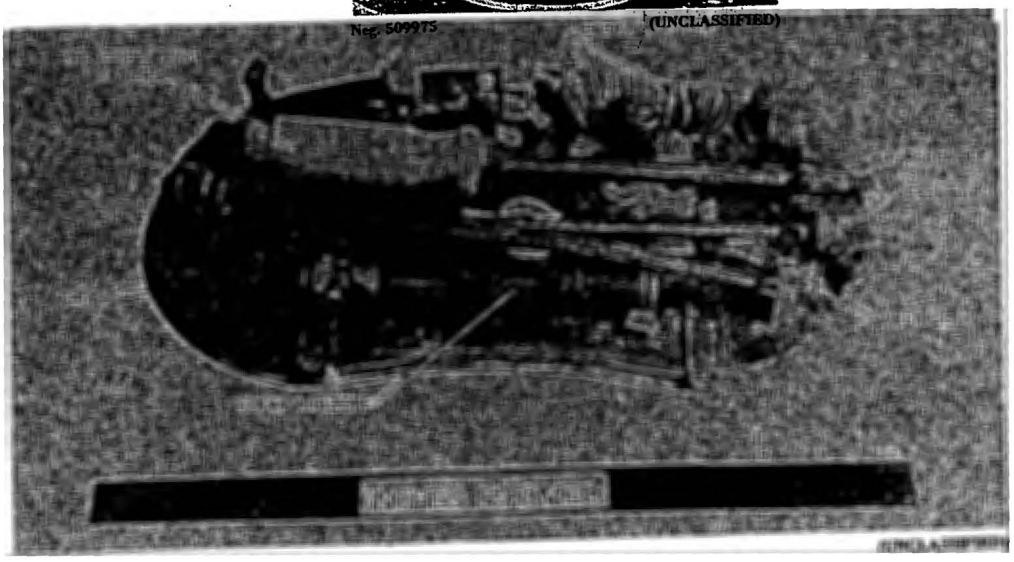

Neg. 509974

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PRODUCED/ADOPTED: ?/?

Original
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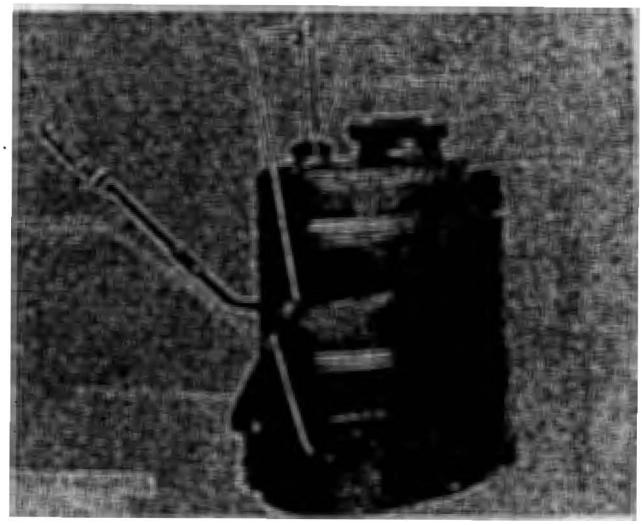
FOM-4230-1-2-1-8
COUNTRY: UNIDENTIFIED



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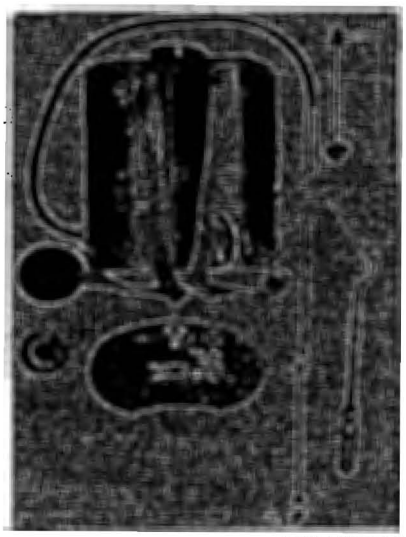

Neg. 511196 (UNCLASSIFIED)

DST-1600S-148-76-SUP 1-CHG 3
27 August 1982

★APPENDIX III

STATE DEPARTMENT SPECIAL REPORT NO. 98, CHEMICAL WARFARE IN SOUTHEAST ASIA AND AFGHANISTAN

LIST OF ABBREVIATIONS

AC	hydrogen cyanide (CW agent)
BW	biological warfare
CAS	Chinese Academy of Sciences
CB	chemical and biological
CBR	chemical, biological, and radiological
CBW	chemical and biological warfare
CCP	Chinese Communist Party
CK	cyanogen chloride
CMPC	Central Military Party Committee
CN	chloracetophenone (riot-control agent)
CS	o-chlorobenzalmalononitrile (riot-control agent)
CW	chemical warfare
DAM	diacetylmonoxime (nerve-agent antidote)
DESO-4	bis(4-hydroxyiminomethyl-pyridinium 1-ethyl) sulfoxide dichloride (nerve-agent antidote)
DM	adamsite (CW agent)
DMZ	Demilitarization Zone (dividing North and South Koreas)
DRV	Democratic Republic of Vietnam
FROG	Soviet free-rocket-over-ground unguided rocket
GB	sarin (CW nerve agent)
H	sulfur mustard (CW agent)
HE	high explosive
HL	sulfur mustard/lewisite mixture (CW agent)
JBE	Japanese B encephalitis (potential BW agent)
LOPAIR	long-path infrared spectrophotometry
LSD	lysergic acid diethylamide
MND	Ministry of National Defense
MPH	Ministry of Public Health
MPAF	Ministry of People's Armed Forces
MPR	Mongolian Peoples Republic
MR	military region(s)
NKA	North Korean Army
NKN	North Korean Navy
NVA	North Vietnam Army
NVN	North Vietnam
OP	organophosphorus
2-PAM	pralidoxime (nerve-agent antidote)
PAVN	People's Army of Vietnam
PLA	People's Liberation Army
PRC	People's Republic of China
PRCN	People's Republic of China Navy
R&D	research and development
R-OH	alkyl alcohol
SCUD	Soviet tactical surface-to-surface ballistic missile
ShM	Soviet "Shlem" protective mask
SRV	Socialist Republic of Vietnam

TMB-4	N,N'-trimethylene-bis(pyridinium-4 aldoxime) dibromide (nerve-agent antidote)
Toxogonin	bis(4-hydroxyiminomethyl-pyridinium-methyl)ether dichloride (nerve-agent antidote)
U/I	Unidentified
US	United States
USSR	Union of Soviet Socialist Republics
VC	Viet Cong
WP	white phosphorus (CW agent)

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Special
Report No. 98

United States Department of State

Chemical Warfare in Southeast Asia and Afghanistan

Report to the Congress
from Secretary of State
Alexander M. Haig, Jr.,
March 22, 1982

THE SECRETARY OF STATE
WASHINGTON

TO THE CONGRESS OF THE UNITED STATES:

The years from 1914 to 1918 were among the most destructive of human life in mankind's history. Yet the sacrifice of millions brought no lasting peace. Of the elaborate structure for collective security, and the series of pacts outlawing war and controlling armaments which were negotiated in the aftermath of this First World War, little remains today. The League of Nations, the Kellogg-Briand Pact, and the Washington Naval Agreement were all swept away in the tide of aggression which culminated in a second global conflict. Almost the sole surviving monument, in the law of nations, to the twenty million dead of the First World War is the 1925 Geneva Protocol outlawing chemical and biological warfare.

Today this accord, among the oldest of arms control agreements still in force, along with another more recent such agreement banning biological and toxin weapons, is again in danger of being swept away by a new tide of aggression. Over the past seven years chemical and toxin weapons have been used, on an ever-widening scale, in genocidal campaigns against defenseless peoples. These weapons are being used for precisely the reason mankind has condemned and sought to outlaw them—because of their indiscriminate action and horrific effects. Today evidence of chemical and toxin warfare has accumulated to the point where the international community can no longer ignore the challenge.

The enclosed report on the use of chemical and toxin weapons by the Soviet Union and its Allies in Laos, Kampuchea, and Afghanistan has been prepared for submission to the Congress, to the United Nations, and to each member of the international community. The report is drawn from information made available to the United States Government since 1975. It contains the most comprehensive compilation of material on this subject available, and presents conclusions which are fully shared by all relevant agencies of the United States Government.

The international community and the world public need not rely solely on this report to form their judgment, nor only upon the United States to provide their information. Lethal chemical and toxin weapons are regrettably still in use in Laos, Kampuchea, and Afghanistan. New victims appear, new witnesses come forward, new scientific evidence is uncovered with increasing frequency. The great bulk of the information in the enclosed report could have been collected and analyzed by any interested government, international organization, or major news service. If the efforts of the United States Government to call attention to chemical warfare in Afghanistan and Southeast Asia stimulate others to discover for themselves, and join in efforts to expose the truth, this report will have served its most important purpose.

Sincerely,

Alexander M. Haig, Jr.

Chemical Warfare in Southeast Asia and Afghanistan

CONTENTS

This study presents the evidence available to the U.S. Government on chemical warfare activities in Laos, Kampuchea, and Afghanistan through January 1982 and examines the Soviet involvement in those activities. It is based on a massive amount of information, from a variety of sources, which has been carefully compiled and analyzed over the years. The paper is accompanied by annexes and tables that provide details of the medical evidence and sample analyses, a technical description of trichothecene toxins, and other supporting data.

INTRODUCTION

Nearly 7 years ago, reports of the use of lethal chemical weapons began to emerge from Laos. In 1978, similar reports started to come from Kampuchea, and in 1979 from Afghanistan. Early reports were infrequent and fragmentary, reflecting the remoteness of the scene of conflict and the isolation of those subjected to such attacks. In the summer of 1979, however, the State Department prepared a detailed compilation of interviews with refugees from Laos on this subject. That fall, a U.S. Army medical team visited Thailand to conduct further interviews. By the winter of 1979, the United States felt that it had sufficiently firm evidence of chemical warfare to raise the matter with the governments of Laos, Vietnam, and the Soviet Union. All three governments denied that a basis for concern over the use of chemical warfare agents existed.

Dissatisfied with these responses, and possessing further reports that lethal chemical agents were in use in Southeast Asia and Afghanistan, the U.S. Government in 1980 began to raise the issue publicly in the United Nations, with the Congress, and in other forums. In August of that year, the State Department provided extensive documentation containing evidence of chemical weapons attacks to the United Nations and also made this material publicly available. In December, as a result of efforts by the United States and other concerned nations, the U.N. General Assembly voted to initiate an international investigation into the use of chemical weapons. This investigation is still underway. To date, the U.N. investigating team has been denied admission to any of the three countries where these weapons are in use.

Despite the volume of information on chemical warfare in Southeast Asia which had become available by 1980, there remained one major unresolved issue—the exact nature of the chemical agents in use. Collection of physical samples was hindered by the remoteness of the then principal areas of conflict—as many as 6 weeks by foot to the nearest international border. Tests for known chemical warfare agents on those samples that were obtained proved consistently negative.

In order to identify the chemical agents in use, U.S. experts in late 1980 began to go back over all the reporting—as far back as 1975—looking for new clues. In particular, they sought to match the reported symptomatology of victims—which commonly included skin irritation, dizziness, nausea, bloody vomiting and diarrhea, and internal hemorrhaging—with possible causes. As a result of this review, the U.S. Government in mid-1981 began to test physical samples from Southeast Asia for the presence of toxins. These substances are essentially biologically produced chemical poisons. Although they have never before been used in war, this was a technical possibility, and it was noted that certain toxins could produce the sorts of symptoms observed in Southeast Asian victims of chemical warfare.

In August 1981, unnatural levels and combinations of lethal trichothecene toxins were detected in the first sample to be tested by the United States for such agents. This consisted of vegetation taken from a village in Kampuchea where an attack occurred in which people had died after exhibiting the symptoms described above. In succeeding months, further samples, taken from the sites of attacks in both Kampuchea and Laos, yielded similar results. So did samples of blood taken from victims of a chemical attack in Kampuchea.

Despite a continued flow of reports, dating back over 7 years, of chemical warfare in Southeast Asia and more recently Afghanistan, and despite the still mounting physical evidence of the use of trichothecene toxins as warfare agents, doubts as to the conclusive nature of the available evidence have persisted. These doubts have arisen for several reasons. For one, the evidence of the use of lethal chemical weapons has become available over a period of several years and from a variety of sources. Few governments, journalists, or interested members of the public have been exposed to all of this evidence, nor has it been available in any one place. A second difficulty has been the inevitable need for the U.S. Government to protect some of the relevant information, often gathered at personal risk to individuals who secured it, or obtained through the use of highly sensitive methods.

Chronology of Diplomatic/ International Actions on Chemical Warfare Use

October 1978

The United States called to the attention of the Lao Charge d'Affaires in Washington the press reports alleging use of poison gas in Laos.

Assistant Secretary of State for East Asian and Pacific Affairs Holbrooke traveled to Vientiane and discussed our concerns over H'Mong human rights and other issues with Lao leaders.

Late 1978

The Department of State directed U.S. diplomatic missions in the Southeast Asia area to seek to develop information on the alleged use of poison gas against the H'Mong.

January 1979

The Department of State again informed the Lao Embassy of U.S. concerns about reports of poison gas use in Laos, coupling this with a similar demarche in Vientiane. The Lao denied the validity of the reports.

March 1979

The U.S. Representative to the 35th session of the U.N. Human Rights Commission expressed U.S. concern about the plight of the H'Mong, specifically raising the poison gas use issue.

May 1979

A State Department representative went to refugee camps in Thailand to interview H'Mong claiming to be eyewitnesses and/or victims of poison gas attacks in Laos.

A State Department representative visited Vientiane where he discussed the problem with various diplomatic missions and the senior U.N. representative in Laos. During that visit, he raised U.S. concerns about the problem directly with the Lao Foreign Ministry.

September 1979

A Department of Defense medical team was dispatched to Thailand to interview and prepare a report on H'Mong refugees having knowledge of gas attacks in Laos.

November 1979

Demarches were made to the Vietnamese in Paris and to the Soviets in Moscow expressing U.S. concerns about reports of poison gas being used against "resistance forces" in Laos. Both the Soviets and Vietnamese supported the Lao denial of the validity of the reports.

December 1979

State and Defense Department officials presented evidence of gas attacks in Laos to the House Foreign Affairs Committee.

February 1980

A bilateral demarche was made to the Soviets about U.S. concerns regarding chemical warfare use in both Laos and Kampuchea and about reports that chemical weapons were being used by the Soviets in Afghanistan. The demarche was made in Geneva in the context of the U.S./Soviet bilateral negotiations on a comprehensive prohibition of chemical weapons production, development, and stockpiling.

May 1980

An interagency team of U.S. Government political, technical, and intelligence officers was dispatched to Europe to brief the allies about the problem and to stimulate support for having an impartial international investigation conducted.

July 1980

Another bilateral demarche was made to the Soviets in the context of the U.S./Soviet bilateral chemical warfare negotiations, concerning the problem of the reported use of chemical weapons in both Southeast Asia and Afghanistan.

The Inter-Parliamentary Union adopted a resolution calling for an impartial international investigation of reports of chemical weapons use.

August 1980

The United States circulated to U.N. member states a 125-page compendium of reports and declassified intelligence information pertaining to the use of chemical weapons in Laos, Kampuchea, and Afghanistan.

The 40-nation Committee on Disarmament included language in its Annual Report to the U.N. General Assembly on the need for an impartial international investigation of the problem of chemical weapons use.

December 1980

With the full and active support of the United States, the West, and others, the U.N. General Assembly adopted a resolution (A/35/144 C) establishing a U.N. investigation, under the auspices of the U.N. Secretary General and with the assistance of qualified medical and technical experts, of reports of chemical weapons use. The vote was 78 in favor to 17 opposed, with 36 abstentions.

March 1981

In accordance with U.N. General Assembly Resolution A/35/144 C and the request of the U.N. Secretary General, the U.S. submitted detailed information pertaining to the reports of the use of chemical weapons in Southeast Asia and Afghanistan. The U.S. submission consisted of a letter summarizing the U.S. submission, the U.S. compendium of reports from August 1980, an update to that compendium covering the period through January-February 1981, the transcripts of congressional hearings held on the subject in December 1979 and in April 1980, and the texts of House and Senate resolutions condemning the use of chemical weapons.

July 1981

The United States provided further details and written responses to questions from the U.N. Group of Experts concerning the U.S. submission of March 1981.

September 1981

Secretary Haig announced, in his September 13 speech in Berlin, that the United States had obtained physical evidence of the use of lethal mycotoxins in Southeast Asia, discovered in the analysis of a leaf and stem sample obtained from the site of a chemical attack in Kampuchea.

On September 14, the United States submitted a report on the new evidence pertaining to the use of mycotoxins to the U.N. Group of Experts investigating reports of chemical weapons use.

Under Secretary of State for Political Affairs Stoessel held a press conference in Washington on September 14 and provided a detailed press backgrounder on the new evidence.

Secretary Haig raised U.S. concerns about the new evidence pertaining to the use of lethal mycotoxins in Southeast Asia and about the 1979 Sverdlovsk anthrax incident with Soviet Foreign Minister Gromyko during their bilateral consultations at the United Nations in New York.

October 1981

Following up the Haig/Gromyko discussions, detailed bilateral demarches were made to the Soviets in Washington by Acting Arms Control and Disarmament Agency Director Grey, and a followup in Moscow by the U.S. Deputy Chief of Mission, on the general subject of Soviet Biological Warfare Convention compliance and specific U.S. concerns regarding the 1979 Sverdlovsk anthrax incident and the evidence of the use of trichothecene mycotoxins in Southeast Asia. The Soviets rejected U.S. concerns once again in their formal response in November.

An interagency team of political, technical, and intelligence officers was dispatched to Europe to brief the allies about the new evidence of the use of lethal mycotoxins in Southeast Asia.

A delegation of U.S. Government political, technical, and medical experts appeared before the U.N. Group of Experts to respond to questions pertaining to the U.S. submission on September 14 of new evidence concerning the use of lethal mycotoxins in Southeast Asia.

November 1981

The U.N. Group of Experts investigating reports of chemical weapons use traveled to Thailand to visit refugee camps and interview and examine survivors and eyewitnesses of chemical attacks in Laos and Kampuchea. While there, the experts also obtained samples from alleged chemical attacks and samples of vegetation and blood from refugees exposed to chemical attacks.

Richard Burt, Director of the Bureau of Politico-Military Affairs, in testimony before the Congress, announced the results of analyses of additional samples of chemical warfare use revealing the presence of high levels of mycotoxins and the results of analyses of control samples from Southeast Asia which were found to contain *no* mycotoxins.

The United States submitted a report on its analyses of chemical warfare use samples from both Kampuchea and Laos, which were found to contain high levels of mycotoxins, to the U.N. Group of Experts investigating reports of chemical weapons use.

Demarches were made to the Vietnamese in New York and to the Lao in Vientiane regarding the evidence of the use of lethal mycotoxins in the conflicts in Kampuchea and Laos. Both the Vietnamese and the Lao rejected the evidence and denied the validity of U.S. concerns.

December 1981

The U.N. Secretary General submitted the Report of the U.N. Group of Experts investigating reports of chemical weapons use (A/36/613). The report was inconclusive and stated that the group had been unable to carry out all the actions it had *intended* (i.e., on-site visits to Afghanistan, Laos, and Kampuchea) due to the refusals to cooperate of the countries concerned, and that it had been unable to complete some of the actions it had *planned* (e.g., on-site visits to Pakistan, analysis of the samples obtained in Thailand) in the time available.

With the full and active support of the United States, the West, and others, the U.N. General Assembly adopted a resolution (A/36/96 C) extending for another year the mandate of the U.N. Secretary General's Group of Experts investigating reports of chemical weapons use. The vote on the resolution was 86 in favor to 20 opposed, with 32 abstentions.

This report represents an effort of the U.S. Government to correct the first deficiency and to ameliorate the second to the extent possible. In preparation of this report, all of the information available to the U.S. Government on chemical weapons use in Laos, Kampuchea, and Afghanistan was assembled in one place. This information was again reviewed, analyzed, cross-indexed, and organized in a coherent fashion. Based upon this comprehensive analysis, a set of conclusions were drawn, conclusions which have since been reviewed and agreed on without qualification by every relevant agency of the U.S. Government.

The evidence upon which this report is based is of several kinds, including:

- Testimony of those who saw, experienced, and suffered from chemical weapons attacks;
- Testimony of doctors, refugee workers, journalists, and others who had the opportunity to question large numbers of those with firsthand experience of chemical warfare;
- Testimony of those who engaged in chemical warfare or were in a position to observe those who did;
- Scientific evidence, based upon the analysis of physical samples taken from sites where attacks had been conducted;
- Documentary evidence from open sources; and
- Intelligence derived from "national technical means."

These sources provide compelling evidence that tens of thousands of unsophisticated and defenseless peoples have for a period of years been subjected to a campaign of chemical attacks. *Taken together, this evidence has led the U.S. Government to conclude that Lao and Vietnamese forces, operating under Soviet supervision, have, since 1975, employed lethal chemical and toxin weapons in Laos; that Vietnamese forces have, since 1978, used lethal chemical and toxin agents in Kampuchea; and that Soviet forces have used a variety of lethal chemical warfare agents, including nerve gases, in Afghanistan since the Soviet invasion of that country in 1979.*

The implications of chemical warfare in Afghanistan and Southeast Asia are painful to contemplate but dangerous to ignore. This activity threatens not only the peoples of those isolated regions but the international order upon which the security of all depends. Those who today suffer chemical warfare against their homelands are powerless to stop it. The prohibitions of international law and solemn agreement are not self-enforcing. Only an alert and outspoken world community, intent to maintain those standards of international behavior it has so painfully achieved and so tenuously established, can bring sufficient pressure to bear to halt these violations of law and treaty. It is hoped that publication of this report will be one step in this process, the end result of which will be the cessation of chemical warfare and the strengthening of the rule of law in the affairs of nations.

KEY JUDGMENTS

Laos. The U.S. Government has concluded from all the evidence that selected Lao and Vietnamese forces, under direct Soviet supervision, have employed lethal trichothecene toxins and other combinations of chemical agents against H'Mong resisting government control and their villages since at least 1976. Trichothecene toxins have been positively identified, but medical symptoms indicate that irritants, incapacitants, and nerve agents also have been employed. Thousands have been killed or severely injured. Thousands also have been driven from their homeland by the use of these agents.

Kampuchea. Vietnamese forces have used lethal trichothecene toxins on Democratic Kampuchean (DK) troops and Khmer villages since at least 1978. Medical evidence indicates that irritants, incapacitants, and nerve agents also have been used.

Afghanistan. Soviet forces in Afghanistan have used a variety of lethal and nonlethal chemical agents on *mujahidin* resistance forces and Afghan villages since the Soviet invasion in December 1979. In addition, there is some evidence that Afghan Government forces may have used Soviet-supplied chemical weapons against the *mujahidin* even before the Soviet invasion. Although it has not been possible to verify through sample analysis the specific agents used by the Soviets, a number of Afghan military defectors have named the agents brought into the country by the Soviets and have described where and when they were employed. This information has been correlated with other evidence, including the reported symptoms, leading to the conclusion that nerve agents, phosgene oxime, and various incapacitants and irritants have been used. Other agents and toxic smokes also are in the country. Some reported symptoms are consistent with those produced by lethal or sublethal doses of trichothecene toxins, but this evidence is not conclusive.

The Soviet Connection. The conclusion is inescapable that the toxins and other chemical warfare agents were developed in the Soviet Union, provided to the Lao and Vietnamese either directly or through the transfer of know-how, and weaponized with Soviet assistance in Laos, Vietnam, and Kampuchea. Soviet military forces are known to store agents in bulk and move them to the field for munitions fill as needed. This practice also is followed in Southeast Asia and Afghanistan, as evidenced by many reports which specify that Soviet technicians supervise the shipment, storage, filling, and loading onto aircraft of the chemical munitions. The dissemination techniques reported and observed evidently have been drawn from years of Soviet chemical warfare testing and experimentation. *There is no evidence to support any alternative explanation, such as the hypothesis that the Vietnamese produce and employ toxin weapons completely on their own.*

METHODOLOGY

The judgments of this study were arrived at through a rigorous analytical process.

- Every relevant piece of information on reported chemical warfare incidents was reviewed, recorded, and tabulated. Numbers of attacks and deaths were screened for possible duplication. Extensive data on the Soviet chemical and biological warfare program also were reviewed.
- All the test data on physical evidence available to the U.S. Government—including environmental samples and background controls—were reviewed.
- A scientific report on toxins, which concluded that trichothecenes probably were among the agents used in Southeast Asia, was prepared.
- The medical evidence was analyzed, drawing on all available information from Southeast Asia and Afghanistan and incorporating the findings of a Department of Defense medical team, which concluded that at least three types of agents were used in Laos.
- Extensive consultations were held with government and nongovernment scientists and medical authorities, many of whom were asked to review the evidence. Experts from other countries also were consulted.

After the data were organized to permit comparative analysis, the study focused on three separate questions.

- Have lethal and other casualty-producing agents been used in Southeast Asia and Afghanistan?
- What are these agents, and how and by whom are they employed?
- Where do these agents originate, and how do they find their way to the field?

Although the evidence differs for each country, the analytical approach was the same. Testimony of eyewitnesses—date, place, and type of attack—was matched against information from defectors, journalists, international organizations, and sensitive information that often pinpointed the time and place of chemical attacks. In addition, information on military operations in the areas where chemical attacks had been reported was examined to establish whether air or artillery strikes took place or whether there was fighting in the areas where chemical agents reportedly were used. *In all three countries, instances were identified in which eyewitness accounts could be correlated directly with information from other sources on military operations in progress.*

There is no evidence of any systematic propaganda campaign by either the H'Mong in Laos or the Afghan resistance forces to promote the allegation that chemical agents have been used on their people. On the other hand, there were early indications that Pol Pot's Democratic Kampuchean resistance did engage in an organized propaganda campaign on chemical agent use. These indications made U.S. Government analysts cautious about accepting DK allegations, which increased markedly after the chemical attacks in Laos were publicized. For Kampuchea, therefore, special efforts were taken to confirm such allegations by analyzing sources of information that in no way could be considered part of a propaganda or deception campaign.

DISCUSSION OF FINDINGS

In September 1981, the U.S. Government declared publicly that toxins—poisonous chemical substances extracted from biological material—probably were the mysterious lethal agents used for many years in Laos and Kampuchea. The statement was prompted by the discovery of high levels of trichothecene toxins in a vegetation sample collected shortly after a March 1981 Vietnamese chemical attack in Kampuchea. This conclusion, however, rested on a much broader base of evidence than analysis of one sample.

By April 1980, the U.S. Government had already concluded that lethal agents almost certainly had been used against H'Mong tribespeople in Laos. There was less certainty then about the use of lethal agents in Kampuchea, mainly because of the already mentioned suspicions about the propaganda campaign of Pol Pot's Democratic Kampuchean forces, although their claims subsequently were shown to be valid. It was also concluded that chances were about even that lethal agents had been used in Afghanistan. There was little doubt by April 1980 that riot-control agents and some form of incapacitants had been used in all three countries. Since that April 1980 assessment, additional evidence has allowed a much firmer conclusion. There is now no doubt that casualties and deaths have resulted from chemical attacks in all three countries.

What Chemical Agents Are Being Used?

As soon as it was determined that chemical agents had been used, an effort was made to identify the specific agents. To do this it was necessary to collect and analyze at least one of the following: environmental samples contaminated with agents, the munitions used to deliver agents, or biological specimens from victims of an attack. A study by medical-toxicological experts of symptoms exhibited by individuals exposed to toxic agents provides a good indication of the general class of chemical agent used. Thus, the range of clinical manifestations from chemical agents, as reported by a U.S. Army investigative team in Thailand, resulted in the determination that nerve agents, irritants such as CS, and highly toxic hemorrhagic chemicals or mixture of chemicals were used in Laos.

Other medical-toxicological personnel who reviewed the evidence and conducted their own investigation reached the same conclusion. They further indicated that toxins such as the trichothecenes were a probable cause of the lethal hemorrhaging effect seen in Kampuchea and Laos. In many cases, symptoms reported by the Democratic Kampuchean forces in Kampuchea and the *mujahidin* in Afghanistan were similar to those reported by the H'Mong in Laos. Moreover, symptoms reported from Afghanistan and Kampuchea indicated that a highly potent, rapid-acting, incapacitant "knockout" chemical also was being used. *Mujahidin* victims and witnesses to chemical attacks reported other unusual symptoms, including a blackening of the skin, severe skin irritation along with multiple small blisters and severe itching, severe eye irritation, and difficulty in breathing—all of which suggests that phosgene oxime or a similar substance was used.

Collecting samples possibly contaminated with a toxic agent during or after a chemical assault is difficult under any circumstances but particularly when the assault is against ill-prepared people without masks or other protective equipment. Obtaining contaminated samples that will yield positive traces of specific chemical agents depends on many factors. These include the persistency of the chemical, the ambient temperature, rainfall, wind conditions, the medium on which the chemical was deposited, and the time, care, and packaging of the sample from collection to laboratory analysis.

Many traditional or known chemical warfare agents are nonpersistent and disappear from the environment within a few minutes to several hours after being dispersed. Such agents include the nerve agents sarin and tabun; the blood agents hydrogen cyanide and cyanogen chloride; the choking agents phosgene and diphosgene; and the irritant phosgene oxime. Other standard chemical warfare agents—such as the nerve agents VX and thickened soman and the blistering agents sulfur mustard, nitrogen mustard, and lewisite—may persist for several days to weeks depending on weather conditions.

The trichothecene toxins have good persistency but may be diluted by adverse weather conditions to below detectable concentrations. To maximize the chances of detection, sample collections need to be made as rapidly as possible after a chemical assault; as with many agents, this means minutes to hours. Under the circumstances of Southeast Asia and Afghanistan, such rapid collection has simply not been possible. Although many samples were collected, few held any realistic prospect of yielding positive results. It is fortunate that trichothecenes are sufficiently persistent and in some cases were not diluted by adverse weather conditions. Thus we were able to detect them several months after the attack.

Samples have been collected from Southeast Asia since mid-1979 and from Afghanistan since May 1980. To date, about 50 individual samples—of greatly varying types and usefulness for analytical purposes—have been collected and analyzed for the presence of known

chemical warfare agents, none of which has been detected. Based on recommendations by medical and toxicological experts and findings of investigators from the U.S. Army's Chemical Systems Laboratory, several of the samples have been analyzed for the trichothecene group of mycotoxins. Four samples, two from Kampuchea and two from Laos, were found to contain high levels of trichothecene toxins. In addition, preliminary results of the analysis of blood samples drawn from victims of an attack indicate the presence of a trichothecene metabolite of T-2, namely HT-2.

A review of all reports indicates the use of many different chemical agents, means of delivery, and types of chemical attacks. The use of trichothecene toxins has been identified through symptoms and sample analysis. In some cases, however, the symptoms suggest other agents, such as nerve gas, which have not been identified through sample analysis. Significant differences as well as similarities have surfaced in the reports from the three countries. The evidence from each country, therefore, is described separately, with attention drawn to similarities where appropriate.

Laos

Reports of chemical attacks against H'Mong villages and guerrilla strongholds in Laos date from the summer of 1975 to the present (see Table 1). Most of the reports were provided by H'Mong refugees who were interviewed in Thailand and the United States. More than 200 interviews were carried out variously by U.S. Embassy officials in Thailand, a Department of Defense team of medical-toxicological experts (see Annex B), U.S. physicians, Thai officials, journalists, and representatives of international aid and relief organizations. According to the interviews, Soviet AN-2 and captured U.S. L-19 and T-28/41 aircraft usually were employed to disseminate toxic chemical agents by sprays, rockets, and bombs. In some cases, Soviet helicopters and jet aircraft were said to have been used.

The reports describe 261 separate attacks in which at least 6,504 deaths were cited as having resulted directly from exposure to chemical agents. The actual number of deaths is almost certainly much higher, since the above figure does not take account of deaths in attacks for which no specific casualty figures were reported. The greatest concentration of reported chemical agent use occurred in the area where the three provinces of Vientiane, Xiangkhoang, and Louangphrabang adjoin (see map). This triborder region accounted for 77% of the reported attacks and 83% of the chemical-associated deaths. Most of the reported attacks took place in 1978 and 1979. Since 1979, the incidence of chemical attacks appears to have been lower, but reported death rates among unprotected and untreated victims were higher. Only seven chemical attacks were reported in the fall of 1981, for example, yet 1,034 deaths were associated with those incidents.

TABLE 1

Laos: Summary of Reported Chemical Attacks and Associated Deaths, 1975–81

Time Period	Area	Attacks[a]	Deaths[b]
Summer 1975	Vientiane	2	25+
Fall 1976	Phou Bia	8	10
	Savannakhet	1	10
Winter 1976–77	Phou Bia	2	16
Spring 1977	Phou Bia	6	66+
	Khammouan	2	1
Summer 1977	Phou Bia	6	95
Fall 1977	Phou Bia	1	25
Winter 1977–78	Phou Bia	10	1,328+
	Savannakhet	6	224
Spring 1978	Phou Bia	34	969+
Summer 1978	Phou Bia	22	664+
Fall 1978	Phou Bia	19	572
Winter 1978–79	Phou Bia	5	15+
Spring 1979	Phou Bia	36	257+
Summer 1979	Phou Bia	5	239+
Fall 1979	Phou Bia	10	56
	Xaignabouri	2	24+
Winter 1979–80	Phou Bia	4	10+
Spring 1980	Phou Bia	3	24
Summer 1980	Phou Bia	6	187+
Fall 1980	Xaignabouri	1	12
	Phou Bia	7	88+
	Savannakhet	3	1+
Winter 1980–81	Xaignabouri	2	57
	Phou Bia	4	82
	Vientiane	1	1+
Spring 1981	Houaphan	2	?
	Phou Bia	7	218
	Vientiane	1	—
Summer 1981	Phou Bia	1	?
Fall 1981	Phou Bia	4	500+
	Khammouan	3	534+
		226	6,310+

[a] This tabulation omits 35 attack sites, accounting for 194 deaths, which could not be geographically located in the reports. The totals overall were 261 attacks and more than 6,504 deaths.

[b] A plus sign indicates that the report(s) of deaths gave a minimum figure. In some cases (shown with a question mark) deaths were reported, but no number was given. Other reports (signified with a dash) gave no information on fatalities.

The medical symptoms reportedly produced by the chemical agents are varied. According to knowledgeable physicians, the symptoms clearly point to at least three types of chemical agents—incapacitant/riot-control agents, a nerve agent, and an agent causing massive hemorrhaging. The last-named was positively identified as trichothecene toxins. This was announced publicly by Secretary Haig in September 1981.

In a number of the refugee reports, eyewitnesses described attacks as consisting of "red gas" or a "yellow cloud."

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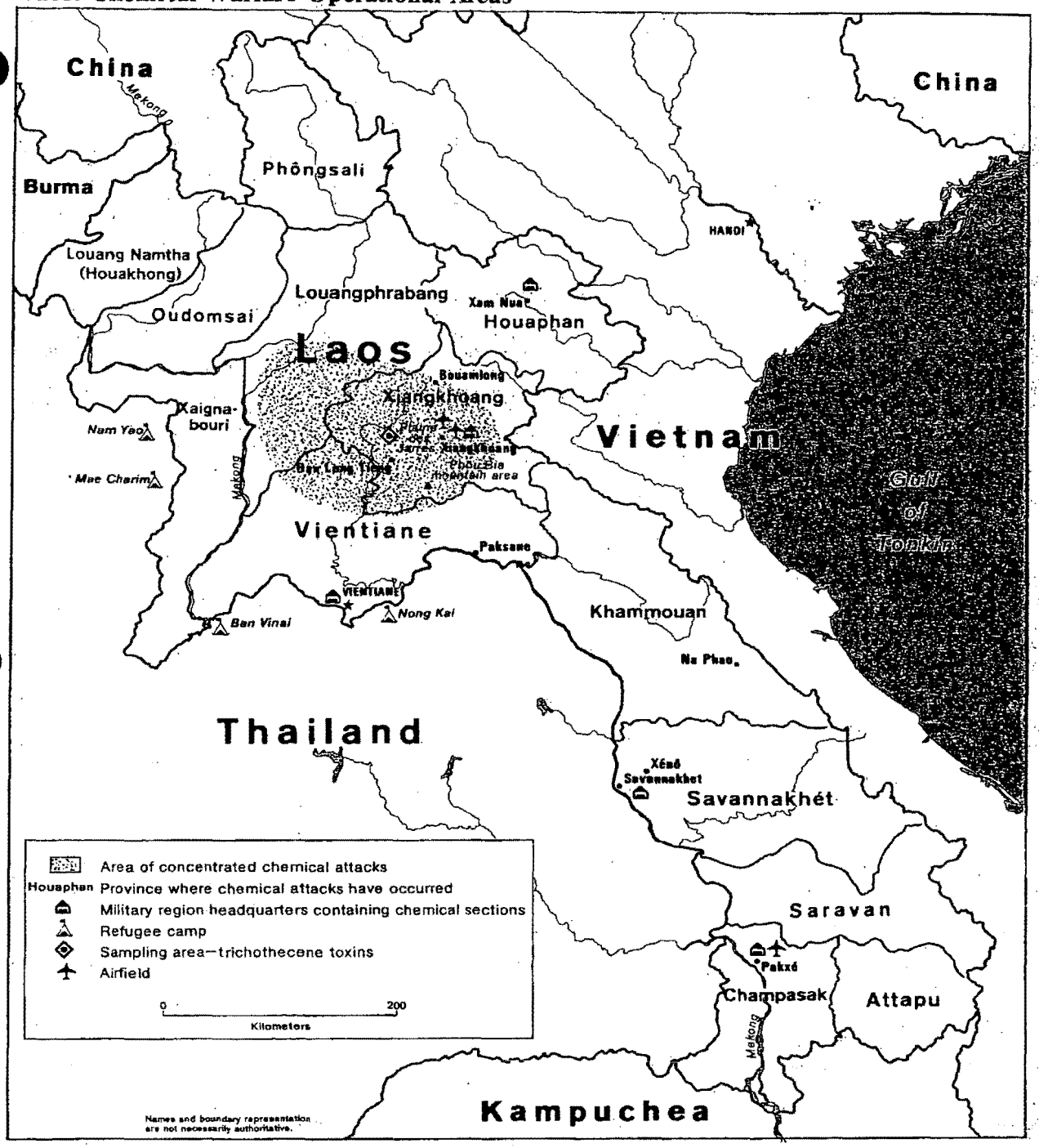

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Red gas was considered the more lethal. A former Lao Army captain stated that the "red gas" caused the H'Mong to die within 12 hours. An employee of an international organization interviewed victims of a September 15, 1979 attack in which nonlethal rounds preceded an attack by five or six "red gas" bombs that covered a 500-meter area. Persons within 30–100 meters of the circle died in 10 minutes after severe convulsions. Others had headaches, chest pains, and vomiting but did not die.

Every qualified interrogator who systematically interviewed the H'Mong refugees concluded that they had been subjected to chemical attacks. A U.S. Government medical team returned from Thailand in 1979 convinced that several unidentified chemical warfare agents had produced the symptoms described by the refugees. This evidence was expanded by testimony from a variety of sources, including that of a Lao pilot who flew chemical warfare missions before defecting in 1979. His detailed description of the Lao, Vietnamese, and Soviet program to use chemical agents to defeat the H'Mong resistance helped dispel any lingering suspicions that the refugees had fabricated or embellished the stories. The Lao pilot described the chemical rocket he had fired as having a more loosely fitting warhead than a conventional rocket. (His account appears in Annex A.)

In 1977, a H'Mong resistance leader found a U.S. 2.75-inch rocket* with a modified Soviet warhead that fits the Lao pilot's description. Other sources reported that U.S. 2.75-inch rockets were fitted with Soviet-supplied lethal chemical warheads by Soviet and Vietnamese technicians at facilities in Vientiane as well as in Xiangkhoang and Savannakhet Provinces. Munitions storage facilities suitable for storing chemical agents and weapons have been identified in each of these provinces. The aircraft types—AN–2s, L–19s, and T–28/41s—most often reported by the H'Mong refugees as being used to deliver chemical agents have been identified as based on airfields in northern Laos throughout this period. A special Lao Air Force unit is responsible for chemical rockets. The unit is commanded by a Soviet-trained Lao and has a Soviet rocket expert attached as an adviser.

* During withdrawal of U.S. forces from Vietnam, thousands of these fell into Vietnamese hands.

Obtaining additional data for Laos has been difficult because of the nature of the fighting there. There have been few major operations. The reports reflect numerous minor engagements between the opposing forces. In nearly all cases, the chemical use reported has been directed against villages, in the absence of obvious combat operations. This lends support to the Lao pilot's claim that the Vietnamese and Lao military commands were engaged in a "H'Mong extermination" campaign.

Of particular interest are the circumstances surrounding the collection of two physical samples found to contain lethal toxins. The first was collected after a March 13, 1981 attack on a village between the villages of Muong Chai and Phakhao in the Phou Bia region. In this case, a large two-engine plane reportedly sprayed a mist of a moist, yellow, sticky substance; two villagers and all village animals died. The second sample is from Ban Thonghak, another village in the Phou Bia region, collected following an April 2, 1981 attack in which a jet aircraft reportedly sprayed a yellow substance; 24 of the 450 villagers died. In the spring of 1981, seven separate chemical attacks, resulting in 218 deaths, were reported to have occurred in this region.

It is significant that these attacks took place following a period of escalation in overall resistance activities in the Phou Bia area in the winter of 1980–81. During that period, joint suppression operations by Lao People's Liberation Army and Vietnamese Army forces had achieved only limited success, perhaps spurring both forces on to greater effort. The more intense use of chemical weapons may have been part of this effort.

Evidently the fact that chemical agents were being used in Laos was not widely known among units of the Lao Army. In June 1981, a group of refugees from a village in Vientiane Province reached Thailand and described attacks against them carried out a month earlier by helicopters "dropping poison" into their water supply. Lao field units subsequently entered the village and were surprised at the sight of many villagers still suffering from symptoms of acute poisoning. According to a villager, when the Lao military personnel saw the "small yellow grains" spread around the village, they were convinced that toxic chemicals had been used on the village and requested medical assistance for those villagers still suffering from nausea and bloody diarrhea.

In a December 15, 1981 press conference in Beijing, former Lao Health Ministry Bureau Director Khamsengkeo Sengsathit—who had defected to China—confirmed that chemical weapons were being used "in the air and on the ground" in Laos, killing "thousands." He asserted that the Vietnamese alone were using such weapons, keeping the matter secret from the Lao. He also stated that 3,000 Soviet advisers were in Laos and "have taken control" of the Lao Air Force, while 40,000–50,000 Vietnamese troops had "reduced Laos to the status of a colony."

Kampuchea

Since October 1978, radio broadcasts, press releases, and official protests to the United Nations by the Democratic Kampuchea leadership have accused the Vietnamese and the Hanoi-backed People's Republic of Kampuchea regime of using Soviet-made lethal chemical agents and weapons against DK guerrilla forces and civilians. DK allegations for a time were the only source of information concerning chemical warfare attacks in Kampuchea. In November 1979, however, the guerrilla forces of the Khmer People's National Liberation Front reported that the Vietnamese had attacked them with a tear gas which, from their description, resembled the riot-control agent CS. Subsequently, Thai officials, Democratic Kampuchea informants and refugees, Vietnamese Army defectors, U.S. and Thai medical personnel, officials of international aid and relief organizations, and Canadian and West European officials also have implicated the Vietnamese in the offensive use of lethal and incapacitating chemical agents in Kampuchea.

There are reports of 124 separate attacks in Kampuchea from 1978 to the fall of 1981 in which lethal chemicals caused the deaths of 981 persons (see Table 2). The mortality figure represents a minimum because some reports state only that there were deaths and do not provide a number. The earliest reports cite attacks in Ratanakiri Province, in the northeastern corner of the country (see map). Reports from 1979 to the present show the use of lethal chemicals primarily in the provinces bordering Thailand. The greatest use of chemical agents apparently has been in Battambang Province, with 51 reported incidents; Pursat Province has experienced the next highest frequency, with 25

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TABLE 2

Kampuchea: Summary of Reported Chemical Attacks and Associated Deaths, 1978–81

Time Period	Area	Attacks	Deaths[a]
1978	Ratanakiri	5	?
Summer 1979	Kompong Speu	4	37
Fall 1979	Siem Reap	1	—
	Battambang	4	22+
	Pursat	2	1+
	Koh Kong	2	6+
	Kampot	1	3
	Kompong Chhnang	2	118
Winter 1979–80	Battambang	12	64+
	Pursat	5	21+
	Koh Kong	2	4
Spring 1980	Battambang	3	20+
	Pursat	8	24+
	Koh Kong	5	13
Summer 1980	Siem Reap	1	82+
	Battambang	3	23+
	Pursat	2	7
	Koh Kong	3	—
Winter 1980–81	Battambang	8	—
	Pursat	2	3
Spring 1981	Preah Vihear	1	—
	Battambang	12	163+
	Pursat	3	42+
	Koh Kong	1	—
	Kampot	1	—
Summer 1981	Battambang	3	7+
	Kompong Thom/Cham	1	—
Fall 1981	Siem Reap	16	305
	Battambang	6	16
	Pursat	3	—
	Koh Kong	1	—
	Kampot	1	—
		124	981

[a] A plus sign indicates that the report(s) of deaths gave a minimum figure. In some cases (shown with a question mark) deaths were reported, but no number was given. Other reports (signified with a dash) gave no information on fatalities.

reported incidents. These numbers are consistent with the overall high level of military activity reported in the border provinces.

A review of information from all sources provides direct and specific support for 28 of 124 reported attacks. There is, in addition, some evidence that in all reported instances some form of attack took place. This evidence includes reports of troop movements, supply transfers, operational plans, postoperation reporting, and air activity. It indicates that military activity took place at the time and place of every incident reported to involve lethal chemical agents. In some cases, it provides strong circumstantial evidence that the action involved chemical substances—for example, the movement of chemicals and personal protection equipment into the area.

There is no doubt that in late 1978 and 1979 the Vietnamese, and what later became the People's Republic of Kampuchea forces, made at least limited use of riot-control chemicals and possible incapacitating agents against both Communist and non-Communist guerrilla forces in Kampuchea. The chemicals used probably included toxic smokes, riot-control agents such as CS, and an unidentified incapacitating agent that caused vertigo and nausea and ultimately rendered victims unconscious with no other signs or symptoms.

In March 1979, during Vietnamese operations against Khmer Rouge forces in the Phnom Melai area, a Vietnamese Army private, who later defected, observed the following activities related to chemical warfare. During the fighting, all regiment (740th) troops were issued gas masks. However, the 2nd Battalion, a "border defense unit," was not issued masks. This unit was in the Phnom Melai area and was virtually surrounded by Khmer Rouge forces. At another point in the battle, the regiment's troops were ordered to don masks. The Vietnamese Army private reported that he saw two Soviets (Caucasians) fire a DH–10 (a hand-held weapon identified by the private's comrades). He was about 50 meters from the firing point. The weapon at impact, which he was able to observe from his position, gave off clouds of white, gray, and green gas/smoke. His signal unit subsequently passed a message reporting that there were 300 dead, including the unprotected Khmer Rouge and Vietnamese of the border defense forces' 2nd Battalion. The corpses reportedly had traces of white and green powder on their faces and clothes. Their faces were contorted, with eyes wide open. No blood was seen. (A H'Mong resistance leader described an incident in 1981 in which two Soviet soldiers fired a hand-held weapon that dispersed a similar lethal agent.)

Starting in February 1980, reports revealed that the Vietnamese were using 60 mm mortars, 120 mm shells, 107 mm rockets, M–79 grenade launchers filled with chemical agents, as well as munitions delivered by T–28 aircraft. According to the DK, the chemicals used were green and yellow and powderlike in appearance. In some instances the gas was described as yellow or white. The symptoms described were tightening of the chest, disorientation, vomiting, bleeding from the nose and gums, discoloration of the body, and "stiffening" of the teeth. In July 1980, the DK described artillery attacks that produced a black smoke causing itchy skin, weakness, skin lesions, and in some cases decaying skin and blisters. In December 1980, the Vietnamese were once again firing chemical artillery shells, and it was believed that poison chemicals were being brought into Thailand's border region. By March 1981, the Democratic Kampuchea forces had reported numerous attacks directed against them with lethal chemical agents and the poisoning of food and water.

U.S. analysis of contaminated vegetation samples collected within hours of a March 1981 attack showed high levels of three trichothecene toxins in a combination that would not be expected to be found in a natural outbreak in this

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environment. At the levels found on the vegetation, the three trichothecenes would produce vomiting, skin irritations and itching, and bleeding symptoms. Water samples taken from the area of the same attack also contained trichothecene toxins. Control samples from nearby areas confirmed that these toxins were not indigenous to the locale. (Details on the sample analysis appear in Annex D.)

There also is ample evidence of military activity at the place and time of the acquisition of the samples. Vietnamese Army defectors described plans for multiregimental sweep operations to be conducted along the border in northwestern Battambang Province before the end of the dry season in May. Actual fighting, however, continued to be characterized by guerrilla tactics on both sides, including, according to a Vietnamese Army defector, "staging ambushes, laying minefields, and use of deception." Indeed, Democratic Kampuchean resistance forces were ordered to avoid large-scale operations and to limit combat operations to scattered sapper attacks. Such information is consistent with other reports of Vietnamese Army forces spreading toxic chemicals in streams, along roadsides, and around villages and firing toxic gas shells against enemy positions. The Phnom Melai sector, where Phnom Mak Hoeun is located, was described as an "anthill of DK activity," and actions reported during March were "sporadic firefights" around Phnom Mak Hoeun involving the Vietnamese Army's 2nd Battalion, 2nd Border Security Regiment.

In Kampuchea, as in Laos, the period of late 1980 through spring 1981 was one of intensified Vietnamese operations to suppress the resistance and break the will of the opposing forces. In July 1981, trucks loaded with blue sacks filled with white powder were being moved by the Vietnamese into the Pailin, Battambang, and Siem Reap areas. Vietnamese soldiers told villagers that the chemicals caused blindness, hemorrhaging, and vomiting.

Additional evidence was derived from blood samples drawn from victims of Vietnamese chemical use that occurred on September 19, 1981 in the Takong area. Takong is in the same general area as Phnom Mak Hoeun—that is, the central region of Battambang Province near the Thai border. Although there is no independent confirmation of the accounts of the attack, American medical personnel visiting a DK field hospital examined the victims and obtained the blood samples. Analyses of these samples suggested the use of trichothecenes. (Blood analysis results also appear in Annex D.)

According to the DK soldiers affected, the chemicals used in the September 19 Takong attack were dispersed as a gas or powder and as a poison to water. The gas or powder was released from containers by tripwires in the area of the rear forces. This description is consistent with the other reporting for this area and time.

Thailand also has been concerned about chemical attacks against its own forces and civilian population. In March 1981, one Thai died from poisons placed by Vietnamese troops, and others became ill after suffering bleeding from the nose and mouth. In May 1981, Thai forces captured two Vietnamese as they were attempting to poison the water supply in a Kampuchean relocation camp in Thailand. The poison was analyzed by the Thai and found to contain lethal quantities of cyanide. Many reports indicate that it is common practice for Vietnamese units to poison water and food used by the DK forces.

The Soviet Connection in Southeast Asia

Much of the Soviet interest in Southeast Asia is dictated by their rivalry with China and their close alliance with the Vietnamese. Regional Communist forces have been strengthened to contain Chinese influence and deter military incursions. The area of northern Laos between Vientiane and the Chinese border—where the H'Mong hill tribes have stubbornly resisted and harassed Vietnamese forces—is strategically significant to the Vietnamese because it adjoins a hostile China. In the last few years the Vietnamese have expanded their military construction and strengthened their forces in Laos which now number 50,000.

Initially there was a tendency to interpret the Soviet role as strictly advisory. Now, however, there is considerable evidence to suggest that the Soviets are far more involved in the Lao and Vietnamese chemical warfare program than was assumed earlier. An estimated 500 Soviet military advisers provide maintenance assistance and technical support, actually running the Lao Air Force, and give advanced training to Lao personnel in conventional as well as chemical warfare.

The Soviets have had advisers and technicians working in Vietnam and Laos for many years and in Kampuchea since 1979. However, it was not until early 1979 that evidence surfaced on the Soviets' direct involvement in chemical warfare activities. For example, the Lao Army chemical section in Xiangkhoang prepared Soviet-manufactured chemical items for inspection by a Soviet military team on February 7, 1979. A seven-man team of Soviet chemical artillery experts, accompanied by Lao chemical officers, inspected chemical supplies and artillery rounds at the Xeno storage facility in Savannakhet on June 1, 1979. One report stated that the Soviets would be inspecting the same chemical explosives used to suppress the H'Mong in the Phou Bia area.

In addition to this information, H'Mong accounts have described Soviet advisers and technicians participating in the preparation of the chemical weapons for the attacks on the H'Mong villages. H'Mong eyewitnesses claim to have seen "Caucasian pilots" in aircraft, and one H'Mong report states that a downed Soviet aircraft was discovered in the jungle along with a dead Soviet pilot. In November 1981, a H'Mong resistance leader described how Soviet soldiers fighting with the Lao Army fired handheld weapons that dispersed a lethal agent over a 300-meter area. Several Lao defectors have reported seeing Soviet advisers present when aircraft were loaded with chemical-agent rockets.

In July 1981, a Soviet shipment of wooden crates filled with canisters described by the Vietnamese as "deadly toxic chemicals" was unloaded at the port of Ho Chi Minh City. This incident further corroborates the judgment that the Soviets have been shipping chemical warfare materiel to Vietnam for some time. During the unloading, Vietnamese soldiers were caught pilfering the wooden crates containing the canisters. The soldiers dropped one of the wooden cases and intentionally broke it open; they wanted to determine if its contents were edible or valuable for pilferage. When a soldier broke the nylon seal and attempted to pry open a canister, special security personnel isolated the area and told the soldiers that the canisters contained deadly toxic substances from the U.S.S.R. The wooden crates, each weighing 100 kilograms, were loaded on military trucks and taken under special guard to the Long Binh storage depot.

This incident is only one in a series involving Soviet chemical warfare materiel dating back several years. In 1975, for example, a Soviet captain of a diving support craft engaged in salvaging a sunken ship in the Black Sea, which had been transporting Soviet military supplies to Vietnam, said that

his divers came in contact with toxic chemicals, and a special Soviet salvage unit took over the operation after the divers became very ill. The salvage operations, conducted by the ASPTR–12 Salvage, Rescue, and Underwater Technical Services Group based in Odessa, were monitored by high-ranking Soviet naval officers.

The operation began with the removal of tractors and helicopters which cluttered the deck of the ship and prevented access to hold hatches. Once the surface clutter was removed, the divers attempted to enter the holds. At this point, however, operations had to be suspended temporarily because of a violent outbreak of chemical poisoning among the divers. Contact with the unidentified chemicals resulted in reddish welts 1–3 centimeters in diameter on exposed skin and was accompanied by severe headaches, nausea, and a general feeling of fatigue. The symptoms disappeared on their own after 3–5 days of rest. At this point, military authorities took over from the ASPTR–12 divers, who were temporarily withdrawn from the project. Soviet naval divers were sent down and determined that the source of poisoning was chemical seepage from an open hatch of one of the holds. The hatch was promptly sealed, and the salvage operation was once more assigned to ASPTR–12 divers who resumed work and retrieved ammunition and an assortment of other equipment. Once this was done, the military took over permanently. The ship was raised without removing the poisonous chemicals and towed to an Odessa shipyard where the chemicals were unloaded by military personnel. The ship was then broken up and scrapped. The entire operation took about 3 years to complete.

As another example of Soviet involvement, two Vietnamese corporals, from the 337th and 347th Vietnamese Army divisions, have stated that Soviet-supplied chemical weapons were stored in caves near Lang Son in February 1979. Although their Vietnamese units were issued gas masks, they were told that Soviet-supplied chemical weapons would not be used unless the Chinese initiated chemical warfare. As late as February 1981, a team of uniformed Soviet military advisers was attached to the corps headquarters. The team leader was a senior Soviet colonel. The Soviets were involved in training corps personnel in the use of Soviet-supplied weapons and equipment, including chemical artillery shells and gas masks. The Soviet team often inspected defensive positions and observed training maneuvers.

Afghanistan

Attacks with chemical weapons against the *mujahidin* guerrillas in Afghanistan were reported as early as 6 months before the Soviet invasion on December 27, 1979. The information specifies that Soviet-made aircraft were used to drop chemical bombs, with no clear identification of Soviet or Afghan pilots or of the specific agents used. On November 16, 1979, chemical bombs reportedly were dropped along with conventional air munitions on targets in Farah, Herat, and Badghisat Provinces by Soviet-supplied Afghan IL–28 bombers based at Shindand. A number of Afghan military defectors have stated that the Soviets provided the Afghan military with chemical warfare training.

TABLE 3

Afghanistan: Summary of Reported Chemical Attacks and Associated Deaths, 1979–81

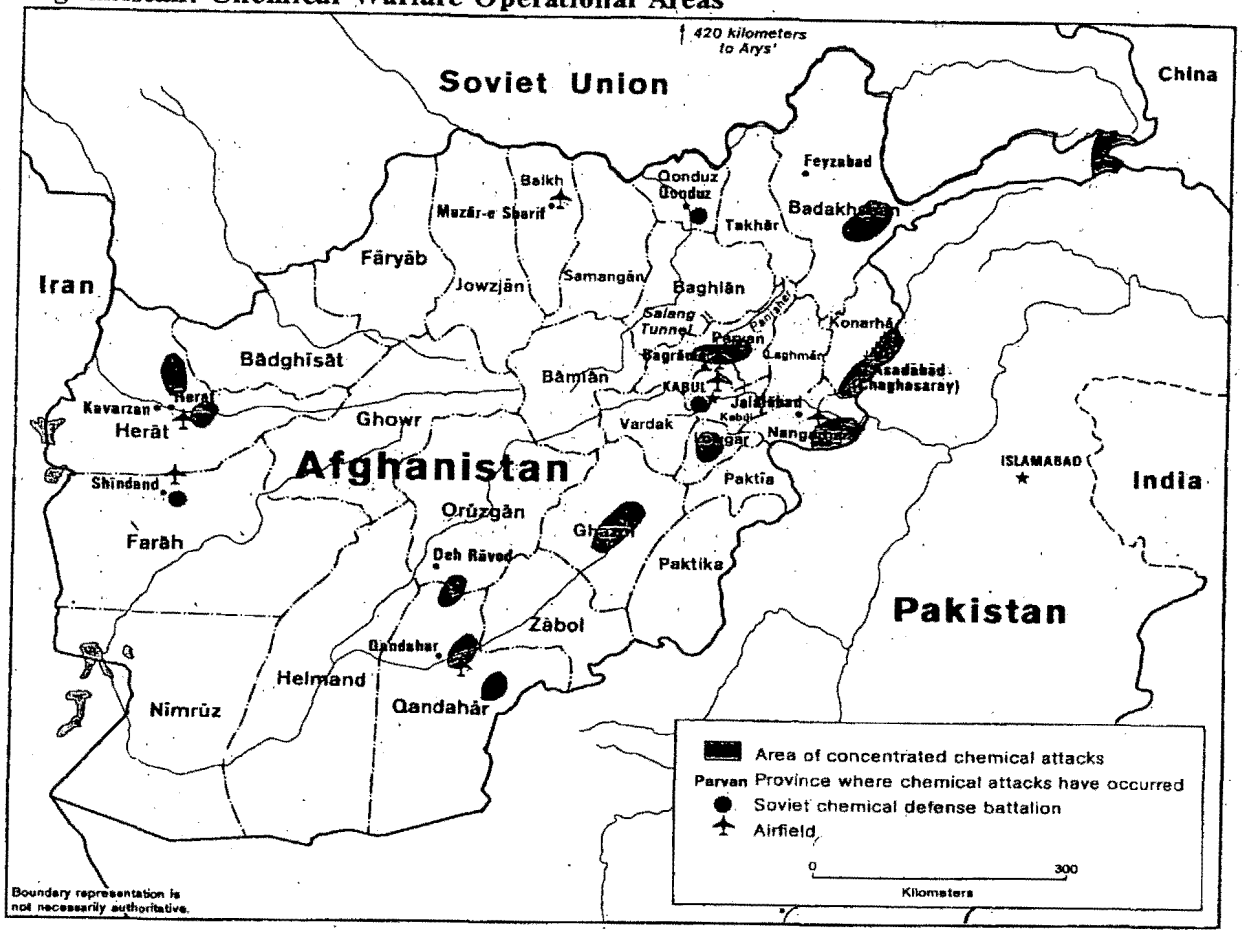
Time Period	Province	Attacks[a]	Deaths[b]
Summer 1979	Badakhshan	1	2,000[c]
	Parvan	1	8
	Bamian	1	—
Fall 1979	Konarha	1	350
	Farah	1	?
	Herat	1	?
	Badghisat	1	?
Winter 1979–80	Badakhshan	5	130+
	Takhar	1	—
	Konarha	2	10+
	Nangarhar	1	?
	Bamian	1	?
Spring 1980	Badakhshan	1	1+
	Konarha	2	?
	Oruzgan	1	—
	Qandahar	1	—
Summer 1980	Nangarhar	2	1
	Vardak	1	3
	Herat	2	300+
	Kabul	2	—
Fall 1980	Konarha	1	?
	Lowgar	1	4
	Ghazni	1	100
Winter 1980–81	Lowgar	2	?
Spring 1981	Parvan	2	—
	Lowgar	3	—
	Ghazni	2	?
	Qandahar	1	—
Summer 1981	Nangarhar	2	?
	Qandahar	2	16
	Herat	1	119
		47	3,042

[a] This tabulation omits some attacks described in the text because they could not be dated or located with high confidence.

[b] A plus sign indicates that the report(s) of deaths gave a minimum figure. In some cases (shown with a question mark) deaths were reported, but no number was given. Other reports (signified with a dash) gave no information on fatalities.

[c] The quality of reporting for this period is not as good as the information that became available after the Soviet invasion. We are concerned that this unusually high figure may reflect an accumulation of deaths from several incidents and not the single attack indicated. For example, reports were received describing over 1,000 deaths in Bamian Province in June-July 1979. An Afghan military officer reported seeing the bodies of many *mujahidin* in Panjsher Valley in August 1979 after a chemical attack and stated that many had been killed. An Afghan civil engineer reported hearing that many deaths resulted from a chemical attack in the Jalalabad area, also in the summer of 1979. Because we could not obtain supporting evidence, these reports were not included. Although sufficient evidence exists to conclude that Afghan Government forces used chemical weapons, mainly bombs, from June to December 1979, no survivors or eyewitness accounts of these attacks are available to determine the type of agent and symptoms.

Afghanistan: Chemical Warfare Operational Areas



as well as supplies of lethal and incapacitating agents.

For the period from the summer of 1979 to the summer of 1981, the U.S. Government received reports of 47 separate chemical attacks with a claimed death toll of more than 3,000 (see Table 3). Of the 47 reports, 36 came from Afghan Army deserters, *mujahidin* resistance fighters, journalists, U.S. physicians, and others. For 24 of the reported attacks, there is additional independent evidence supporting allegations of chemical attacks. In seven instances, further individual reporting exists. Evidence for 20 of the reported incidents comes from information on Soviet or Afghan Army combat operations in progress in areas and at times approximating those of a reported chemical attack (see map).

The reports indicated that fixed-wing aircraft and helicopters usually were employed to disseminate chemical warfare agents by rockets, bombs, and sprays. Chemical-filled landmines were also reportedly used by the Soviets. The chemical clouds were usually gray or blue-black, yellow, or a combination of the colors.

Symptoms reported by victims and witnesses of attacks indicate that nonlethal incapacitating chemicals and lethal chemicals—including nerve agents, phosgene or phosgene oxime, possibly trichothecene toxins, and mustard—were used. Medical examinations of some of the victims include reports of paralysis, other neurological effects, blisters, bleeding, and sometimes death. While none of the agents being used in Afghanistan has been positively identified through sample analysis, there is no doubt that the agents being used are far more toxic than riot-control agents such as CN and CS or even adamsite.

Several descriptions of the physiological action of a chemical agent or of the condition of the corpses of victims were particularly unusual. In one, victims were rapidly rendered unconscious for 2–6 hours and had few aftereffects. In another, the bodies were characterized by abnormal bloating and blackened skin with a dark-reddish tinge, and the flesh appeared decayed very soon after death. In a third incident, three dead *mujahidin* guerrillas were found with hands on rifles and lying in a firing position, indicating that the attacker had used an extremely rapid-acting lethal chemical that is not detectable by normal senses and that causes no outward physiological responses before death.

Shortly after the Soviet invasion, many reports were received that both Soviet and Afghan forces were using various types of chemical agents. Ten separate chemical attacks, resulting in many deaths, were reported in the first 3 months of 1980. These reports came from northeastern Afghanistan and provide the highest percentage of reported deaths. During the mid-January to February 1980 period, helicopter attacks were reported in northeastern Afghanistan in which a grayish-blue smoke resulted in symptoms similar to those

described by the H'Mong refugees from Laos (e.g., heavy tearing or watering of eyes; extensive blistering and discoloration of the skin, later resulting in large sheetlike peeling; swelling in the areas affected by the blister; and finally numbness, paralysis, and death). Medical reports from examinations in Pakistan of refugees from a large attack in the upper Konar Valley in February 1980 described red skin and blisters containing fluid described as "dirty water." Refugees estimated that about 2,000 people were affected after contact with a dirty yellow cloud.

By spring and summer of 1980, chemical attacks were reported in all areas of concentrated resistance activity. Many reports from different sources strongly support the case that irritants were used to drive the insurgents into the open to expose them to attack with conventional weapons and incapacitants to render them tractable for disarming and capture. On several occasions in April 1980, for example, Soviet helicopter pilots dropped "gas bombs" on insurgents, evidently to drive them from caves.

A Dutch journalist, Bernd de Bruin, published an eyewitness account of two chemical attacks occurring in the Jalalabad area on June 15 and June 21, 1980 (*Newsnet*, August 2, 1980). He filmed an MI-24 helicopter dropping canisters that produced a dirty yellow cloud. A victim with blackened skin, discolored by extensive subcutaneous hemorrhaging, was photographed in the village 5 hours after the attack. The journalist evidently was exposed because he developed blisters on his hands and a swollen and itchy face. He also was exposed in the second attack, and it took about 10 days for him to recover from skin lesions, nausea, diarrhea, and stomach cramps.

An Afghan insurgent provided an eyewitness account of a July 6, 1980 attack on a village 10 kilometers east of Darae Jelga in Vardak Province. He reported that a Soviet MI-24 helicopter gunship dropped a bomb that, upon explosion, released a lethal chemical. A separate report confirmed that Soviet bombing attacks on villages in Vardak as well as Lowgar and Parvan Provinces were taking place during this period. In August 1980, information surfaced on a Soviet attack with chemical bombs on the village of Sya Wusan, 30 kilometers southeast of Herat, leaving 300 dead. It was during this time that the Soviet chemical battalion at Shindand set up an operational decontamination station.

Reports of chemical weapons use in 1981 essentially parallel 1980 reporting with respect to frequency and location of attack. Soviet helicopter units participated in chemical attacks from April 20 to April 29, 1981, in areas east and west of Kabul and in the Konar Valley, according to eyewitness accounts. These attacks were intended to drive personnel from sanctuaries, such as caves, in order to engage them with conventional fire. The munitions were described as Soviet 250-kilogram RBK cluster bombs. The Soviets have such a munition, which can be filled with chemical agents. Other reports described similar operations by helicopters north of Qandahar on April 24 and April 26, 1981.

A former Afghan MI-8 helicopter pilot said Soviet forces had used chemical weapons in Badakhshan, Qonduz, and Konarha. Chemicals in canisters that contained toxic gas, tear gas, and antirespiratory gas, which has an incapacitating effect by causing choking and difficulty in breathing, were manually pushed from the cargo compartment of helicopters. The pilot said that there also was a specific gas that is absorbed by the body and leaves the skin so soft that a finger can be punched through it. In one case, there was a wind shift, and Soviet and Afghan forces were seriously affected. Other sources also have described an incident where Soviet and Afghan forces were victims of their own gas attack.

The following sequence occurred in a small valley in Qandahar Province in early June 1981. According to an Afghan exile, Soviet combat groups engaged rebel forces in that valley during a 2-week period. The situation worsened for the Soviets, and an airstrike was conducted. The exile stated that a Soviet helicopter delivered a single rocket, releasing a chemical that killed 16 insurgents. Nearly all reports state that chemicals were delivered by aircraft or helicopters; a few reports describe chemical artillery rounds.

Before a sweep operation in the Konar Valley in September 1981, resistance leaders were told by an Afghan officer that the Soviets had four agents available but would use only the incapacitant which they could defend against with wet rags over the face. During the operation, Soviet helicopters conducted gas attacks in 25 different areas, using cylinders about 1.5 meters long and 60 centimeters in diameter that exploded 4–5 meters above the ground, releasing the incapacitating gas. Some victims lost consciousness, were paralyzed, and recovered, but others died, and unprotected areas of their skin turned dark green to blue-green.

An Afghan tribal leader recently described a Soviet chemical attack against a large resistance force in October 1981 near Maruf, about 100 kilometers east of Qandahar. Soviet helicopters dropped green cylindrical canisters (18 inches long, 3–4 inches in diameter) which, upon hitting the ground, emitted a greenish-yellow gas. According to the report, victims felt faint and dizzy; later their skin began to itch, and many lost consciousness. About 300 persons were affected by the gas and many died. Soviet ground forces captured many of the survivors. Other information on Soviet and *mujahidin* activities in the Qandahar area during this period confirms that this incident did in fact take place.

In February 1982, a member of the resistance, with considerable knowledge of Soviet weapons, told a U.S. official that the Soviets were using irritants, a hallucinogenic gas, and what he said was an apparent nerve gas. He described the "nerve agent" as an off-white powdery substance dispersed from helicopters generally during artillery or bombing attacks. Victims realize they have been exposed to chemical attack only when they become faint and dizzy. Subsequently, they begin to vomit and bleed from the eyes, nose, and mouth. Death occurs within a short time. The corpses are extremely relaxed, with no evidence of rigor mortis. Flesh and skin frequently peel off if an effort is made to move the bodies.

According to this account, survivors suffer aftereffects for about 6 months, including chest congestion and pain, dizziness, and mental agitation. The powder-like substance is more effective at lower altitudes where there is less wind to dilute the poison, and *mujahidin* groups have experienced fatality rates as high as 70%. Many survivors of chemical attacks in Laos and Afghanistan have exhibited the same long-term health problems described in this account.

Chemical defense battalions—standard in all Soviet divisions—are deployed with the three Soviet motorized rifle divisions operating in Afghanistan at Qonduz, Shindand, and Kabul. Soviet operational personnel decontamination stations were observed at several locations, and chemical decontamination field units were deployed during a sweep operation of the Konar Valley in eastern Afghanistan and near Shindand in the west in 1980. The operational deployment of decontamination units for personnel and equipment suggests that chemical battalions have supported offensive chemical use. In addition, Soviet personnel have been observed wearing chemical protective equipment. The Soviets have specifically tailored their forces in Afghanistan, in part

because of logistical constraints; 5,000 troops and "nonessential" combat equipment were withdrawn, but the chemical battalions remain.

A Soviet military chemical specialist, captured by the *mujahidin*, gave his name as Yuriy Povarnitsyn from Sverdlovsk. During an interview, he said that his mission was to examine villages after a chemical attack to determine whether they were safe to enter or required decontamination. An Afghan pathologist who later defected described accompanying Soviet chemical warfare personnel into contaminated areas to collect soil, vegetation, and water samples after Soviet chemical attacks. According to firsthand experience of former Soviet chemical personnel, the Soviets do not require decontamination equipment in an area where chemical bombs are stored or loaded onto aircraft. Thus, deployment of this equipment in Afghanistan must be assumed to be associated with the active employment of casualty-producing chemical agents.

Afghan military defectors have provided information on ammunition and grenades containing phosgene, diphosgene, sarin, and soman and have described where and when some of them have been used. They also have revealed locations where these agents were stockpiled. The agents used, plus the time and location of the attacks, correspond with the refugee reports and recorded military operations.

The Soviet Union has stocked a variety of toxic chemical agents and munitions to meet wartime contingencies. Weapons systems capable of delivering chemical munitions available to Soviet forces in Afghanistan include artillery, multiple rocket launchers, and tactical aircraft.

Motivation for Using Chemical Weapons

In the course of this analysis, the question has been posed: Is there a military-strategic or tactical rationale for the systematic use of chemical weapons by conventional forces in Laos, Kampuchea, and Afghanistan? The military problems faced in these countries—viewed from the perspective of the Soviets and their allies—make the use of chemical weapons a militarily effective way of breaking the will and resistance of stubborn anti-government forces operating from relatively inaccessible, protected sanctuaries.

The Soviets have made a large investment in insuring that Vietnam and its clients succeed in extending their control over Indochina. For Vietnam, the H'Mong resistance in Laos is a major irritant to be removed as quickly and cheaply as possible. The use of chemical agents has played a major role in driving the H'Mong from their mountain strongholds, relieving Vietnamese and Lao ground forces of the need for costly combat in difficult terrain. Much of the H'Mong population that lived in the Phou Bia mountain region has been driven into Thailand, killed, or resettled.

In the mountainous areas of Afghanistan, where rebels are holed up in caves or other inaccessible areas, conventional artillery, high-explosive bombs, and napalm are not particularly effective. Many reports indicate that unidentified chemical agents have been used on such targets. Caves and rugged terrain in Laos and thick jungles in Kampuchea also have frustrated attempts to locate and destroy the resistance forces. Chemical clouds can penetrate the heavy forests and jungle canopy and seep into the mountain caves. Persistent agents linger in the area and cause casualties days and sometimes weeks after the attack. Unprotected forces and civilians have little or no defense against lethal agents like toxins, nerve gas, or blister agents.

Trichothecene toxins, which are known to have been used in Southeast Asia, have the added advantage of being an effective terror weapon that causes bizarre and horrifying symptoms. Severe bleeding, in addition to blisters and vomiting, has instilled fear in the resistance villages. Not only have the villagers and their animals been killed in a gruesome manner, but the vegetation and water also have been contaminated. Survivors are reluctant to return to their inhospitable homes and instead make the long and dangerous trek to camps in Thailand.

There is no clearcut explanation of why trichothecene toxins have been used in addition to irritants, incapacitants, and other traditional chemical warfare agents. Speculation suggests that they are probably cheaper to make and are readily available from Soviet stocks; they are probably safer and more stable to store, transport, and handle in a Southeast Asian environment, and they may require less protective equipment when being prepared for munitions. They are difficult to trace as the causative agent after an attack—as demonstrated by the length of time it took for the United States to detect them. Few laboratories in the world have the analytical capability to identify precisely the type and amount of trichothecene toxin in a sample of vegetation, soil, or water.

The Soviets may well have calculated that they and their allies could successfully deny or counter charges that chemical weapons had been used, recognizing that it would be especially difficult to compile incontrovertible evidence from inaccessible areas of Southeast Asia and Afghanistan. With respect to Kampuchea, they may also have calculated that, in view of the lack of international support for Pol Pot's resistance, chemical weapons could be used on his troops without significant international outcry.

In addition, the Soviet military very likely considers these remote areas as providing unique opportunities for the operational testing and evaluation of chemical weapons under various tactical conditions. Years of aerial and artillery chemical dispersion have undoubtedly provided the Soviets with valuable testing data. Southeast Asia has offered the Soviets an opportunity to test old agents that had been stockpiled for many years as well as more recently developed agents or combinations of agents. This conclusion is supported by information from foreign military officers who have attended the Soviet Military Academy of Chemical Defense in Moscow. According to their Soviet instructor, three types of chemical agents may be used during the "initial stages" of local wars: "harassing agents (CS, CN, DM), incapacitants such as psychochemicals (BZ) or intertoxins [sic—possibly enterotoxins], and herbicides." During the "decisive phase, lethal agents can be employed under certain circumstances." In a local war, "chemical weapons can be used to spoil enemy efforts to initiate operations, even if the enemy has not used them first." The foreign officers' accounts, including detailed descriptions of the Soviet chemical warfare program, support the conclusion that the Soviets consider chemical weapons an effective and acceptable means of warfare in local conflicts.

Insight into the Soviet bloc military perspective on the use of toxins is provided in the following passage from a 1977 East German military manual entitled *Textbook of Military Chemistry*.

> Toxins are designated as toxic agents which are produced by biological organisms such as micro-organisms, plants, and animals, and cannot themselves reproduce.
>
> By the middle of 1960 the toxins selected for military purposes were included among the biologic warfare agents. In principle, this was understood to mean only the bacterial toxins. Today it is possible to produce various toxins synthetically. Toxins with 10–12 amino acids can currently be synthesized in the laboratory. Toxins are not living substances and in this sense are chemicals. They thus differ fundamentally from the biological organisms so that they can be included among chemical warfare agents. As a result

of their peculiarities they are designated simply as "toxin warfare agents." They would be used in combat according to the same principles and with the same methods used for chemical warfare agents. When they are used in combat the atmosphere can be contaminated over relatively large areas—we can expect expansion depths of up to 6 kilometers before the toxin concentration drops below lethal concentration 50 . . . the toxin warfare agents can be aerosolized. They can be used primarily in micro-bombs which are launched from the air or in warheads of tactical rockets. Toxin warfare agents concentrates can be applied with aircraft spray equipment and similar dispersion systems.

The Soviet designation for several pathogenic *Fusarium* products is "IIF (*iskusstvennyy infektsionny fon*), which stands for "artificial infection background." IIF devices are used in the Soviet Union deliberately to contaminate soil in experimental agricultural test areas with spores of disease-producing fungi. We are not certain if the IIF compounds include trichothecenes. Nor are we certain as to the intent of this agricultural research program. It is possible that these programs are designed to colonize soil with pathogenic organisms either to determine which crop varieties are most resistant to disease or, alternatively, to test eradication and control methods in infected soils. Elsewhere in the Soviet agricultural research program, however, it is known that there is widespread use of certain trichothecenes, including sprays from light aircraft. A capability exists within the Soviet Union for multi-ton production of light aircraft spray-delivered microbial products such as those described above.

Evidence accumulated since World War II clearly shows that the Soviets have been extensively involved in preparations for large-scale offensive and defensive chemical warfare. Chemical warfare agents and delivery systems developed by the Soviets have been identified, along with production and storage areas within the U.S.S.R. and continuing research, development, and testing activities at the major Soviet chemical proving grounds. Soviet military forces are extensively equipped and trained for operations in a chemically contaminated environment. None of the evidence indicates any abatement in this program. The Soviets have shown a strong interest in improving or enhancing their standard agents for greater reliability and effect. Their large chemical and biological research and development effort has led them to investigate other kinds of chemical warfare agents, particularly the toxins.

None of the four countries considered in this report—Vietnam, Laos, Kampuchea, and Afghanistan—has any known large-scale facility or organization for the manufacture of chemical and biological materials. Nor are they known to have produced even small quantities of chemical warfare agents or munitions. The technical problems of producing large quantities of weapons-grade toxins, however, are not so great as to preclude any of the four countries from learning to manufacture, purify, and weaponize these materials. It is highly unlikely, however, that they could master these functions without acquiring outside technical know-how.

ANNEX A

A Lao Pilot's Account

One of the most complete descriptions of chemical warfare activities in the 1976–78 period came from a Lao pilot who was directly involved in chemical warfare. The pilot, a former Lao People's Liberation Army (LPLA) officer who defected in 1979, reported that he flew captured L–19 and T–41 aircraft equipped to dispense toxic chemical agents on H'Mong villagers in the Phou Bia area of northern Laos. He said that the LPLA, in cooperation with the Vietnamese Army, had conducted chemical warfare operations in Laos since April or early May 1976. At that time, two Lao H–34 helicopters were flown between Long Tieng and the Phonsavan airfield, both in Xiangkhoang Province, on a series of flights to transport rockets to Phonsavan for storage.

Between June and August 1976, the LPLA launched attacks in the area of Bouamlong—in Xiangkhoang Province—a stronghold for remnants of the forces of former H'Mong Gen. Vang Pao. The LPLA used L–19 aircraft for rocket attacks in that area aimed at eliminating the H'Mong resisting government control. Lao crews responsible for loading rockets on the attack aircraft noted that they were not allowed to use the rockets that had been moved from Long Tieng to Phonsavan, even though Phonsavan was much closer to the Bouamlong target area than Long Tieng, where Lao aircraft had to rearm. The pilot said that, during nearly 3 months of flying missions against the Bouamlong area, he flew his L–19 aircraft to Long Tieng to be armed with rockets.

In late 1976, the pilot's L–19 aircraft was rearmed with rockets stored at Phonsavan. Initially, H–34 helicopters were used to transport the rockets from Phonsavan to a depot near the Ban Xon airfield (Vientiane Province), where the rockets were fitted onto racks of the L–19 aircraft for missions in the Phou Bia area; later, the rockets from Phonsavan were transported to Ban Xon by trucks. All U.S.-manufactured rockets were stored with the tip and canister kept apart; the two parts had to be joined before being fitted to the racks on the aircraft. The pilot observed, however, that all the rockets transported from Phonsavan to Ban Xon were already assembled.

As part of his routine flight activities, the pilot would check his aircraft and, in doing so, examine the tip portion of new smoke rockets that had been transported from Phonsavan. He said that most appeared "loose" in the portion where the tip and canister joined, whereas the tip and canister of the ordinary explosive-type rockets at Long Tieng were noticeably more tightly connected.

In late 1976, during preparation for airstrikes on Kasy (Louangphrabang Province) and in new areas of Phou Bia, the pilot said he began carrying two or three Vietnamese Army staff officers, sometimes accompanied by a Lao staff officer, in T–41 aircraft for reconnaissance over the target areas. When these airstrikes were launched, the defector pilot initially flew his L–19 aircraft on missions with another pilot and a Lao staff officer. After 2 or 3 weeks, however, Vietnamese staff officers, who spoke excellent Lao, began alternating with the Lao officers. Before each mission, the Vietnamese or Lao staff officer would go over target areas outlined on situation maps—which then were taken along—and would point out the targets to be attacked. The defector pilot noted that at no time did the Vietnamese staff officer communicate with Lao officers on the ground, as did the Lao staff officers. A new Vietnamese officer was assigned for each airstrike mission in the H'Mong areas.

The pilot related that before flying L–19 airstrike missions with a full load of rockets he was often warned by a Lao commander to fly at above-normal altitudes when firing rockets—to preclude hazard to the occupants of the aircraft. For this reason the pilot surmised that the "smoke" rockets fired at the H'Mong were unusual. He was able to observe that the "smoke" rockets detonated in the air and that some produced white smoke, with a mixture of blue, while others produced red smoke, with a mixture of yellow. The ordinary explosive-type rockets detonated on impact. The

commander or his designated representative told the pilot before every mission that the operations—called Extinct Destruction Operations—were intended to "wipe out the reactionary H'Mong people."

Before a mission involving "smoke rockets," the commander warned the pilots to keep the operation secret. The Lao defector said that, during the nearly 2 years in which he flew rocket missions, he learned from the Lao staff officers accompanying him that there were two types of rockets. The first, mostly "smoke" rockets, were to be fired at targets far away from Lao and Vietnamese troops to avoid exposing them to the poison smoke. The second was of the ordinary explosive type, considered a "close support" rocket that could be fired near Lao troop positions. Initially, the L–19 aircraft carried eight rockets—five "close support" and three "smoke" rockets. Later, only four rockets, mainly of the "smoke" type, were carried.

After each mission in which chemical warfare rockets were used, the pilot was returned to a "rest house" at Phonsavan, where a Lao Army doctor and nurse would examine him. He said that after his missions, especially in 1978, he was particularly well treated by the examining doctor and watched very closely by the nurse. Those L–19 aircraft pilots assigned to missions utilizing chemical warfare rockets had special privileges, including additional flight pay and free meals at the Phonsavan cafeteria. In October 1978, the Lao Army stopped using L–19 aircraft on combat missions and began using Soviet MiG–21s for chemical attacks on the Phou Bia areas.

Several H'Mong reports corroborate the testimony of the Lao pilot. A village chief, for example, described attacks covering all 7 days of the week of June 5, 1976 in the Bouamlong area. He described L–19 aircraft firing rockets that produced red and green smoke: Ten villagers were killed by gas and 30 by shrapnel. Most of the H'Mong reports documented by a U.S. Foreign Service officer in June 1979 and a Department of Defense medical team in October 1979 were consistent with the pilot's testimony. H'Mong observers familiar with military aircraft reported L–19s in use until late 1978. After that time, reports described jets or "MiGs" and some accurately described Soviet AN–2s.

A review of information back to 1975 shows L–19 and T–28 aircraft were operating from airfields in northern Laos—including the one at Phonsavan, where AN–2s were seen in 1978. Failure to observe chemical decontamination equipment at the airfields does not rule out the presence or handling of chemical munitions. The Soviets supervise the chemical warfare activities in Laos; it is assumed that chemical munitions are handled in about the same manner as in the U.S.S.R. According to former Soviet chemical warfare personnel, no protective clothing or special decontamination equipment is required for loading chemical bombs onto aircraft and helicopters at chemical munitions test ranges.

The Lao pilot's description of the rockets used on the L–19 was corroborated by other sources. A H'Mong refugee, a former commander of a 500-man resistance force, reported that in 1977 he found a rocket canister and a separated warhead that he believed were the kinds used by the Vietnamese and Lao. The canister had authentic U.S. markings identifying it as a U.S.-manufactured 2.75-inch rocket and, reportedly, three lines of Russian writing which he could not translate. Another H'Mong resistance force officer, reportedly trained as a liaison officer and ordnance expert before the Communist takeover of Laos, stated that he, too, believed that the rocket canister was of U.S. manufacture and that the Soviet technicians in Laos had modified the upper stage to contain a poisonous (i.e., lethal) chemical.

The diameter of the warhead was reported to be 12.5 centimeters (5 inches), probably a measurement taken on a modified warhead, because the United States does not have a 5-inch warhead for the 2.75-inch "rocket motor." During the Vietnam conflict, about 35 million U.S.-manufactured, conventional 2.75-inch rockets were sent to the war zone, and many tens of thousands of these fell into North Vietnamese hands when the South Vietnamese forces collapsed. The Vietnamese may be using some of these rockets with existing loads, but modified warheads for the 2.75-inch rocket motor could easily be fabricated in Vietnam and filled with a lethal or nonlethal agent in Laos, especially with Soviet assistance. According to U.S. experts, fabrication of a warhead 5 inches in diameter, necked down to fit the 2.75-inch rocket, could be accomplished by trained technicians in a small, well-equipped machine shop and laboratory.

ANNEX B

Findings of U.S. Government Investigative Teams: Use of Chemical Agents Against the H'Mong in Laos

State Department Team

In May 1979, State Department officials visited Thailand to interview H'Mong refugees and investigate allegations of the use of chemical agents against H'Mong tribesmen in Laos (see Table B–1). From the signs/symptoms described and observed, it is suggested that at least two and possibly three different chemical agents may have been used, such as:

- A nerve agent (five or six individuals reported symptoms that could be attributed to a nerve agent);
- An irritant or riot-control agent (one-third of the interviews); and
- More than half of the interviews indicated such a variety of signs and symptoms that it is difficult to attribute them to a single known agent.

It is possible that in some cases two or more agents were combined.

- Reported signs and symptoms suggesting a nerve agent include sweating, tearing, excessive salivation, difficulty in breathing, shortness of breath, nausea and vomiting, dizziness, weakness, convulsions, and death occurring shortly after exposure.
- Reported signs and symptoms suggesting a riot-control or irritant agent include marked irritation or burning of the eyes, with tearing and pain; irritation and burning of the nose and throat; coughing; burning and tightness in the chest; headache; and nausea and vomiting in a few cases.
- Reported signs and symptoms not related to any known single agent include a mixture of the above as well as profuse bleeding from mucous membranes of the nose, lungs, and gastrointestinal tract, with rapid death of the affected individuals in some instances.

Estimates from the H'Mong interviewed indicate that approximately 700–1,000 persons may have died as a result of the use of chemical agents and that many times this number became ill. It was reported that on many occasions entire villages were devastated by these agents, leaving no survivors.

In the episodes described, most of the animals exposed to the chemical agents were killed. Generally, all

chickens, dogs, and pigs died and, to a lesser extent, the cattle and buffalo. On several occasions it was reported that where these agents settled on tree and plant leaves, many small holes appeared in the leaves within 2 or 3 days. Rarely did agent exposure result in the defoliation or death of the plants.

Department of Defense Team

From September 28 to October 12, 1979, a team from the U.S. Army Surgeon General's Office was in Thailand to conduct a similar series of interviews.* The team visited the following H'Mong refugee camps of northern Thailand: the detention center at Nong Kai, the large H'Mong camp at Ban Vinai, and two smaller camps at Nam Yao and Mae Charim. As the great majority of refugees as well as the H'Mong leadership are at Ban Vinai, most interviews were obtained there.

The team was prepared to obtain blood and skin samples (for cholinesterase activity and study of pathological changes, respectively) from those exposed to chemical agents. For such samples to yield meaningful results they must be taken within 6–8 weeks of exposure. Since the last reported exposure was in May 1979, no blood or skin samples were collected.

Interviews were conducted through interpreters; one was an employee of the U.S. Consulate at Udorn, and the remainder were hired from among the refugees. The interpreters screened those refugees who volunteered to talk to the team and selected only those who had been eyewitnesses to or had themselves been exposed to an agent attack. Team members interviewed 40 men, 2 women, and a 12-year-old girl. Each interview took 1–2 hours. To insure conformity, a prepared questionnaire was used as a guide.

The chemical attacks reportedly occurred between June 1976 and May 1979 (Table B–1). The absence of reports of attacks after May 1979 may be because

TABLE B–1

Reports of Probable Chemical Agent Attacks in Laos

Department of State Interviews Conducted in Summer 1979

Date	Location	Method of Attack by Plane	Material Used (Smoke/Gas)
Oct. 1977	Phu Hay, S. of Phou Bia	Rockets	Yellow-gray
1978	Pa Sieng, S. of Phou Bia	Bomb	Yellow
Feb. 1978	Ban Nam Luk, S. of Phou Bia	Spray (?)	Yellow/white
Feb. 1978	20 kms SE. of Phou Bia	Spray (?)	Yellow
Feb. 1978	Ban Ko Mai	Bomb	Yellow
Mar. 1978	Pha Houei	Sacks, burst in air	Brown
Mar. 1978	Ban Na Pong	(?)	Yellow
Apr. 1978	Ban Phamsi	(?)	White, green, blood-colored
May-Apr. 1978	Ban Nong Po	Cloud	Yellow-brown like rain
June 1978	Ban Nam Teng	Rocket (?)	Yellow
June 1978–May 1979	Ban Don area	Spray	Yellow
Mid-1978	1–3 kms NE. of Phou Bia	Rocket, air burst	Red
Oct. 1978	Nam Kham	Rockets, air burst	Yellow
Oct. 1978	6 kms N. of Phou Khao	Rockets, air burst	Red
Oct. 1978	3–4 kms N. of Phou Bia	Rockets, air burst	Yellow-gray
Nov. 1978	Phou Xang Noi	Spray	Yellow, blue
Nov. 1978	near Phou Bia	Bomb, air burst	Yellow
Nov. 1978	NE. of Pha Khao	Rocket, air burst	Yellow
Apr. 1979	Ban Nouia Pong	Spray	Yellow
May 1979	Nam Po	Spray	Yellow
May 1979	Pha Mai	Spray, air burst	Yellow

Department of Defense Interviews Conducted in Fall 1979

Date	Location	Method of Attack by Plane	Material Used (Smoke/Gas)
June 1976	Pou Mat Sao	Rockets	Red, green
Jan. 1977–Oct. 1978	Pha Khao	Rockets	Yellow, red, green
Mar. 1977	Nam Theuna	Rockets	Red, yellow
Apr. 1977	Houi Kam Lang	Rockets	Yellow
May 1977	Pha Khae	Rockets	Red
May 1977	Nam Moh	Rockets	Yellow
May 1977	Pha Ngune	Spray/rockets	Yellow
1977–1978 (3 attacks)	Phu Seu	Rockets	Red, green, yellow
Jan. 1978	Houi Xang	Rockets	Red, green
Feb. 1978	Sane Mak Ku	Rockets	Yellow
Feb. 1978	Tham Se Sam Leim	Rockets	Yellow, black
Feb. 1978	Kio Ma Nang	Rockets	Yellow
Mar. 1978	Mouong Ao	Rockets	White
Mar. 1978	Khieu Manang	Rockets	Green
Apr. 1978	Tha Se	Rockets	White
June 1978	Pha Phay	Rockets	Yellow
June 1978	Phou Seng	Rockets	Red, white, black
July 1978	Phou Bia	Rockets	Red
July 1978	Ban Nam Mo	Spray	Yellow
July 1978	Phou Lap	Rockets	Yellow
Aug. 1978	Pha Houai	Rockets	Red, green
Aug. 1978	Ban Thin On	Rockets	Green, red
Aug. 1978	Bouamlong	Rockets	Red, green, yellow
Sept. 1978	Pha Koug	Rockets	Yellow
Sept. 1978	Ban Nam Tia	Spray/rockets	Yellow, green, red
Sept. 1978	Pha Na Khum	Rockets	Red
Oct. 1978	Phou Bia	Rockets	
Oct. 1978	Ban Done	Spray	Yellow
Oct. 1978	Phou Bia	Rockets	White, green, red
Nov. 1978	Phou Bia	Rockets	White, red
Feb. 1979	Pha Mat	Spray	Yellow
Feb. 1979	Tong Moei	Rockets	Yellow, red
Mar. 1979	Pha Mai	Spray	Yellow
Mar.–May 1979 (6 attacks)	Pha Mai	Spray	Yellow
Apr.–May 1979 (4 attacks)	Pha Mai	Spray	Gray-white
May 1979	Phou Bia	Spray	Yellow
May 1979	Moung Phong	Rockets	Red

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few refugees crossed the Mekong River after that time—as a result of heavy rains and flooding from June to September 1979. Most of the early reports were of the use of rockets releasing the agent; beginning in the fall of 1978, the majority of the attacks were carried out by aircraft spraying a yellowish substance which "fell like rain." The attack sites, concentrated around the H'Mong stronghold in the mountainous Phou Bia area, also are listed in Table B–1.

The team was given a plastic vial containing pieces of bark, stained by a yellow substance, which several H'Mong refugees claimed was residue from an aircraft spray attack in April 1979. Preliminary chemical analysis of the sample indicates that no standard chemical agent (i.e., an agent listed in TH 8–285, U.S. Army, May 1974) was present.

Conclusions

The conclusions of these teams, based upon interviews obtained from H'Mong refugees, are as follows:

- Chemical agents have been used against the H'Mong.
- The reported effects of these agents suggest the use of a nerve agent, a riot-control agent, and an unidentified combination or compound.

ANNEX C

MEDICAL EVIDENCE

Southeast Asia

Since 1975, many different sources—refugees, relief workers and medical personnel, including specially qualified physicians—consistently have detailed unusual signs and symptoms of victims of "yellow rain." Specifically, victims in Southeast Asia subjected to a direct attack of the yellow powder, mist, smoke, or dust would be seen to begin retching and vomiting within minutes. These effects and those described below were not pronounced in individuals even 100 meters from the attack zone, indicating a relatively dense chemical/carrier combination that was effective in low wind conditions.

Following the victim's exposure to yellow rain, the initial induced vomiting—unlike that caused by a traditional riot-control nausea agent—was protracted over hours to days. It was often accompanied by dizziness, rapid heartbeat and apparently low blood pressure, chest pain, loss of far-field vision, and a feeling of intense heat and burning on the skin, although not described as being most acute in the groin and axillae. Thus, the acute signs and symptoms match some effects of traditional vomiting and blister agents but clearly not all.

Within the first hours after the attack, many victims also reported intense red eyes, bleeding gums, convulsions or more often trembling, and vomiting of blood, with or without production of copious amounts of saliva—lasting many hours to days, apparently depending on the exposure level. Thick mucous, pinpoint pupils, respiratory collapse, prolonged spasticity, and involuntary urination or defecation were never reported after a yellow rain attack; the absence of these symptoms helped to rule out organophosphate nerve agents in the minds of chemical warfare experts. Many medical and environmental samples also ruled out these and other traditional agents such as DM, DS, and others.

Many observers of "yellow rain" effects reported formation within several hours of small (1 centimeter) homogeneous, hard, fluid-filled blisters over only exposed areas of skin, frequently including the victim's hands, arms, entire throat, and face—wherever skin was uncovered. In most cases the vomit, after 2–8 hours, contained blood and, in many cases, large amounts of it. About half of those receiving the most concentrated doses of yellow material—those who had been directly under the spray—were observed within several hours to cease vomiting temporarily. This interval was often followed in 5–15 minutes by a period of great pain when the victim would hold his abdomen and emit a gush of blood from mouth and nose. These individuals usually died within minutes afterward.

Close questioning by physicians of witnesses to these final moments leaves no doubt that the effects resulted from severe gastrointestinal bleeding, significant pulmonary bleeding, temporary compression of accumulated blood in the stomach, and, finally, projectile vomiting of as many as several hundred milliliters of blood. These findings were consistent with animal and human autopsies.

Many victims of the yellow material received less than the full brunt of a spray, entered the attack zone several hours to 2 days later, or consumed food or water contaminated by the material. These individuals—often within the next 24 hours—developed signs and symptoms similar to those more directly affected but often without pronounced skin effects if they had not contacted the powder residue directly. In addition to attacks of intense vomiting five or six times a day, they also had diarrhea, with bloody stools passed up to eight times a day. Bleeding under the fingernails and around the skin of the eyes and severe bruising of the skin also were commonly reported. Opiates helped the fluid loss in adults, but in children or young persons unable to tolerate the treatments of raw opium and water, death occurred after 10 days to 2 weeks in about half the cases. On the basis of reported signs and symptoms, the cause of delayed death almost certainly was dehydration.

In many cases, chemical attacks are reported to produce symptoms other than those described here. However, there has always been a direct association of the above symptoms with reports of yellow rain attacks—that is, when yellow material is used these symptoms appear; other agents may give rise to other symptoms. Although it is possible to exhibit one or even several of these symptoms associated with traditional chemical warfare agents, no expert has been able to fit the sequence, severity, and consistency with any of them. In many cases, victims and observers were examined, histories taken, and interviews conducted by several health professionals weeks apart. Remarkable consistency has been observed.

From the beginning of the yellow rain episodes in 1975, autopsies occasionally have been reported anecdotally. Some have been done inexpertly, some by nonphysicians, and some were performed on animals rather than on human victims. However, the consistency of the early reported "putrefaction" or "rottenness" of the digestive tract within 12–48 hours after death led many forensic medical experts to suspect that one effect of the poison—whatever it was— was to cause necrosis (cell death) of rapidly dividing mucosa (mucous membranes), especially in the stomach and upper small intestine. Other autopsy findings included hyperemia (engorgement with blood) of digestive mucosal linings and remarkably intense congestion and swelling in the lungs, liver, spleen, and sometimes the kidneys. These and other findings often led experts in toxicology and pathology, on the basis of clinical and pathological data alone, to suggest mycotoxin or even trichothecene intoxication.

Trichothecene effects have been reported in the forensic, oncological, and toxicological literature for several years. Unpublished findings often have been discussed in symposiums. In several dozen cases, toxic effects in humans and

animals have been carefully recorded, and they match those of yellow rain with good precision (see Table C–1). *There are no additional signs or effects of known trichothecene intoxication not frequently reported by victims, nor are there any reported yellow rain symptoms that cannot be explained by the effects of the four specific trichothecene toxins found in the samples.*

There are no significant medical differences in the reporting from Laos and Kampuchea. Although the timing and delivery systems have sometimes varied, the effects of the chemical agent, clinically and pathologically, are identical. In some cases, a series of blood samples from Kampuchean victims also showed a trend toward leukopenia (reduction in the number of white blood cells) and the presence of a trichothecene metabolite (HT–2) consistent with trichothecene intoxication (see Annex D). Dose-response effects that were observed and routes of administration were both consistent with effects of trichothecenes.

An early hypothesis (1978–79) was that a significant number of deaths, especially in Laos, could be explained by the heavy use of riot-control agents such as CS, CN, DM, and agents which cause itching and/or blistering. This hypothesis was rejected quickly on two grounds. First, trace contaminant analysis failed to show the presence of any of these compounds in samples; several samples did, however, contain a trichothecene precursor. Second, contrary to commonly held views, the epidemiology of diseases endemic to the central highlands of Laos and the public health situation of the H'Mong do not support the view of malnourished, disease-ridden, and weak persons who would succumb easily to riot-control agents. Also, many studies have shown the opposite: a relatively low incidence of pulmonary disease, lower than what could otherwise account for certain effects; better nutritional states than could otherwise account for death in 10 days to 2 weeks from water loss (dehydration) and calorie depletion; and a death rate of nearly zero from causes other than infection, old age, and trauma.

TABLE C–1

Comparison of Reported "Yellow Rain" Effects With Known Trichothecene Effects

Yellow Rain Reports*	Effects of Trichothecenes
1. Nausea, vomiting—severe, immediate	1. Nausea, vomiting—severe, immediate
2. "Falling down, world turning"	2. Dizziness
3. "Burning of skin"—small blisters	3. Generalized erythema with a burning sensation of skin
4. "Shaking all over, flopping like fish out of water"	4. Ataxia (failure of muscular coordination), occasional tremors and convulsions
5. "Bleeding eyes"	5. Congestion of the sclera (white outer coat of eyeball) and blood in tears
6. "Pounding" chest, rapid heartbeat, weakness	6. Hypotension (abnormally low blood pressure) with secondary rise in heart rate
7. Severe pain in center of chest	7. Angina (substernal chest pain)
8. Sleepiness, "not able to talk"	8. Somnolence, central nervous system symptoms
9. Bleeding gums and profuse salivation	9. Stomatitis (inflammation of oral mucous membranes) and ptyalism (excessive salivation)
10. "Can't breathe"	10. Shortness of breath
11. "Skin and body hot with cold"	11. Fever and chills
12. Diarrhea with blood	12. Diarrhea with blood
13. Loss of appetite, inability to eat	13. Anorexia
14. Bleeding into skin and fingernails	14. Thrombocytopenia (decrease in number of platelets, white blood cells involved in clotting of blood) and purpura (skin discoloration caused by hemorrhage into tissues)
15. Drop in white blood cell count	15. Leukopenia and anemia
16. "Rotten esophagus, stomach, intestines; soft spleen and liver"	16. Rapid necrosis of linings of gastrointestinal tract; lymphoid necrosis in spleen and liver
17. Swelling of all organs	17. Congestion of all organs

* Effects are immediate at levels near to or above a rough estimate of 500–1,000 mg total body burden for an adult. Although inhalation data are pending, the levels are consistent with reported lethal and sublethal doses. Trichothecenes in combination, when directly ingested or inhaled, or in purified form, are more toxic in lower concentrations, and the order of signs and symptoms and timing varies.

Afghanistan

Some deaths associated with bleeding have been described in the accounts from Afghanistan. In one set of cases, a physician examined persons who had been exposed to sublethal doses of a yellow smoke/black smoke combination attack and one man near death after a series of attacks. Hemoptysis (nasal bleeding)—but not hematemesis (bleeding from the gastrointestinal tract)—was reported in about half of these cases.

Several features of at least one of the chemical agents—an incapacitant—used in Afghanistan defy explanation at this time. One possibility is that the agent(s) are highly selective for the central nervous system rather than the autonomic nervous system. As yet, no good candidate agent has been identified which will selectively inhibit the central nervous system so as to cause unconciousness for several hours. Another finding has been the presence of a dermal anaesthesia, affecting only exposed areas of skin.

Postattack Medical Survey

There is evidence that after some attacks in Laos and Afghanistan, Lao Communist or Soviet forces entered the attack zones to conduct surveys. Several reports indicate that survivors from a toxin attack on a Lao village were taken several kilometers from the village and injected with a small volume of a clear solution said by their captors to be a "new" medicine to assess the gas. The injections, given intramuscularly in the upper arm, reportedly did nothing to

alleviate the weakness, nausea, vomiting, or diarrhea suffered by the survivors. One victim reported the drug caused an immediate sensation of warmth throughout his body. Only the use of opium later eased the discomfort. It is probable that this procedure was a test either of a new antidote or of a drug developed to reduce incapacitation from the nausea and vomiting.

Similarly, in a few cases in Afghanistan, Soviet troops reportedly disembarked from helicopters or armored personnel carriers at the edge of an attack site. Three or four, dressed in full anticontamination gear, walked among the dead, examined the corpses and, opening them with a crude incision, examined the organs in the abdominal and thoracic cavities. In one case, a solution was poured into the incision. When the corpses were later recovered by the *mujahidin,* the body cavity contents had been destroyed beyond recognition. These and a few additional reports support the hypothesis that the perpetrators of some of the attacks were interested in studying aftereffects, lethality, or some other quasi-experimental aspect of the use of a new chemical weapon. Recent indications from Afghanistan indicate that one purpose of the field surveys and body examinations is to determine levels of toxic materials still present in the attack zone before Soviet troops occupy it.

ANNEX D

Analysis and Review of Trichothecene Toxins

Sample Analyses for Trichothecenes

The Trichothecene Hypothesis. Since 1975, the U.S. Government has received remarkably consistent reports detailing chemical attacks in Southeast Asia. Some of these reports described the use of lethal agents which produced symptoms that could not be correlated with those produced by known or traditionally recognized chemical warfare agents or combinations of them (see Table D–1). It is readily apparent that the symptoms most frequently described in Laos and Kampuchea correspond most closely with those produced by a group of mycotoxins—the trichothecenes. A review of the scientific literature revealed not only that these compounds had physical and chemical properties indicating potential as chemical agents but also that they were the subject of intensive investigation by Soviet scientists at institutes previously linked with chemical and biological warfare research. In the fall of 1980, the trichothecenes were added to the list of agents suspected to have been used in Southeast Asia and Afghanistan. Other candidates under consideration included phosgene oxime, arsines, cyanogen chloride, nerve agents, riot-control agents, and combinations of these agents.

Many samples from chemical attacks in Laos and Kampuchea were examined at the U.S. Army's Chemical Systems Laboratory (CSL) for the presence of traditional chemical warfare agents and were reported to be negative. In March 1981, CSL reported the presence of an unusual compound ($C_{15}H_{24}$) in the vapor analyses from several clothing and tissue samples taken from the victim of a chemical attack. The compound was closely related in structure to the simple trichothecenes. This finding sparked the request for analysis of all future samples for the presence of trichothecene mycotoxins.

The Kampuchean Leaf and Stem Sample: The First Analysis for Trichothecenes. On March 24, 1981, a number of samples were received from the U.S. Embassy in Bangkok. Two were reported to have been collected from the site of a chemical attack that occurred in the vicinity of TV 3391, an area just south of Phnom Mak Hoeun. A vegetation sample and a water sample were collected within 24 hours of the attack. Examination of bodies of victims of this attack by medical personnel revealed highly unusual degeneration of the mucosal lining of the gastrointestinal tract. The effects described paralleled those known to be produced by the trichothecenes. The samples were submitted to the Chemical Systems Laboratory for analysis for the presence of chemical warfare agents. With the exception of the unusual presence of high levels of CN-, Cl-, and F-ions, no evidence of known chemical warfare agents was found. An initial test for the trichothecenes by thin layer chromatography was inconclusive because of severe problems with interfering substances and the lack of appropriate standards.

The trichothecenes are difficult to detect even under ideal circumstances, and the presence of interfering substances in the sample may make identification and quantification by thin layer chromatography inconclusive. A review of the limitations and potentials of the analytical methods for trichothecenes led to the conclusion that the computerized gas chromatography/mass spectroscopy method in the selected ion-monitoring mode enabled precise identification and quantification of these compounds in complex mixtures. A comparison of the currently available methods suitable for trichothecene analysis and an assessment of their utility and limitations is presented in Table E–3.

A portion of the leaf and stem sample was furnished to the U.S. Army Medical Intelligence and Information Agency for further analysis. This sample, a positive control sample to which T–2 toxin was added, and a negative control sample of similar vegetation were forwarded to Dr. Chester J. Mirocha of the Department of Plant Pathology, University of Minnesota. Dr. Mirocha was given no information concerning the history or content of the samples and was requested to analyze the three unknowns for the presence of trichothecene toxins using the best methods at his disposal.

The analysis involves a series of extractions followed by ferric gel separation, selected ion monitoring on a computerized gas chromatograph/mass spectrometer, and a full mass spectral scan for comparison with known standards. The methods used are among the most sensitive and specific for detection of these compounds; also, false positives are rare. Toxins can be identified by their mass spectra and quantified with a high degree of accuracy. The vegetation sample allegedly exposed to a chemical warfare agent was found to contain 109 parts per million (ppm) of nivalenol, 59.1 ppm of deoxynivalenol, and 3.15 ppm of T–2 toxin; each is a potent toxin of the trichothecene group. No trichothecenes were detected in the negative control sample, and 35 ppm of T–2 toxin were detected in the sample to which T–2 toxin had been added. It was Dr. Mirocha's assessment that a mixture of these particular toxins in the high levels detected could not have occurred as a result of natural contamination.

The possibility that the identified toxins were produced by natural fungal contamination was discounted on the basis of the climatic conditions required for production of T–2 toxin, the high levels of toxins detected, the unusual mixture of toxins found, and the results of surveys of Southeast Asia for the presence of these toxins. This conclusion was supported by the analysis of normal flora samples from Kampuchea described below.

Analyses of Control Samples From Kampuchea for the Presence of Trichothecenes. On September 20, 1981, the U.S. Army Medical Intelligence and Information Agency received nine control samples from U.S. Army personnel in Bangkok for the purpose of conducting laboratory analyses for background

TABLE D-1

Symptoms of Chemical Attacks Reported in Laos, Kampuchea, and Afghanistan

Symptom	% of Reports Mentioning Symptom	Trichothecenes	Nerve Agents	Arsines	Phosgene Oxime	Cyanogens	Incapacitant (BZ)	Riot-Control Agents
Laos								
Multiple deaths	84.6	X	X	X	—	X	—	—
Vomiting	71.4	X	X	X	—	—	—	X
Diarrhea	53.1	X	X	X	—	—	—	—
Hemorrhage	52.0	X	—	—	X[a]	—	—	—
Breathing difficulty	47.95	X	X	X	X	X	X	X
Itching and skin irritation	43.9	X	—	X	X	—	—	X
Nausea	42.8	X	X	X	—	—	X	X
Animal death	41.8	X	X	X	—	X	—	—
Blurred vision	39.7	X	X	X	X	X	X	X
Headache	36.7	X	X	—	X	—	X	X
Fatigue	35.7	X	X	—	—	—	X	—
Nasal excretion	34.7	X	X	X	X	—	—	X
Rash or blisters	32.6	X	—	X	X	—	—	X
Tearing	30.6	X	X	X	X	X	—	X
Coughing	28.6	X	X	X	X	X	—	X
Effect on vegetation	26.5	X	—	X	X	—	—	—
Dizziness and vertigo	25.5	X	X	—	—	X	X	X
Facial edema	20.4	X	—	X	X	—	—	X
Thirst and dry mouth	20.4	X	—	—	—	—	X	—
Skin color change	16.3	X	—	—	X	—	—	—
Tachycardia	12.3	X	X	—	X	X	X	X
Temporary blindness	9.18	X	—	X	X	—	X	X
Rapid loss of consciousness	9.18	X[b]	X	—	—	X	X	—
Salivation	6.12	X[c]	X	—	—	—	—	—
Hearing loss	5.1	X	—	—	—	—	—	—
Tremors or convulsions	4	X	X	—	X	X	—	—
Sweating	3	—	X	—	—	—	—	—
Paralysis	3	X	X	—	—	X	—	—
Loss of appetite	3	X	X	X	—	—	—	—
Frequent urination	2	X	X	—	—	—	—	—

Continued on p. 25

Note: This table is a compilation relating the signs and symptoms reported in the three countries to symptoms associated with certain chemical agents. The frequency with which a particular symptom was reported is expressed as a percentage of the total number of attacks.

levels of trichothecene toxins. The samples were collected from an area near TV 3391 that had not been subjected to any reported chemical attacks. The samples were collected by U.S. personnel under instructions to reproduce the sampling conditions, handling, packaging, and transfer conditions of the original sample as closely as possible. The same species of plant was sampled, and four other vegetation samples also were collected. A water sample and two soil samples were recovered. Corn and rice samples from the area also were taken. These grains provided an ideal substrate for growth of toxin-producing fungi and would, therefore, be a sensitive indicator of any natural occurrence. The nine samples were forwarded under code to Dr. Mirocha for trichothecene analysis. A portion of each sample also was submitted to Chemical Systems Laboratory for background determinations of CN-, Cl-, and F-levels. No trichothecenes were detected in any of these samples, indicating that nivalenol, deoxynivalenol, T-2, and diacetoxyscirpenol are not prevalent in the geographical area from which the alleged chemical warfare-exposed sample was collected. The appearance of these trichothecenes in high levels and unique combinations in a sample associated with a chemical attack—which produced symptoms typical of trichothecene exposure—indicates that these toxins may have been used as chemical weapons. This conclusion is further supported by the evidence provided by analysis of additional alleged chemical warfare samples from Laos and Kampuchea as described below.

Analysis of Additional Chemical Warfare Samples From Laos and Kampuchea for the Presence of Trichothecenes. The U.S. Army Medical Intelligence and Information Agency received from the Chemical Systems Laboratory three additional suspected chemical warfare samples for analysis for trichothecenes. The first sample consisted of 10 ml of water taken from the same chemi-

TABLE D-1 (continued)

Symptoms of Chemical Attacks Reported in Laos, Kampuchea, and Afghanistan

Symptom	% of Reports Mentioning Symptom	Trichothecenes	Nerve Agents	Arsines	Phosgene Oxime	Cyanogens	Incapacitant (BZ)	Riot-Control Agents
Kampuchea								
Multiple deaths	72.4	X	X	X	—	X	—	—
Hemorrhage	62.06	X	—	—	X[d]	—	—	—
Dizziness and vertigo	51.7	X	X	—	—	X	X	X
Vomiting	41.3	X	X	X	—	—	—	X
Nausea	34.5	X	X	X	—	—	X	X
Skin irritation	27.6	X	—	X	X	—	—	X
Rapid loss of consciousness	24.1	X[b]	X	—	—	X	X	—
Fever	20.68	X	—	—	—	—	—	—
Headache	17.2	X	X	—	X	—	X	X
Tearing	13.8	X	X	X	X	X	X	X
Breathing difficulty	13.8	X	X	X	X	X	X	X
Fatigue	13.8	X	X	—	—	—	X	—
Paralysis	10.3	X	X	—	—	X	—	—
Numbness	6.9	X	X	—	—	X	X	—
Blurred vision	6.9	X	X	X	X	X	X	X
Dry throat and thirst	6.9	X	—	—	—	—	X	—
Edema	6.9	X	—	X	X	—	—	—
Salivation	3.4	X[c]	X	—	—	—	—	—
Vegetation affected	3.4	X	—	X	—	—	—	—
Diarrhea	3.4	X	X	X	—	—	—	—
Cough	3.4	X	—	X	X	X	X	X
Nasal discharge	3.4	X	X	X	X	—	—	X
Rash or blister	3.4	X	—	X	X	—	—	X
Chills	3.4	X	?	—	—	—	—	—
Hearing loss	3.4	X	—	—	—	—	—	—
Afghanistan								
Rapid loss of consciousness	47.9	X[b]	X	—	—	X	X	—
Skin irritation and itching	31.5	X	—	X	X	—	—	X
Multiple deaths	30.1	X	X	X	—	X	—	—
Nausea	20.5	X	X	X	—	—	X	X
Vomiting	19.1	X	X	X	—	—	—	X
Tearing	17.8	X	X	X	X	X	—	X
Dizziness and vertigo	16.4	X	X	—	—	X	X	X
Blisters or rash	15	X	—	X	X	—	—	X
Difficulty breathing	13.7	X	X	X	X	X	X	X
Paralysis	13.7	X	X	—	—	X	—	—
Headache	12.3	X	X	—	X	—	X	X
Temporary blindness	8.2	X	—	X	X	—	X	X
Salivation	6.8	X[c]	X	—	—	—	—	—
Loss of appetite	6.8	X	X	X	—	—	—	—
Effects on vegetation	5.5	X	—	—	—	—	—	—
Fatigue	5	X	X	—	—	—	X	—
Confusion	4.1	X	X	—	—	—	X	—
Hemorrhage	4.1	X	—	—	X[a]	—	—	—
Change in skin color	2.8	X	—	—	X	—	—	—
Diarrhea	2.8	X	X	X	—	—	—	—
Coughing	1.3	X	X	X	X	X	X	X

[a] Bloody frothing.
[b] Only at very high doses.
[c] Depending on which trichothecenes.
[d] Blood flecked frothing.

cal attack site in Kampuchea as the leaf and stem sample previously examined. The second sample came from the site of a "yellow rain" attack occurring on March 13, 1981, in the village of Muong Cha (TF 9797) in the Phou Bia region of Laos. The agent was sprayed from a twin-engine propellor aircraft at about noon, local time. The falling substance was described as "like insect spray" and sounded like drizzling rain. Quite sticky at first, it soon dried to a powder. Symptoms described by victims included nausea, vomiting, and diarrhea. A sample of the agent scraped from the surface of a rock by a victim and carried into Thailand was turned over to U.S. Embassy personnel. The third sample was taken from the site of a "yellow rain" attack that occurred at 2:00 p.m. on April 2, 1981, at Ban Thong Hak (TF 9177). Twenty-four people reportedly died in this attack; there were 47 survivors. Symptoms included severe skin irritation and rash, nausea, vomiting, and bloody diarrhea. A survivor of the attack scraped this sample from the surface of a rock with a bamboo knife. Although the individual took precautions (that is, cloth mask), a severe skin rash and blisters developed.

These three samples were submitted to Dr. Mirocha for analysis. The water sample from Kampuchea contained 66 ppm of deoxynivalenol and a trace amount of diacetoxyscirpenol. A trace quantity of the second sample was screened as strong positive for trichothecenes. Further analysis of that sample confirmed the presence of high levels of T-2 toxin (150 ppm) and diacetoxyscirpenol (25 ppm). Nivalenol and deoxynivalenol may also be present but are being masked by interference from phtalate compounds (leached from the plastic packaging). An effort to modify the extraction process is being made in order to overcome the interference so that nivalenol and deoxynivalenol can be measured more easily. Interestingly, examination of the petroleum ether fraction from the sample revealed the presence of a yellow pigment almost identical to that previously identified by Dr (b)(6) in cultures of *Fusarium roseum*, indicating that the yellow powder probably consisted of the crude extract of a *Fusarium* culture.

There was little of the third sample contained in the vial received for testing. The quantity was too small to be weighed accurately, and inspection of the vial revealed only a small speck estimated to weigh much less than 0.1 mg. That speck contained 10 ng of diacetoxyscirpenol, a level equivalent to 100 ppm at the very least and probably much higher. The sample size was too small to allow adequate analysis for the other three trichothecenes of interest.

These results support the hypothesis that trichothecenes have been used as chemical warfare agents in Laos and Kampuchea. The presence of these high levels of trichothecene toxins in water and in yellow powder scraped from rocks argues against natural occurrence, since neither water nor rock is a suitable environment for growth of the fungi required to produce the toxins.

Differences between the analyses of the Kampuchean leaf and stem sample and the water sample collected from the same attack site raise additional questions. Failure to find T-2 toxin in the water sample is probably due to the relative insolubility of T-2 toxin in water. The presence of diacetoxyscirpenol in the water might be the result of biotransformation or breakdown of T-2, as they are so structurally similar, differing only in the substitution on carbon 8. While this hypothesis cannot be entirely ruled out, it is unlikely on the basis of known biotransformation of T-2 in the laboratory. The initial vegetation sample was not screened for diacetoxyscirpenol, although the mass spectra from the initial analysis will be reexamined for trace amounts of it.

The absence of nivalenol in the water sample is more difficult to explain because nivalenol is water soluble. The effect of environmental conditions and microorganisms on the stability of these compounds may vary widely for each of the specific compounds and may explain the analytical results. Further scientific investigation of these factors is needed.

Analysis of Blood Samples From Chemical Attack Victims

Blood samples drawn from victims of recent chemical attacks in Kampuchea have been received by the U.S. Army Medical Intelligence and Information Agency for analysis for indications of trichothecene exposure. Little is known concerning the rate of metabolism of trichothecenes in humans; it is difficult, therefore, to estimate the probability of detecting trichothecenes or their metabolites in blood samples. T-2 is rapidly cleared from the blood in animals, and 25% of the total dose is excreted within 24 hours after exposure; it is unlikely that trichothecenes could be detected unless blood samples were obtained within 24–48 hours after an attack. Other blood parameters are affected by the trichothecenes, however, and may prove to be useful markers. The trichothecenes induce a severe leukopenia (decrease in white cell count) which can persist for several weeks following exposure. In addition, the trichothecenes affect some liver and kidney function marker enzymes which can be monitored in the blood.

On October 11, 1981, four whole blood samples and four blood smears were received from the U.S. Embassy in Bangkok. The blood was drawn from four Khmer Rouge soldiers on October 7, 1981 at a Khmer Rouge hospital inside Kampuchea. Detailed medical histories as well as descriptions of the attack were recorded on each individual from whom a blood sample was taken. All four men were victims of a gas attack occurring near Takong on September 19, 1981. Symptoms experienced included vomiting, blurred vision, bloody diarrhea, difficult breathing, dry throat, loss of consciousness, frontal headache, tachycardia, and facial edema. Unfortunately, the samples could not be refrigerated until 48 hours after collection. Thus, it was impossible to obtain data concerning white cell counts and blood chemistry. The four whole blood samples were submitted to Dr. Mirocha for analysis for trichothecene metabolites because of the possibility, admittedly remote, that some of the metabolites might bind to blood proteins and might still be detectable even 3 weeks after an attack.

On October 22, 1981, additional blood samples were received. These had been drawn from nine victims from the September 19 attack and from four control individuals of similar age and background who had not been exposed to a chemical attack. The samples had been properly refrigerated and were accompanied by complete and detailed medical histories taken by trained medical personnel who examined the individuals. Included in the package were blood smears and heparinized and nonheparinized samples from each individual. The samples were submitted for blood assays to the U.S. Army Medical Research Institute of Infectious Diseases.

The above results show no statistically significant differences between exposed and control groups (students T-test). In eight individuals exposed to a chemical agent, a trend toward depressed white cell counts was observed. Such an observation would be compatible with the clinical picture of toxin exposure; however, it is also compatible with a number of other medical problems, and a larger control sample would

be required before such results could be adequately interpreted. Abnormal liver and kidney functions were not indicated by these data.

Portions of the blood samples were analyzed by (b)(6) for the presence of trichothecenes and/or trichothecene metabolites. The results of the analyses are consistent with trichothecene exposure in at least two of the gassing victims and tend to support the hypothesis that a trichothecene-based agent was used in this attack.

Using the selected ion-monitoring gas chromatography/mass spectroscopy analysis technique, Dr. Mirocha was able to identify tentatively a metabolite of T-2 toxin (that is, HT-2) in the blood of two alleged victims. The compound was identified on the basis of its selected ion masses and gas chromatographic retention times.

The tentative identification of HT-2 in the blood of two victims, and the trend toward depressed white cell counts in these same victims, cannot be taken as conclusive scientific proof of toxin exposure because the trace amount of the compound present precluded unequivocal identification and quantification and because many other medical problems in addition to toxin exposure can cause a decrease in white cell counts. It is interesting to note that the individual who showed the greatest amount of the compound tentatively identified as HT-2 in his blood reportedly received the greatest exposure to the agent. He was exposed to contaminated water for more than 30 minutes and was the only victim who fell down in the water and actually swallowed some of it. However, the description by victims of symptoms correlating exactly with those associated with trichothecene poisoning provides strong circumstantial evidence that trichothecenes were used as chemical agents in yet another chemical attack in Southeast Asia.

Trichothecenes have been identified previously in environmental samples taken from several other chemical attacks in Laos and Kampuchea. Analysis of control vegetation, water, soil, corn, and rice samples from these areas, as well as reviews of published scientific literature, indicates that the particular toxins that have previously been identified are not known to occur naturally in the combinations found and at the levels detected in Southeast Asia. The latest analysis results contribute another piece of evidence to the growing body of data supporting the charge that trichothecenes have been used as chemical/biological agents in Southeast Asia.

ANNEX E

Overview of Natural Occurrence and Significant Properties of Trichothecenes

Historical Trichothecene Mycotoxicoses

The trichothecenes are members of a large group of naturally occurring toxins known as mycotoxins. The word "mycotoxin" is derived from the Greek "mykes" meaning fungus and the Latin "toxicum" meaning poison. It refers to a metabolite produced by a mold that is toxic to man and animals. Mycotoxicoses have been described as the "neglected diseases," and before 1960 English-language literature concerning the diseases caused by mycotoxins was scarce. Soviet scientists have been involved in research with some of these compounds for almost 30 years longer than their Western counterparts. The Soviet Union has had serious problems with mycotoxin contamination of food and has suffered several severe outbreaks of disease in humans. The first comprehensive studies of mycotoxin diseases were conducted in the Soviet Union in the late 1930s.

Since the 1940s, the group of mycotoxins figuring most prominently in Soviet scientific literature are the trichothecenes, a class of chemically related, biologically active fungal metabolites produced primarily by various species of *Fusarium*. Table E-1 lists some of the toxins in this group and producing fungi. The fungi are well-known plant pathogens that frequently invade many agricultural products.

Trichothecene toxins, perhaps more than any other mycotoxins, have been associated with acute disease in humans. Most of the human intoxications have occurred in the Soviet Union (Table E-2). The earliest recognized outbreak occurred in 1891 in the Ussuri district of eastern Siberia. Humans who consumed contaminated grain exhibited headache, chills, nausea, vomiting, vertigo, and visual disturbances. Dogs, horses, pigs, and domestic fowls reportedly were affected.

The most extensive mycotoxicosis outbreak reported to have caused multiple fatalities in man also occurred in the Soviet Union. In 1944, 30% of the population of Orenburg district, near Siberia, was affected by alimentary toxic aleukia (ATA), a disease later shown to be caused by ingestion of trichothecene toxins. More than 10% of the entire population of the district died of the disease. Many other outbreaks of ATA occurred in the Soviet Union, mainly during the 1942–47 period. The contamination was traced to overwintered millet, wheat, and barley infected with *Fusarium*. Symptoms of the disease included vomiting, skin inflammation, multiple hemorrhaging (especially of the lung and gastrointestinal tissue), diarrhea, leukopenia, and suppression of bone marrow activity.

In 1939, Premier Joseph Stalin dispatched Nikita Khrushchev to the Ukraine to organize and improve agricultural operations and to identify the disease causing the deaths of many horses and cattle. The problem was traced to hay and straw contaminated with *Stachybotrys atra*. The disease, later referred to as stachybotryotoxicosis, occurred after ingestion or contact with the contaminated grain. Symptoms included ulcerative dermatitis, peroral dermatitis, blood dyscrasias, hemorrhagic syndromes, abortion, and death. The greatest economic impact was due to loss of horses, although cattle, sheep, poultry, and humans also were affected.

Other disease outbreaks in which similar symptoms were present occurred in 1958 and 1959 among horses and cattle in the Soviet Union and Eastern Europe; thousands of animals were lost. Other intoxications were reported later

Soviet Scientists Involved in Mycotoxin Research

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(b)(6) Ukrainian S.S.R. Institute of Microbiology and Virology, Kiev

(b)(6) U.S.S.R. Academy of Medical Sciences Nutrition Institute, Moscow

(b)(6) U.S.S.R. Academy of Medical Sciences Institute of Epidemiology and Microbiology

(b)(6)

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in Japan, Europe, the Soviet Union, and the United States, affecting various domestic animals and—in the case of "red mold toxicosis"—man. All of these diseases have now been shown to be due to ingestion of trichothecenes rather than to an infectious agent. In earlier outbreaks, the levels of toxin present in the contaminated grain were not measured; however, the levels of nivalenol and/or deoxynivalenol measured in toxic grains implicated in more recent outbreaks (i.e., "moldy corn toxicosis" and "red mold toxicosis") typically were between 2 and 8 ppm.

Natural Occurrence of Trichothecene Mycotoxins

Publications concerning the occurrence of trichothecenes are relatively scarce because of the lack of convenient detection methods and the complexity of the trichothecene family of compounds. Only recently have scientists developed methods capable of distinguishing between close structural derivatives and accurately quantifying the levels of toxin present (see Table E-3 for comparison of analytical methods). Extreme care must be taken when reviewing the scientific literature on natural occurrence of these compounds because erroneous conclusions can be drawn on the basis of results obtained with inadequate analytical techniques. Misidentification of compounds and gross overestimation of concentrations have occurred using techniques such as thin layer chromatography.

Table E-4 lists the reports of natural occurrence of T-2 toxin, diacetoxyscirpenol, and nivalenol that were obtained from a literature search of more than 3,000 citations concerned with trichothecene toxins. Levels that are questionable on the basis of techniques used are indicated. It is immediately apparent that the levels of toxins found in the various samples from Laos and Kampuchea are highly unusual, even if one accepts the questionable reports in Table E-4 as valid. The levels of these toxins (150 ppm of T-2 toxin, 109 ppm of nivalenol, more than 100 ppm of diacetoxyscirpenol, and 66 ppm of deoxynivalenol) are markedly higher than those reported to occur in nature. It should also be noted that the incidences recorded in Table E-4 concern levels of toxin produced when *Fusarium* is growing on its ideal substrate, while the Laos and Kampuchea samples were taken from surfaces—rocks and water—that would be extremely unlikely to support *Fusaria* growth and toxin production. Higher levels of toxin production can, of course, be induced when the mold species is grown in pure culture under ideal laboratory conditions; for instance, the Soviets have succeeded in producing 4 grams of T-2 per kilogram of substrate. In a natural environment, however, the *Fusaria* species cannot compete well with other molds such as species of *Aspergillus* and *Penicillium*, and levels of toxin produced are orders of magnitude lower.

The conclusion that the levels of toxins found in the Southeast Asia samples could have occurred only by means of an unnatural mechanism is also strengthened by surveys of the area conducted

TABLE E-1
Trichothecene-Producing Fungi

Type	T-2 Type	Nivalenol-Type	Macrocyclic
Trichothecenes	T-2 Toxin	Nivalenol	Roridins
	HT-2 Toxin	Monoacetyl-Nivalenol	Veirucarins
	Diacetoxyscirpenol	Diacetyl-Nivalenol	Satratoxins
	Neosolaniol	Deoxynivalenol	Vertisporin
Fungus	F. tricinctum	F. nivale	Myrothecium verrucaria
	F. roseum	F. opisphaeria	
			M. roridum
	F. equiseti	F. roseum	
	F. sporotrichioides		Stachybotrys atra
			Verticimonosporium diffractum
	F. lateritium		
	F. poae		
	F. solani		
	F. rigidiusculum		
	F. semitectum		

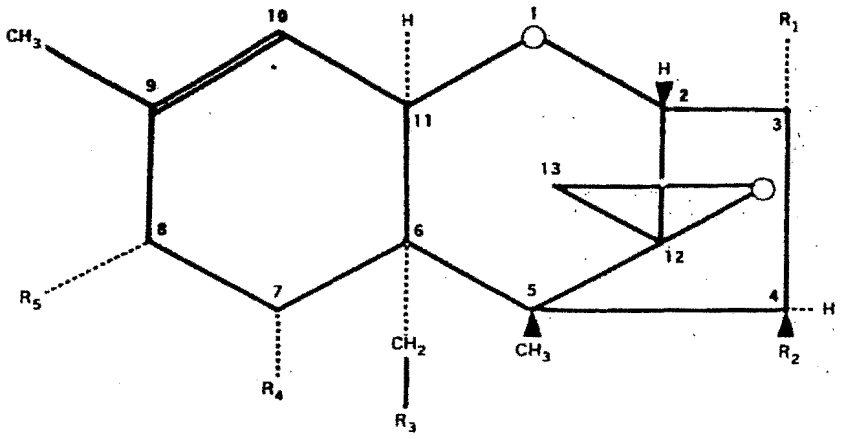
TABLE E-2
Historical Trichothecene Mycotoxicoses

Toxicosis	Districts and Affected Species	Symptoms
"Taumelgetreide" Toxicosis	U.S.S.R.: man, farm animals	Headache, nausea, vomiting, vertigo, chills, visual disturbances
Alimentary toxic aleukia	U.S.S.R.: man, horse, pig	Vomiting, diarrhea, multiple hemorrhage, skin inflammation, leukopenia, angina
Stachybotryotoxicosis	U.S.S.R., Europe: horse	Shock, stomatitis, hemorrhage, dermal necrosis, nervous disorders
Bean-hull toxicosis	Japan: horse	Convulsion, cyclic movement
Dendrodochiotoxicosis	U.S.S.R., Europe: horse	Skin inflammation, hemorrhage
Moldy corn toxicosis	United States: pig, cow	Emesis, hemorrhage
Red mold toxicosis	Japan, U.S.S.R.: man, horse, pig, cow	Vomiting, diarrhea, congestion and hemorrhage of lung and intestine

by various researchers. Surveys of the toxigenic fungi and mycotoxins naturally present in Southeast Asia conducted by the Mahidol University in Bangkok and the Massachusetts Institute of Technology have not revealed the presence of T-2, nivalenol, deoxynivalenol, or diacetoxyscirpenol, although other mycotoxins such as aflatoxin were identified. These results were confirmed by our analysis, using our own methodology, of normal flora samples of vegetation, soil, water, corn, and rice from Kampuchea that failed to reveal the presence of trichothecenes.

Skeptics have formulated theoretical explanations for the analytical results to support a hypothesis of natural occurrence of these toxins. It was postulated that the trichothecenes found were absorbed through the roots of a plant, translocated to the leaves, and exuded and washed onto the surface of a rock and into water where they were found. A 1981 publication by Jarvis et al. reported a Brazilian shrub that appeared to absorb, translocate, and chemically alter a macrocyclic trichothecene produced by soil fungi. While this citation is used to support a hypothetical mode for natural deposition in Southeast Asia, it should be noted that the plant reported in this publication did not exude the toxin, that the toxin was extremely phytotoxic to all other plants assessed, and that the plant was not capable of de novo trichothecene synthesis. No other trichothecenes have been found to be absorbed and translocated in any other plant in this manner. Control samples of soil and vegetation from Southeast Asia do not support endemic presence of these toxins. The appearance of these particular trichothecene toxins in these high levels in environments generally inhospitable to their formation cannot reasonably be attributed to a natural contamination.

FIGURE E-1
General Structure of Trichothecenes



T_2 Toxin	Nivalenol	Deoxynivalenol
R_1=OH	R_1=CH	R_1=OH
R_2=OAc	R_2=CH	R_2=H
R_3=OAc	R_3=OH	R_3=OH
R_4=H	R_4=OH	R_4=OH
R_5=OCOCH$_2$CH(CH$_3$)$_2$	R_5= =O	R_5= =O

Chemical and Physical Properties of the Trichothecenes

When considering the suitability of trichothecenes as agents, factors such as stability, solubility, and ease of production must be considered. The general structure for the trichothecene group is shown in Figure E-1. There are more than 40 currently known, naturally occurring, 12 to 13 epoxytrichothecenes. The R groups may be hydroxyls, acylated hydroxyl groups or esters. The R group for the toxins detected in the sample is shown below the general structure. All of the compounds have in common an olefinic double bond at carbon atoms 9 and 10 and an epoxy group at carbon atoms 12 and 13. These compounds are stable, especially in the solid form. They may be stored for years at room temperature with no loss of activity. They are heat stable with no loss of activity noted after heating for 1 hour at 100° centigrade. The solubility depends on the R groups; highly hydroxylated derivatives are more water soluble. The compounds are also quite stable in solution. Detoxification can be accomplished by treatment with strong mineral acid, which will open the 12 to 13 epoxide bond and abolish all biological activity. Most of the toxins are well absorbed through mucous membranes and some through skin; this property is also a function of the R group.

Some of these compounds have been synthesized chemically; however, biosynthesis employing *Fusarium* species is the most effective way to produce large quantities. In a preliminary search of recent Soviet literature, 50 articles dealing

TABLE E-3

Physicochemical Methods for Detection of Trichothecenes in Feedstuffs

Method	Trichothecenes Detected	Detection Limits	Required Standards	Use and Limitation
Thin-layer chromatography 1-dimension	All	0.1 microgram/spot (H_2SO_4)	Reference Standard	Qualitative Interference Not confirmatory
Thin-layer chromatography 2-dimension	All	0.1–1.0 microgram/spot (H_2SO_4)	Reference Standard	Qualitative Less interference Confirmatory
Gas-liquid chromatography	Nonhydroxylated or TMS derivatives	0.03–0.05 microgram/microliter injection	Reference Standard	Quantitative Monoglyceride interference Equivocable identification
Gas chromatography/mass spectrometry-normal scanning mode	TMS derivatives	0.02–0.05 microgram/microliter injection	Reference Standard or Spectrogram	Semiquantitative Less interference Unequivocable identification
Gas chromatography/mass spectrometry-selection ion monitoring	TMS derivatives	0.007–0.02 microgram/microliter injection	Reference Standard or Spectrogram	Quantitative Best for complex mixtures Unequivocable identification
Nuclear-magnetic-resonance	All	——	Reference Standard or Spectrogram	Confirmatory Purified toxin structure elucidation
Radio-immunoassay (developmental stage)	T-2 toxin	1–20 nanogram	Rabbit anti-T-2 toxin anti-body	Sensitive Low interference
			HT-2 toxin	Relative structural specificity

with the trichothecenes were reviewed. Of these, 22 dealt with defining optimum conditions for biosynthesis of the compounds. N.A. Kostyunina has reported production of T-2 toxin at levels of 4 grams per kilogram of substrate (normally wheat grain or rice). Many industrial microbiology plants have been identified in the Soviet Union. Some are involved in production of single-cell protein for fodder additives, others produce antibiotics, and the function of still others is unknown. *Fusaria* are produced in the Soviet Union at a facility long reported in the open literature as being a suspected biological warfare agent production and storage facility. This facility, Berdsk Chemical Works, is near the science city of Novosibirsk in Siberia. The only difference between an antibiotic and mycotoxin is their target specificity. Both are produced by fungi, but the mycotoxins are relatively more toxic to man than to microorganisms. Mycotoxins can be produced in good yield employing the same techniques used to produce some antibiotics. Thus, it may be concluded that the Soviets could produce trichothecenes in large amounts. They produce an antibiotic that is a trichothecene derivative, which would provide an ideal cover for agent production facilities.

Medical Effects of the Trichothecenes in Humans

The most prominent symptoms associated with trichothecene poisoning are listed in Table E-2. Striking among these is the rapid onset of vomiting, along with severe itching and tingling of the skin. Hemorrhage of the mucous membranes and bloody diarrhea follow. The symptoms shown in Table E-2 are similar to those reported by victims of trichothecene attacks in Laos, Kampuchea, and Afghanistan. The correlation is striking.

The LD_{50}'s (dose required to produce death in 50% of a test population) of the trichothecenes in laboratory animals range from 0.1 mg/kg to greater than 1,000 mg/kg, depending on the particular toxin, species, and route of exposure. The LD_{50} of T-2 toxin in a cat is 0.5 mg/kg. However, the ED_{50} (dose required to produce a desired physiological effect in 50% of a test population) is much lower. The ED_{50} to produce a vomiting reaction is 0.1 mg/kg; for skin irritation it is in the tenths of microgram range.

Most of the data concerning the toxicological effects of the trichothecenes are derived from animal data in which pure compounds were administered by oral, subcutaneous, intraperitoneal, or intravenous routes. Unfortunately, there are no reports concerning the effects of inhalation of mixtures of the compounds. Therefore, it is difficult to speculate concerning the effects that would be expected in humans exposed to an aerosol of mixtures of these potent toxins. The most useful data concerning exposure in humans were obtained in a phase I clinical evaluation of anguidine (diacetoxyscirpenol) as an anticancer drug. Diacetoxyscirpenol was administered by intravenous infusion. Doses of 3 mg/m²/day caused immediate onset of nausea, vomiting, diarrhea, somnolence and/or mental confusion, fever, chills, a generalized erythema with a burning sensation, hypotension, dyspnea, stomatitis, hives, and ataxia. Because of the side effects, the treatment was discontinued. The properties which make the use of diacetoxyscirpenol potentially useful as an anticancer drug are the same as those responsible, in part, for its extreme toxicity. It and the other trichothecenes cause extensive damage to rapidly dividing cells such as tumor cells. Unfortunately, the cells of the lining of the gastrointestinal tract and bone marrow are also rapidly dividing, and the effects of the trichothecenes on these cells result in severe, rapid degeneration of these tissues. The compounds also have direct effects on the clotting factors in the blood (that is, a primary effect on Factor VII activity and a secondary effect on prothrombin), which result in excessive hemorrhage following trauma.

The other useful body of clinical data concerning the effects of trichothecenes in humans is drawn from descriptions of the course of the disease in the natural

TABLE E-4

Spontaneous Occurrence of Trichothecene Mycotoxins

Toxin	Country	Source	Concentration (parts per million)	Reference[a]
T-2 Toxin	U.S.	Mixed feed	0.08[b]	15
	U.K.	Brewer's grains	ND[c]	19
	India	Sweet corn	4[b,d]	5
	Canada	Corn	ND	4
	India	Sorghum	ND[d]	22
	Canada	Barley	25[d]	20
	India	Safflower seed	3–5[d]	6
	U.S.	Corn stalks	0.11[b]	16
	U.S.	Feed supplement	ND	7
	U.S.	Corn	2	8
	U.S.	Mixed feed	0.3	14
	France	Corn	0.02[b]	10
	U.S.	Corn	ND	2
Diacetoxy-scirpenol	U.S.	Mixed feed	0.5	15
	U.S.	Mixed feed	0.38	15
	India	Safflower seed	3–5[d]	6
	India	Sweet corn	14[d]	5
	Germany	Corn	31.5[d]	23
	U.S.	Corn	0.88	21
Deoxynivalenol	U.S.	Corn stalks	1.5[b]	16
	U.S.	Corn	1.8[b]	15
	U.S.	Corn	1.0[b]	15
	U.S.	Corn	0.1[b]	15
	U.S.	Mixed feed	0.04[b]	15
	U.S.	Mixed feed	1.0[b]	15
	U.S.	Mixed feed	1.0[b]	15
	U.S.	Corn	7.4	9
	U.S.	Corn	0.1–25[d]	21
	U.S.	Corn	trace–25[d]	2, 21
	U.S.	Corn	1.1–10.7	26
	U.S.	Corn	41	25
	U.S.	Corn	1.0[b]	17
	U.S.	Oats	5	17
	Japan	Barley	ND	18
	U.S.	Corn	1.0[b]	13
	U.S.	Corn	0.06[b]	13
	U.S.	Mixed feed	0.07[b]	13
	France	Corn	0.6[b]	10
	South Africa	Corn	2.5	11
	Zambia	Corn	7.4	11
	U.S.	Corn	ND	2
	Japan	Barley	7.3	18
	Austria	Corn	1.3	24
	Austria	Corn	7.9	24
	Canada	Corn	7.9	24
Nivalenol	Japan	Barley	ND	18
	France	Corn	4.3[b]	10
Partially characterized trichothecenes	U.S.	Corn	ND	25
	India	Safflower seed	ND[d]	6
Skin irritant factors—not analyzed chemically	U.S.	Corn	93 positive[b] of 173	3
	U.S.	Corn	Multiple positive samples	21
	Yugoslavia	Corn	16 positive of 191	1

FOOTNOTES

[a] References:

1. Balzer *et al.* (1977)
2. Ciegler (1978)
3. Eppley *et al.* (1974)
4. Funnel (1979)
5. Ghosal *et al.* (1978)
6. Ghosal *et al.* (1977)
7. Hibbs *et al.* (1974)
8. Hsu *et al.* (1972)
9. Isshi *et al.* (1975)
10. Jemmail *et al.* (1978)
11. Marasas *et al.* (1977)
12. Miller (1976)
13. Mirocha (1979)
14. Mirocha (1979)
15. Mirocha *et al.* (1976)
16. Mirocha *et al.* (1979)
17. Mirocha *et al.* (1979)
18. Morooka *et al.* (1972)
19. Petrie *et al.* (1977)
20. Puls and Greenway *et al.* (1976)
21. Romer, T., Ralston Purina, St. Louis, MO (personal communication)
22. Rukmini and Bhat (1978)
23. Siegfried (1979)
24. Vesonder and Ciegler (1979)
25. Vesonder *et al.* (1976)
26. Vesonder *et al.* (1978)

[b] Zearalenone (F-2 toxins) also detected in the sample.

[c] ND = toxin concentration was not determined.

[d] Levels that are questionable on the basis of techniques used.

outbreaks that occurred in the Soviet Union. The effects produced are similar to radiation poisoning, and there is a latent phase similar to that seen in radiation poisoning, in which the overt symptoms disappear.

The clinical picture may be divided into four stages.

The first stage occurs within minutes to hours after ingestion of toxic grains. The symptomatology described was produced by oral exposure to low doses. In exposure by inhalation, the symptoms may be more pronounced or the time course accelerated. The characteristics of the first stage include primary changes, with local symptoms, in the buccal cavity and gastrointestinal tract. Shortly after ingestion of toxic grain, the patient experiences a burning sensation in the mouth, tongue, throat, palate, esophagus, and stomach as a result of the toxin's effect on the mucous membranes. The tongue may feel swollen and stiff, and the mucosa of the oral cavity may be hyperemic. Inflammation of the gastric and intestinal mucosa occurs, along with vomiting, diarrhea, and abdominal pain. In most cases excessive salivation, headache, dizziness, weakness, fatigue, and tachycardia accompany the initial stage. There may be fever and sweating, but the body temperature normally does not rise. The leukocyte count may begin to decrease in this stage, and there may be an increased erythrocyte sedimentation rate. This first stage may last from 3 to 9 days.

The second stage is often called the latent stage or incubation period because the patient feels well and is capable of normal activity. It is also called the leukopenic stage because its main features are disturbances in the bone marrow and the hematopoietic system, characterized by a progressive leukopenia and granulopenia and a relative lymphocytosis. In addition, anemia and a decrease in erythrocytes, in the platelet count, and in hemoglobin occur. Disturbances in the central nervous system and autonomic nervous systems may occur as well as weakness, vertigo, fatigue, headache, palpitations, and mild asthmatic conditions. Visible hemorrhagic spots (petechiae) begin to appear on the skin, marking the transition to the third phase. The second stage may last 3–4 weeks. The transition to the third stage is sudden, and symptoms progress rapidly.

In the third stage, petechial hemorrhages occur on the skin of the trunk, arms, thighs, face, and head. They can vary from a millimeter to a few centimeters in size. Capillaries are fragile, and any slight trauma results in hemorrhage. Hemorrhages of the mucous membranes of the mouth, tongue, soft palate, and tonsils occur. Nasal, gastric, and intestinal hemorrhages can be severe. Areas of necrosis begin to appear on the lips, fingers, nose, jaws, eyes, and in the mouth. Lymph nodes are frequently enlarged, and the adjoining connective tissue can become so edematous that the patient has difficulty opening his mouth. Blood abnormalities previously described are intensified. Death may occur from hemorrhage, strangulation due to swelling, or secondary infection.

The fourth stage is convalescence. Three or 4 weeks of treatment are required for disappearance of necrotic lesions and hemorrhagic effects. Two months or more may elapse before the bloodforming capability of the bone marrow returns to normal. ■

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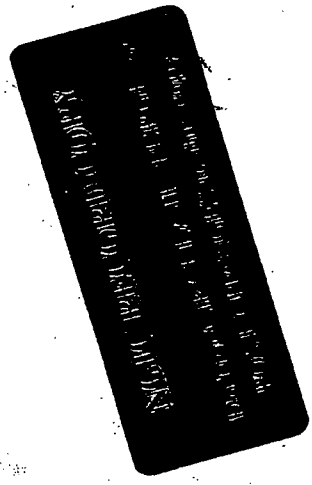

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REPLY TO
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10 JUN 2013

This is in further response to your Freedom of Information Act (FOIA) request of October 23, 2008, and supplements our electronic message of May 12, 2010.

Coordination has been completed with another element of our command and other government agencies and records returned to this office for our review and direct response to you. We have reviewed the records and determined the records are partially releaseable to you. A copy of the records are enclosed for your use.

We have completed a mandatory declassification review in accordance with Executive Order (EO) 13526. As a result of our review information has been sanitized and 4 pages have been withheld in their entirety as the information is currently and properly classified TOP SECRET, SECRET and CONFIDENTIAL according to Sections 1.2(a)(1), 1.2(a)(2), 1.2(a)(3) and 1.4(c) of EO 13526. This information is exempt from the public disclosure provisions of the FOIA pursuant to Title 5 U.S. Code 552 (b)(1). It is not possible to reasonably segregate meaningful portions of the withheld pages for release. The records are enclosed for your use. A brief explanation of the applicable sections follows:

Section 1.2(a)(1) of EO 13526, provides that information shall be classified TOP SECRET if its unauthorized disclosure reasonably could be expected to cause exceptionally grave damage to the national security.

Section 1.2(a)(2) of EO 13526, provides that information shall be classified SECRET if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

Section 1.2(a)(3) of EO 13526, provides that information shall be classified CONFIDENTIAL if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

Section 1.4(c) of EO 13526, provides that information pertaining to intelligence activities, intelligence sources or methods, and cryptologic information shall be considered for classification protection.

In addition, information has been sanitized from the records and 4 pages have been withheld in their entirety as the release of the information would reveal sensitive intelligence methods. This information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(7)(E) of the FOIA. The significant and legitimate governmental purpose to be served by withholding is that a viable and effective intelligence investigative capability is dependent upon protection of sensitive investigative methodologies. It is not possible to reasonably segregate meaningful portions of the withheld pages for release.

The withholding of the information described above is a partial denial of your request. This denial is made on behalf of Major General Stephen G. Fogarty, the Commanding General, U.S. Army Intelligence and Security Command, who is the Initial Denial Authority for Army intelligence investigative and security records under the FOIA. You have the right to appeal this decision to the Secretary of the Army. Your appeal must be postmarked no later than 60 calendar days from the date of this letter. After the 60-day period, the case may be considered closed; however, such closure does not preclude you from filing litigation in the courts. You should state the basis of your disagreement with the response and provide justification for a reconsideration of the denial. An appeal may not serve as a request for additional or new information. An appeal may only address information denied in this response. Your appeal is to be made to this office, for forwarding, as appropriate to the Secretary of the Army, Office of the General Counsel.

Coordination has been completed and we have been informed by the Central Intelligence Agency (CIA) that information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(1) and (b)(3) of the FOIA.

The withholding of the information by the CIA constitutes a denial of your request and you have the right to appeal this decision to the Agency Release Panel within 45 days from the date of this letter. If you decide to file an appeal, it should be forwarded to this office and we will coordinate with the CIA on your behalf. Please cite CIA #F-2010-01292/Army #57F-09 assigned to your request so that it may be easily identified.

Coordination has been completed and we have been informed by the Defense Intelligence Agency (DIA) that their information is exempt from public disclosure pursuant to Title 5 U.S. Code § 552 (b)(1), (b)(2) (b)(3) and (b)(4) of the Freedom of Information Act and Executive Order (EO) 13,526 § 1.4 (c) (d) and (h). The statute invoked under Title 5 U.S. Code 552 (b)(3) is 10 U.S.C. §424, which allows for the protection of organizational and personnel information for DIA.

The withholding of the information by the DIA constitutes a partial denial of your request and you have the right to appeal this decision directly to the DIA. If you decide to file an appeal, it should be forwarded to the Director, Defense Intelligence Agency, ATTN: DAN-1A-FOIA, Washington, DC 20340-5100. Please cite MDR #0155-2010 assigned to your request so that it may be easily identified.

You have received all Army intelligence investigative records pertaining to this request.

There are no assessable FOIA fees.

If you have any questions regarding this action, feel free to contact this office at 1-866-548-5651, or email the INSCOM FOIA office at: INSCOM_FOIA_ServiceCenter@mi.army.mil and refer to case #57F-09.

Sincerely,

Brad S. Dorris
Director
Freedom of Information/Privacy Office
Investigative Records Repository

Enclosure

[redacted]

15
AST-2660R-015-82
JANUARY 1982

US ARMY SCIENTIFIC AND TECHNICAL INTELLIGENCE BULLETIN

A S T I B

CUBAN CHEMICAL AND BIOLOGICAL WARFARE CAPABILITIES (U)

WARNING NOTICE

Authority for the release of this document to a foreign government must be secured from the Assistant Chief of Staff for Intelligence, Department of the Army, Washington, DC 20310.

SECURITY MARKINGS

The security classification markings in this document are accompanied by special control markings, when applicable. These control markings and their meanings are as follows:

NOFORN ..... NOT RELEASABLE TO FOREIGN NATIONALS

WNINTEL ..... WARNING NOTICE: INTELLIGENCE SOURCES AND METHODS INVOLVED

ORCON .....DISSEMINATION AND EXTRACTION OF INFORMATION CONTROLLED BY ORIGINATOR

NOCONTRACT ..... NOT RELEASABLE TO CONTRACTORS OR CONTRACTOR/CONSULTANTS

PROPIN ..... CAUTION: PROPRIETARY INFORMATION INVOLVED

CHANGES IN DISTRIBUTION

Requests by Army commands, installations, and activities for changes in distribution should be addressed to the Commander, ITAC, ATTN: IAX-M-DI, Arlington Hall Station, Arlington, VA 22212 in accordance with AR 381-19. Non-Army elements and U&S Commands should make requests in accordance with DIAM 59-1.

FOREWORD

The Army Scientific and Technical Intelligence Bulletin (ASTIB) is a monthly publication summarizing the current level of US Army Intelligence knowledge concerning a specific scientific and technical mission area. It represents an ACSI approved position. The ASTIB is managed, printed, and disseminated by the US Army Foreign Science and Technology Center (FSTC), with specific issues written by FSTC, the Missile Intelligence Agency (MIA), or the Medical Intelligence and Information Agency (MIIA).

Comments regarding the information in this document and requests for additional information should be directed to FSTC, MIA, or MIIA as appropriate.

Wm E Odom

WILLIAM E. ODOM
Brigadier General, United States Army
Assistant Chief of Staff for Intelligence

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AST-2660R-015-82
January 1982

Topics to be addressed in the Army Scientific and Technical Intelligence Bulletin (ASTIB): November 1981--February 1983 (U).

(U) Under procedures initiated in October 1979, various organizational units at the US Army Foreign Science and Technology Center (FSTC), the US Army Missile Intelligence Agency (MIA), and the US Army Medical Intelligence and Information Agency (MIIA) will address specified topics (mission area themes) in separate issues of the ASTIB. The following schedule has been developed:

Issue	Responsible Agency	Mission Area Theme
(b)(7)(E)		

AST-2660R-015-82
January 1982

(b)(7)(E)

AST-2660R-015-82
January 1982

INTRODUCTION

(U) This issue of the Army Scientific and Technical Intelligence Bulletin (ASTIB) was prepared by the Chemical Warfare and Life Sciences Branch, Military Technologies Division, US Army Foreign Science and Technology Center, 220 Seventh Street, NE., Charlottesville, VA 22901. As a result of recent inquiries about the state-of-the-art of Cuban chemical and biological warfare capabilities, this issue is devoted exclusively to that subject. Economically and militarily, Cuba is heavily dependent upon the Soviet Union and other Warsaw Pact countries. Presently, more than 1500 Soviet military advisors are in Cuba, in addition to a Soviet brigade of about 2000 men, to assist in Cuban military training and operational planning. As will become obvious to the reader, this Soviet influence is strongly manifested in the chemical and biological warfare area.

(U) Additional information on Cuban chemical and biological warfare capabilities and related topics can be obtained from the author, Mr. Victor Wolfe, Chief, Chemical Warfare and Life Sciences Branch.

AST-2660R-015-82
January 1982

CUBAN CHEMICAL AND BIOLOGICAL WARFARE CAPABILITIES (U)

(b)(6)

BACKGROUND (U)

(b)(1)

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ORGANIZATION (U)

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AST-2660R-015-82
January 1982

Reported Chemical Units (U)

(CONFIDENTIAL-NOFORN)

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Reported Chemical Units (Continued) (U)

(CONFIDENTIAL-NOFORN)

(b)(1)

NOT Rreleasable TO FOREIGN NATIONALS

Reported Chemical Units (Continued) (U)

(CONFIDENTIAL-NOFORN)

(b)(1)

*Unidentified

(CONFIDENTIAL-NOFORN)

TRAINING (U)

Training Schools (U)

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(b)(1)

Unit Training (U)

(b)(1)

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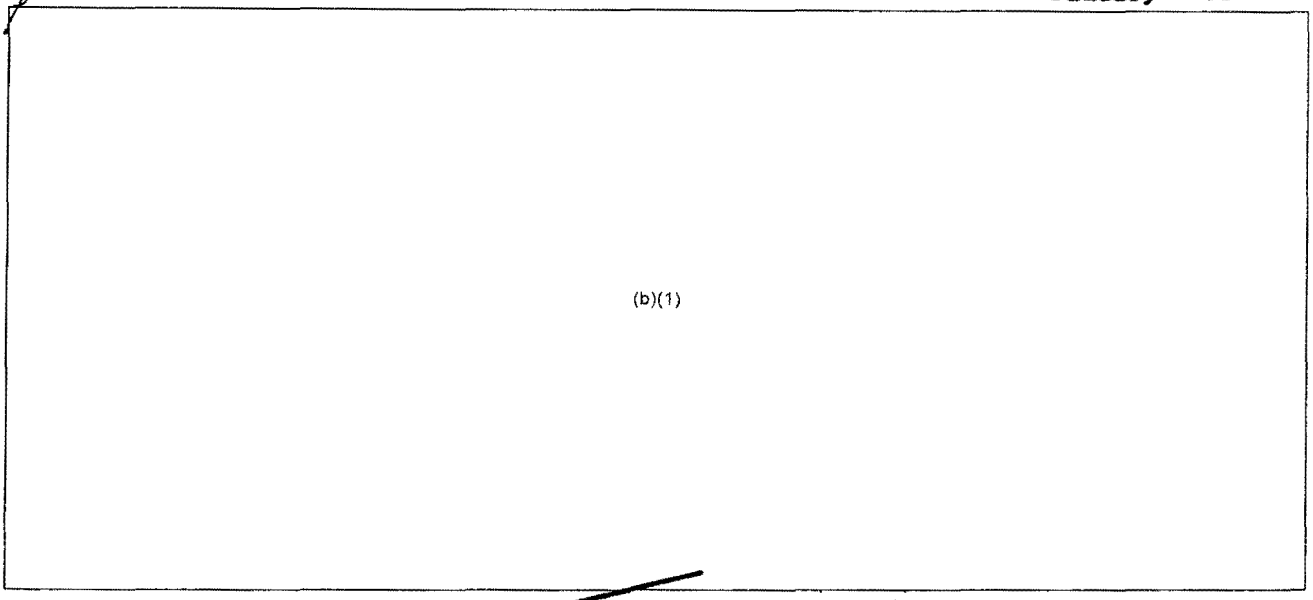

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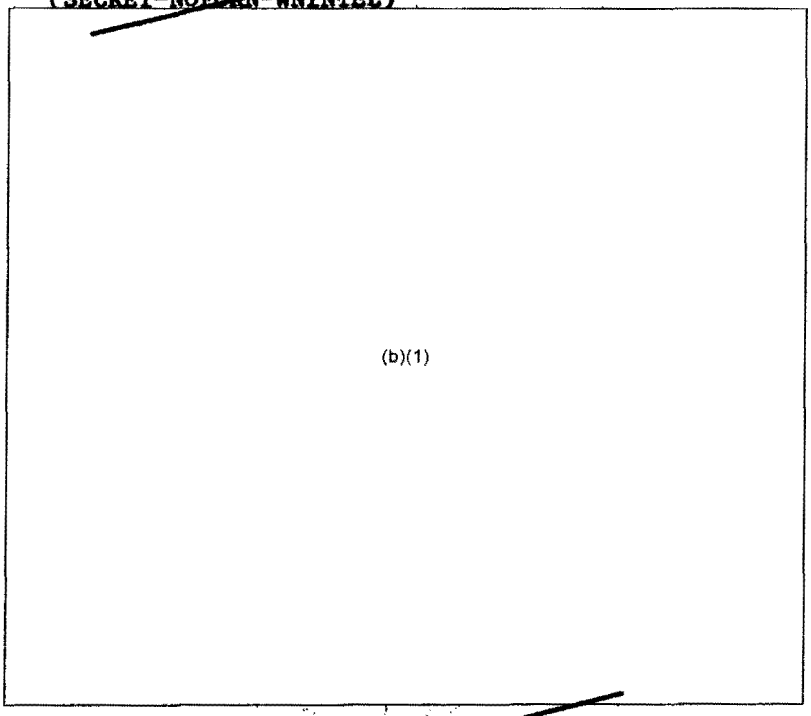

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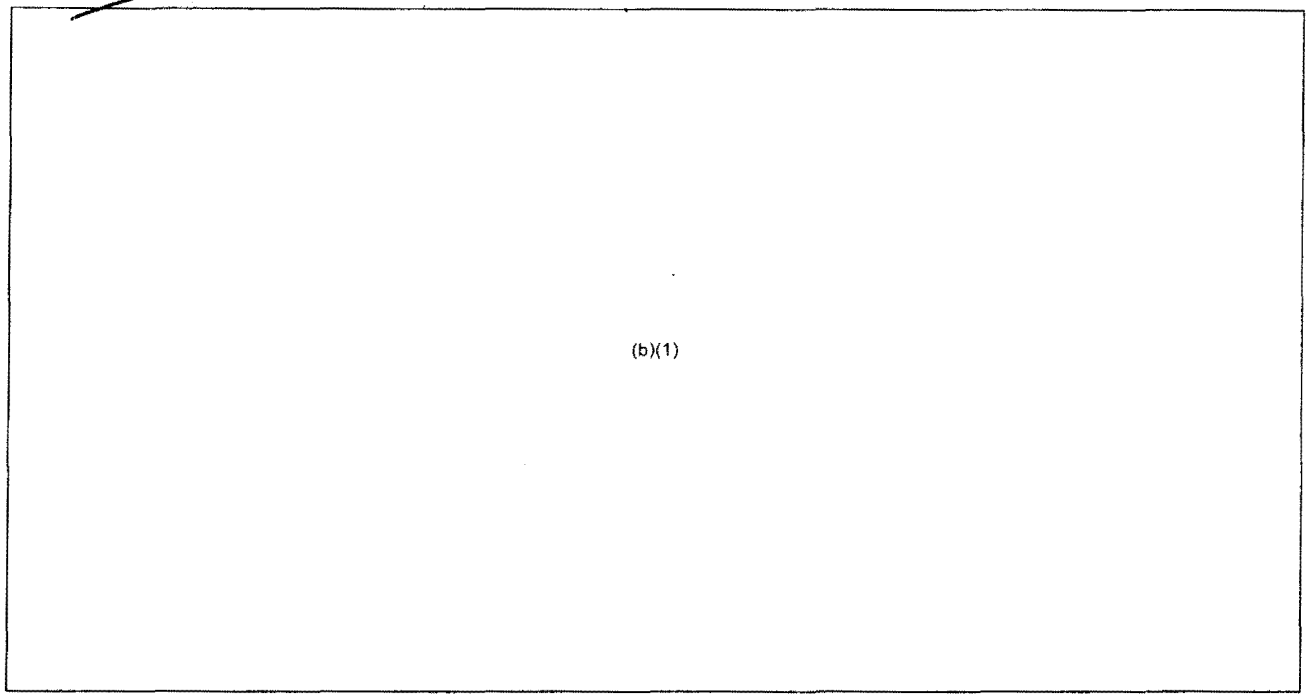

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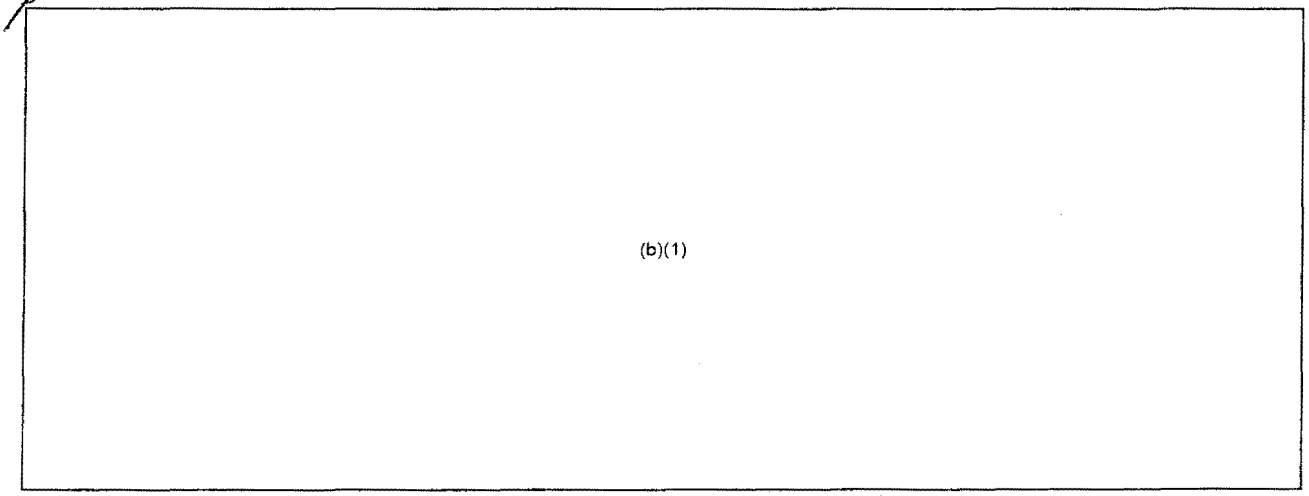

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January 1982

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(b)(1)

Medical Training (U)

(b)(1)

CBW Materiel (U)

Agents and Munitions (U)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(b)(1)

Defensive Materiel (U)

(b)(1)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

PRODUCTION AND STOCKPILES (U)

(b)(1)

RESEARCH AND DEVELOPMENT (U)

(U) Very little is known about possible CBR research and development activities in Cuba. According to a Cuban open press article, a Central Chemical Troops Laboratory (location unknown) has been in existence for 25 years, and as of 22 June 1980, a new laboratory building was in the planning stages. A Dr. Julio Lopez Rendueles is apparently associated with this facility, but no other information is available on him or his areas of expertise.

CONCLUSIONS (U)

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Description of document:	Defense Intelligence Agency report, Tissue Culture Technology (BW-Related): USSR, August 1969
Requested date:	23-October-2008
Released date:	10-June-2013
Posted date:	13-August-2013
Source of document:	Commander US Army Intelligence & Security Command Freedom of Information/Privacy Office ATTN: IAMG-C-FOI 4552 Pike Road Fort George G. Meade, MD 20755-5995 Fax: (301) 677-2956 Email: FOIA/Privacy Office Online FOIA Request Form
Note:	This report is one of 16 reports released under Mandatory Declassification Review by the US Army Intelligence & Security Command. All of these reports may be accessed here: http://www/governmentattic.org/inscomBWCW.html

DEPARTMENT OF THE ARMY
UNITED STATES ARMY INTELLIGENCE AND SECURITY COMMAND
FREEDOM OF INFORMATION/PRIVACY OFFICE
FORT GEORGE G. MEADE, MARYLAND 20755-5995

REPLY TO
ATTENTION OF:

Freedom of Information/
Privacy Office

10 JUN 2013

This is in further response to your Freedom of Information Act (FOIA) request of October 23, 2008, and supplements our electronic message of May 12, 2010.

Coordination has been completed with another element of our command and other government agencies and records returned to this office for our review and direct response to you. We have reviewed the records and determined the records are partially releaseable to you. A copy of the records are enclosed for your use.

We have completed a mandatory declassification review in accordance with Executive Order (EO) 13526. As a result of our review information has been sanitized and 4 pages have been withheld in their entirety as the information is currently and properly classified TOP SECRET, SECRET and CONFIDENTIAL according to Sections 1.2(a)(1), 1.2(a)(2), 1.2(a)(3) and 1.4(c) of EO 13526. This information is exempt from the public disclosure provisions of the FOIA pursuant to Title 5 U.S. Code 552 (b)(1). It is not possible to reasonably segregate meaningful portions of the withheld pages for release. The records are enclosed for your use. A brief explanation of the applicable sections follows:

Section 1.2(a)(1) of EO 13526, provides that information shall be classified TOP SECRET if its unauthorized disclosure reasonably could be expected to cause exceptionally grave damage to the national security.

Section 1.2(a)(2) of EO 13526, provides that information shall be classified SECRET if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

Section 1.2(a)(3) of EO 13526, provides that information shall be classified CONFIDENTIAL if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

Section 1.4(c) of EO 13526, provides that information pertaining to intelligence activities, intelligence sources or methods, and cryptologic information shall be considered for classification protection.

In addition, information has been sanitized from the records and 4 pages have been withheld in their entirety as the release of the information would reveal sensitive intelligence methods. This information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(7)(E) of the FOIA. The significant and legitimate governmental purpose to be served by withholding is that a viable and effective intelligence investigative capability is dependent upon protection of sensitive investigative methodologies. It is not possible to reasonably segregate meaningful portions of the withheld pages for release.

The withholding of the information described above is a partial denial of your request. This denial is made on behalf of Major General Stephen G. Fogarty, the Commanding General, U.S. Army Intelligence and Security Command, who is the Initial Denial Authority for Army intelligence investigative and security records under the FOIA. You have the right to appeal this decision to the Secretary of the Army. Your appeal must be postmarked no later than 60 calendar days from the date of this letter. After the 60-day period, the case may be considered closed; however, such closure does not preclude you from filing litigation in the courts. You should state the basis of your disagreement with the response and provide justification for a reconsideration of the denial. An appeal may not serve as a request for additional or new information. An appeal may only address information denied in this response. Your appeal is to be made to this office, for forwarding, as appropriate to the Secretary of the Army, Office of the General Counsel.

Coordination has been completed and we have been informed by the Central Intelligence Agency (CIA) that information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(1) and (b)(3) of the FOIA.

The withholding of the information by the CIA constitutes a denial of your request and you have the right to appeal this decision to the Agency Release Panel within 45 days from the date of this letter. If you decide to file an appeal, it should be forwarded to this office and we will coordinate with the CIA on your behalf. Please cite CIA #F-2010-01292/Army #57F-09 assigned to your request so that it may be easily identified.

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The withholding of the information by the DIA constitutes a partial denial of your request and you have the right to appeal this decision directly to the DIA. If you decide to file an appeal, it should be forwarded to the Director, Defense Intelligence Agency, ATTN: DAN-1A-FOIA, Washington, DC 20340-5100. Please cite MDR #0155-2010 assigned to your request so that it may be easily identified.

You have received all Army intelligence investigative records pertaining to this request.

There are no assessable FOIA fees.

If you have any questions regarding this action, feel free to contact this office at 1-866-548-5651, or email the INSCOM FOIA office at: INSCOM_FOIA_ServiceCenter@mi.army.mil and refer to case #57F-09.

Sincerely,

Brad S. Dorris
Director
Freedom of Information/Privacy Office
Investigative Records Repository

Enclosure

FSTC-CS-03-7-68 INT

DEFENSE INTELLIGENCE AGENCY

P&D

IA77-55413

501-04 Tissue Cultures

TISSUE CULTURE TECHNOLOGY (BW-RELATED): USSR (U)

ST-S-3-4334

Cy 13 of [illegible]

CONFIDENTIAL SECRET

August 1969

FSTC-CS-03-7A-68-INT

Publication No.
FSTC-CS-03-7-68-INT
Amendment A

US ARMY MATERIEL COMMAND
FOREIGN SCIENCE AND TECHNOLOGY CENTER
Munitions Building, Washington, D.C. 20315

TISSUE CULTURE TECHNOLOGY (BW-RELATED): USSR (U)

Publication No. FSTC-CS-03-7-68-INT, July 1968, is amended as follows:

1. (U) The overall classification of FSTC-CS-03-7-68-INT is changed from SECRET Group 3 to CONFIDENTIAL Group 3. Necessary pen-and-ink changes will be made to accomplish the downgrading.

2. (U) Make the following pen-and-ink changes:

(U) Page vi, LIST OF ILLUSTRATIONS: Before "Diagram . . ." insert "1."

Add

"2. Tissue Culture Vessel ----------16.1"

(U) Page vii, first para, line 3: Change "medical" to "public health".

(U) Page viii, first para, line 1: Change classification from "(U)" to "(C)".

(b)(1)

(U) Page 13, para 1b, line 3: Change "VNK-21" to BHK-21".

(U) Page 19, para 4d, line 2: Delete "?"

(C) Page 20: Add the following paragraph:

(b)(1)

3. (U) Remove pages 9, 10, 15, 16, 17, 18, 21, and 22 and insert new pages 9, 10, 15, 16, 16.1, 17, 18, 21, and 22.

4. (U) Insert new pages iv.1 and iv.3.

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FSTC-CS-03-7A-68-INT
August 1969

(b)(7)(E)

(Total: 213 copies)

FSTC-CS-03-7A-68-INT
August 1969

LIST OF EFFECTIVE PAGES

FSTC-CS-03-7A-68-INT
August 1969

RECORD OF CHANGES

CHANGE NUMBER	DATE OF CHANGE	DATE ENTERED	SIGNATURE RANK/RATE AND ORGANIZATION OF INDIVIDUAL ENTERING CHANGE
A	August 1969		

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TISSUE CELL STRAINS (Continued)

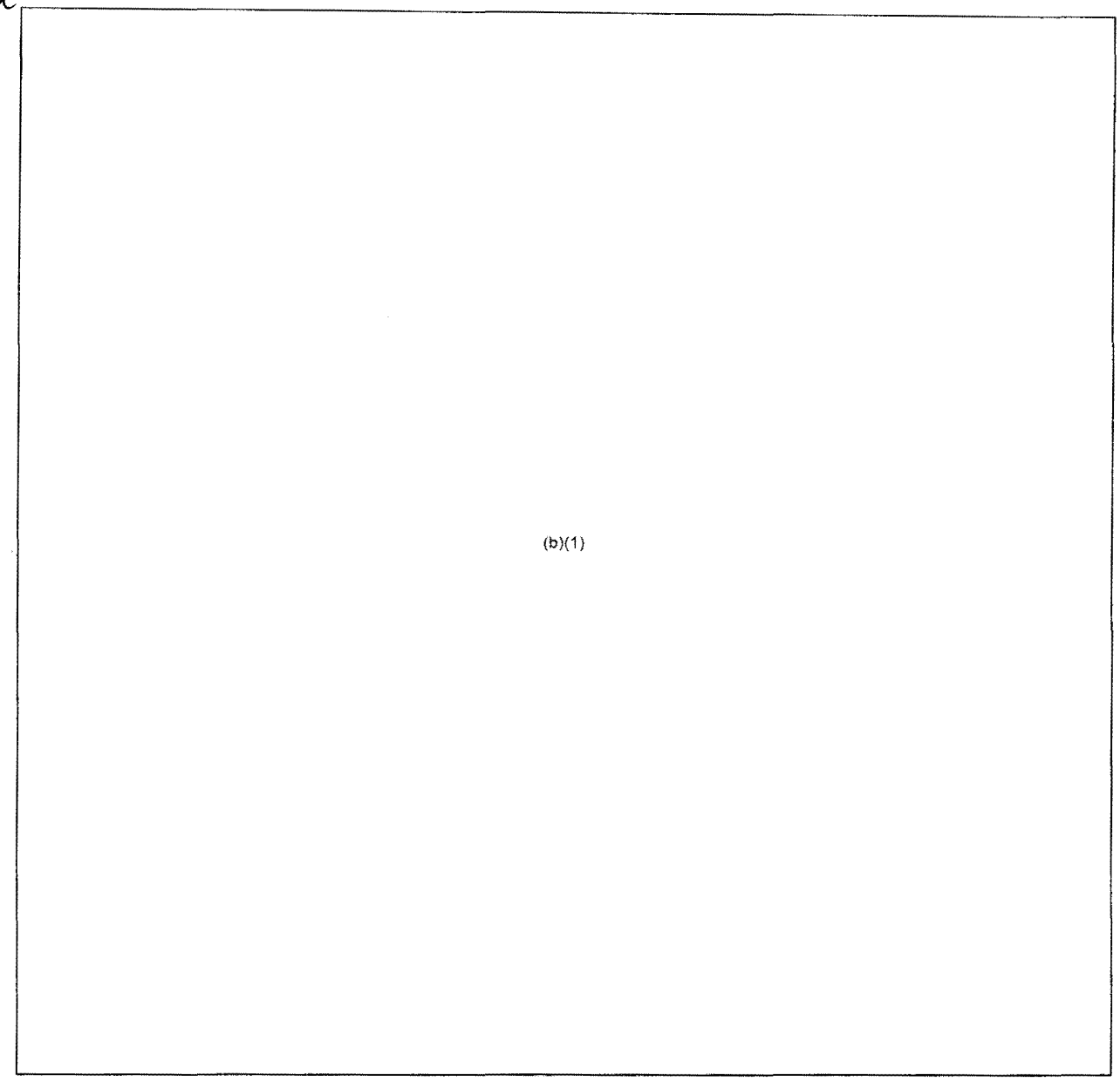
Cell line (continued)	Tissue source (continued)
ERK-1	Rabbit kidney
HEP-2	Human larynx
RES	Fetal pig kidney
CEC	Chick embryo cells
BHK-21	Syrian hamster kidney
WI-38	Human embryo (diploid)
Detroit-6	Human embryo (diploid)
FL	Human amnion
PKP	Lamb kidney
SK	Human lung
SPE	Swine kidney
S-44	Human diploid

Tissue cell isolates from a number of different sources include the following:

Human embryo kidney	Puppy testis
Human embryo skin	Rabbit kidney
Human embryo lung	Rabbit testis
Sheep embryo kidney	Guinea pig kidney
Monkey kidney	Guinea pig testis
Monkey testis	Swine embryo
Puppy kidney	Hamster kidney

b. (U) The classic methods, or variations thereof, were used to obtain, for cultivation, dispersed cells from human and animal tissues. Cell suspensions were counted in the Garyaeva chamber before being planted in Rous or Pavitsky bottles. After cells grew on the glass, the standard procedures for maintaining the established cell lines were followed.

c. (U) In recent years, the Soviets have been considerably interested in the cultivation and use of human diploid cells. Dr. R. I. Rapoport, MNIIVP, isolated 13 strains of diploid cells from human embryo lung tissue and determined the stability of the diploid cells in various media. A long-term study of one line (L-10) showed that the best results were obtained with Eagle's medium No. IX, which contained 10% bovine serum. The diploid complement of chromosomes was preserved, and the line was devoid of oncogenic (tumor-producing) effects. The L-10 cell line was also sensitive to measles, tick-borne encephalitis (TBE), and adenoviruses.



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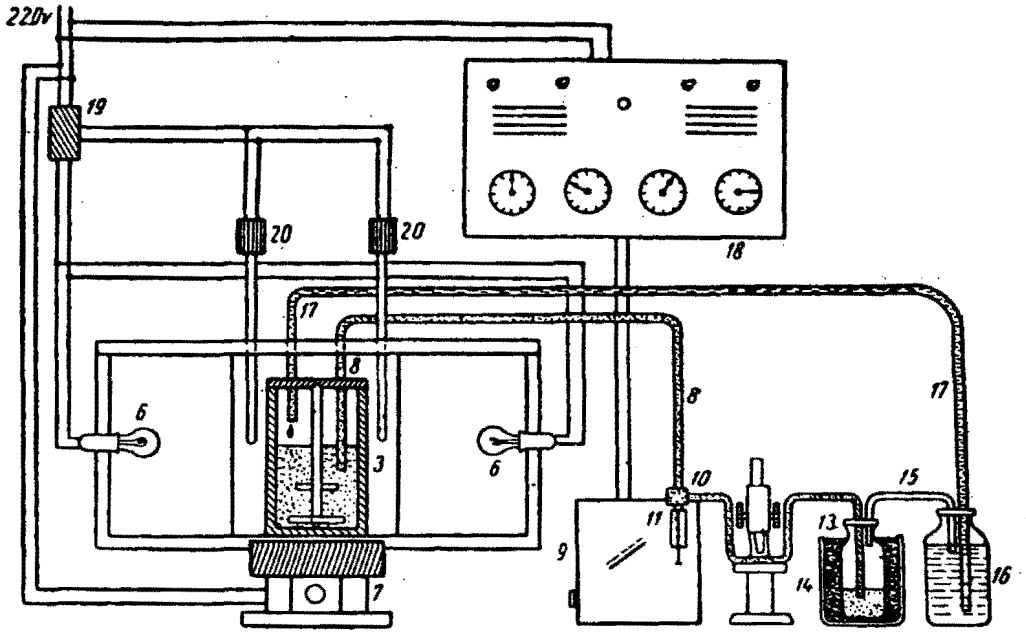


UNCLASSIFIED

Figure 1. Diagram of design of a simple hemostat for continuous cultivation of tissue cultures (author's modification) (U).

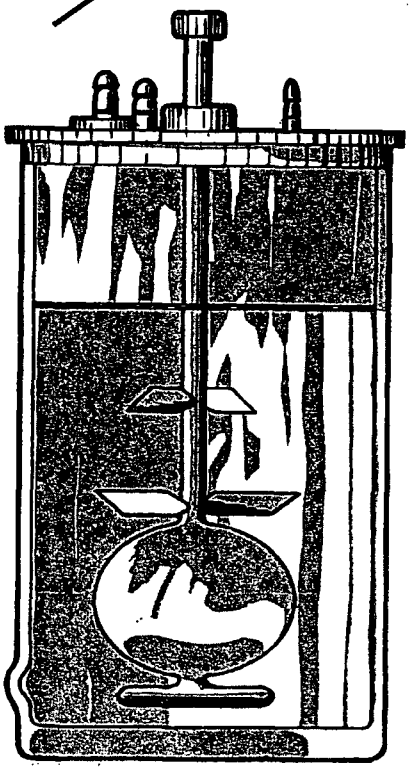
1 and 2 (missing).
3, plastic reactor.
4 and 5 (missing).
6, heater.
7, magnetic agitator.
8, polyvinylchloride discharge tube.
9, pouring machine or peristaltic pump.
10, valve adapter.
11, injector.
12, device for microscopic inspection of growing cells.
13, receiving flask.
14, container for ice.
15, connecting pipe.
16, flask with extra nutrient medium.
17, polyvinylchloride feeding tube.
18, electronic device regulating feeding of fresh nutrient medium.
19, thermorelay.
20, contact thermometers.

c. (U) Special nutrient mixtures were used to maintain the viability of cells cultivated in suspension. Nutrient media were supplemented by the addition of amino acids, vitamins, glucose, lactalbumin hydrolysate, and other ingredients. The composition of Pirt and Thackeray nutrient medium for the growth of rabbit kidney cells was cited as an example of medium used for suspended cell cultures. The constitutents of the medium were:

Ingredient	Mg/liter	Ingredient	Mg/liter
Lactalbumin hydrolysate	5000	Hypoxanthine	10.0
l-glutamine	100	Vitamin B12	1.0
l-glutamic acid	300	NaCl	3810
dl-methionine	100	KCl	351
l-arginine hydrochloride	250	$CaCl_2$	300
Inositol	.4	$MgCl_2.6H_2O$	200
Biotin	.4	$NaHCO_3$	2500
Choline	1.2	NaH_2PO_4	500
Folic acid	.04	Phenol red	10
Calcium pantothenate	1.2	Glucose	2500
Niacinamide	1.2	Carboxymethyl cellulose	1000
Pyridoxine hydrochloride	.2	Bovine serum (%)	5
Thiamine	2.0	Neomycin units/liter	100,000
Riboflavin	.2		
Demineralized water (ml) Up to 1000			

d. (U) To eliminate cell aggregation in suspended cultures, methyl cellulose, darvan, "pluronik," bactopeptone, and polysulfonic acid were added. Introduction of these components increased the yield of viable cells. Other ingredients, such as insulin, protamine sulfate, and aspergillin-o stimulated the multiplication of inoculated cells.

e. (U) A semiautomatic system for propagation of tissue cells was described by L. N. Mishin, Institute of Virology imeni Ivanovskiy (see figure 2). The concentration of air or CO_2 in a gas mixture was automatically adjusted to maintain a preset level of CO_2 in a sodium bicarbonate-buffered medium. Mixing was provided by a float-type blade mounted inside the culture vessel and driven by a magnetic stirrer. The use of a magnetically driven blade eliminated the need for a shaft seal and reduced contamination problems. The apparatus, operated semi-continuously for several months, maintained good culture conditions. Infectivity studies using VEE virus and chick embryo fibroblast cells showed that the device could be used to propagate viruses. A titer of 2.1×10^9 virus particles per milliliter was obtained at a cell concentration of 2×10^6 cells per milliliter.



UNCLASSIFIED
Figure 2. Tissue culture vessel (U).

f. (U) Work on automated tissue cell culture systems indicates that the Soviets have successfully copied techniques previously reported and have incorporated modifications which contribute to the simplicity and dependability of operation. The method of continuous cell cultivation is well suited to the industrial production of cell cultures, antigens, viruses, and nucleic acids in mass quantities. The method is more advantageous than ordinary systems for producing viruses and may make it possible to obtain large concentrations of viruses for the solution of many theoretical and practical problems. In addition, the cultivation of TBE, VEE, and adenoviruses shows much promise.

(b)(1)

Section IV (C)

TISSUE CULTURE IN VIROLOGY

(b)(1)

(b)(1)

(b)(1)

(b)(1)

(b)(1)

3. (U) Diagnosis and Detection of Viruses

a. The application of tissue cell culture techniques for the diagnosis and detection of viruses has been studied extensively by Dr. S. Ya. Gaydamovich's group at the Institute of Virology imeni Ivanovskiy. Diagnosticums for the complement fixation reaction and for inhibition of hemagglutination with TBE, VEE, WEE, and Japanese B encephalitis have been prepared in tissue cells. In addition, a neutralization reaction based on the titration of excess hemagglutinins of TBE and Japanese B encephalitis has been used successfully.

b. The fluorescent antibody staining technique (FAST) has been applied to the detection of arboviruses in tissue cultures. A method of contrasting nonspecific proteins by using rhodamine dyes with the specific fluorescence of arboviruses has shown greater reliability and specificity than conventional methods for the detection of viruses. R. M. Gol'din, Military Medical Academy imeni Kirov, found that the addition of red fluorescing rhodamine dyes was quite effective in suppressing nonspecific fluorescence. Pronounced contrasting was obtained by staining nonspecific proteins with sulforhodamine B. Although the background was stained red, the coloring did not suppress the bright green specific fluorescence of the viruses.

(b)(1)

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Section V (A)

TRENDS IN TISSUE CULTURE TECHNIQUES

1. (C) Past

(b)(1)

2. (U) Present

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3. (U) Future

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FSTC-CS-03-7A-68-INT
August 1969

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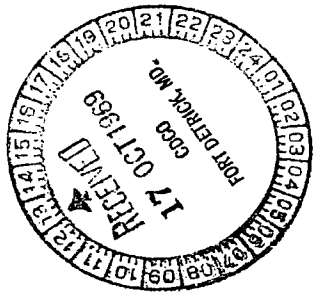

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TISSUE CULTURE TECHNOLOGY (BW-RELATED): USSR (U)

FSTC-CS-03-7-68-INT

DIA TASK T67-03-6

July 1968

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(b)(3):10 U.S.C 424 DIA

ST-S-8-4334

~~CONFIDENTIAL~~ ~~SECRET~~

[redacted]

PREFACE

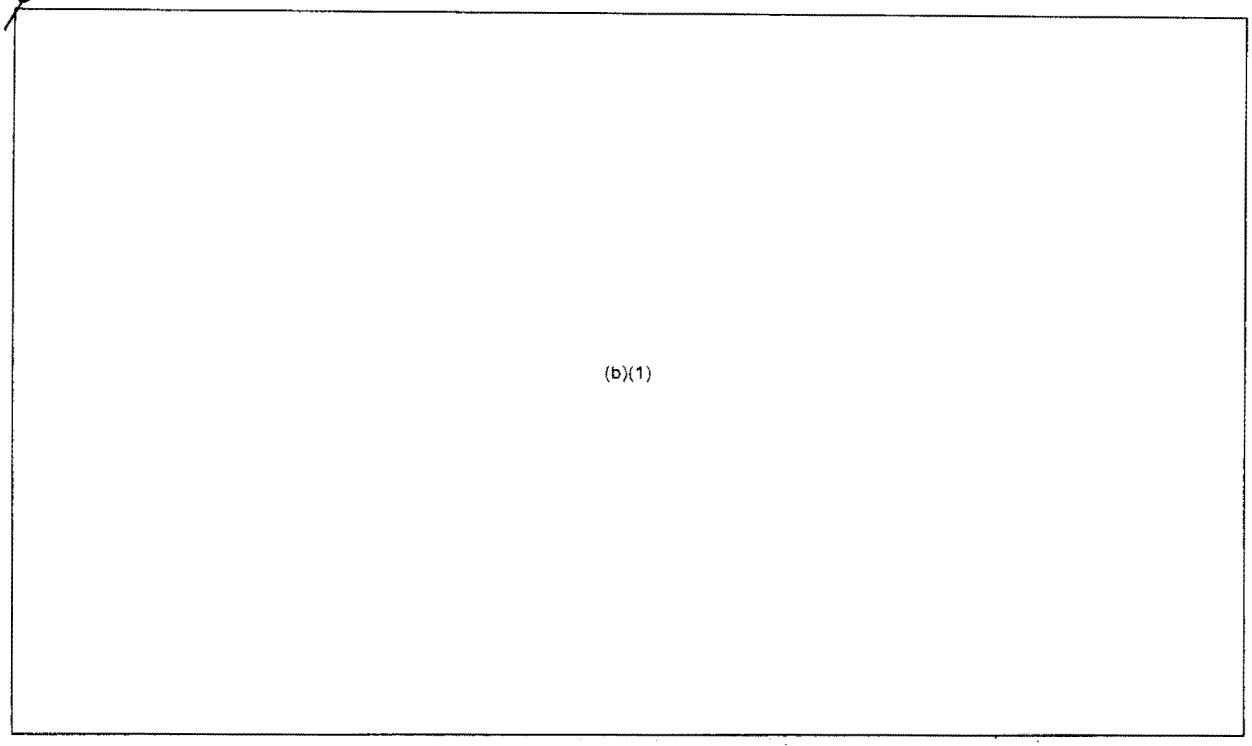
(b)(1)

(U) Although the cutoff date for information in this document is March 1968, major updatings were made to the date of final approval for printing.

(U) This study has been prepared with the editorial assistance of (b)(6) (b)(6)

(U) Comments concerning the study may be forwarded to the Commanding Officer, Attn: AMXST-AB, US Army Foreign Science and Technology Center, Munitions Building, Washington, D. C. 20315.

TABLE OF CONTENTS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FSTC-CS-03-7-68-INT
Original

Section I (C).

TISSUE CELL CULTURE APPLICATIONS

1. (C) General

(b)(1)

(b)(1)

(b)(1)

Section II (S).

TISSUE CULTURE TECHNIQUES

1. (C) Tissue Culture Media

a. (U) Soviet scientists have explored the growth of cells isolated from many human and animal sources in different media and under different growth conditions. Through extensive literature surveys and applied research, they have determined that tissue cells demand a minimum of 12 amino acids, eight vitamins, six inorganic ions, glucose, and serum for growth in vitro. These basic-medium components are shown in table I.

Table I. Minimum Nutritive Requirements for Cells in Tissue Cultures (U)

Amino acids	Carbohydrates	Vitamins and factors	Ions	Protein
Leucine -------	Glucose[1] --	Choline -------	Sodium -----	Serum
Isoleucine -----	----------	Folic acid ----	Potassium --	------
Lysine -------	----------	Pantothenate --	Calcium ----	------
Methionine ----	----------	Pyridoxol -----	Magnesium --	------
Phenylalanine --	----------	Riboflavin ----	Chlorides ---	------
Tryptophan ---	----------	Thiamine -----	Phosphates --	------
Threonine ----	----------	Inositol ------	----------	------
Valine -------	----------	Nicotinamide --	----------	------
Arginine -----	----------	----------	----------	------
Tyrosine -------	----------	----------	----------	------
Histidine ------	----------	----------	----------	------
Glutamine -----	----------	----------	----------	------
Cystine[2]	----------	----------	----------	------
Glycine[3] -------	----------	----------	----------	------

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[1] Fructose, mannose, galactose, etc, also can be used.
[2] Not needed in presence of restoring inorganic serum compounds in the medium.
[3] Needed for primary cultures of cells of the monkey kidney.

b. (U) The addition of supplementary ingredients to the basal medium stimulated the multiplication of cells at an optimum pH range between 7.2 and 7.4. A number of synthetic media, including medium No. 199 and Eagle's and Earle's media, were explored by (b)(6) Institute of Epidemiology and Microbiology imeni Gamaleya, Moscow, and (b)(6) Moscow Scientific Research Institute for Virus Preparations (MNIIVP). Medium No. 199 with some modifications (table II), used extensively in Soviet laboratories, is prepared in a single-strength and a tenfold concentrate at the MNIIVP and distributed to the using laboratories. Eagle's medium, trypsin, balanced salt solution, serum, and other tissue culture reagents also are produced. Because of the known composition, the synthetic media are important for the study of viral infectivity and the cell-virus interrelationships, for biosynthesis within the cell, and for the preparation of vaccines.

Table II. The No. 199 Medium (U).

Composition	Mg/liter
Inorganic salts:	
Sodium chloride (NaCl)	8000
Potassium chloride (KCl)	400
Calcium chloride ($CaCl_2$)	1400
Magnesium sulfate ($MgSO_4.7H_2O$)	200
Sodium hydrophosphate ($Na_2HPO_4.2H_2O$)	60
Potassium hydrophosphate (KH_2PO_4)	60
Sodium bicarbonate ($NaHCO_3$)	1500
Iron nitrate ($Fe(NO_3)_3.9H_2O$)	100
Amino acids:	
l-arginine monohydrochloride	70
l-histidine monohydrochloride	20
l-lysine monohydrochloride	70
dl-tryptophan	20
dl-phenylalanine	50
dl-methionine	30
dl-serine	50
dl-threonine	60
dl-leucine	120
dl-isoleucine	40
dl-valine	50

Table II. The No. 199 Medium (U). (Continued)

Composition	Mg/liter
Amino acids: (continued)	
dl-glutamic acid monohydrate	150
dl-asparaginic acid	60
dl-alpha-alanine	50
l proline	40
oxy-l-proline	10
glycine	50
l-histidine	20
l-tyrosine	40
l-cysteine hydrochloride	.1
Vitamins:	
Nicotinic acid (niacin)	.025
Nicotinamide (niacinamide)	.025
Pyridoxine hydrochloride	.025
Thiamine hydrochloride	.010
Pyridoxol hydrochloride	.025
Riboflavin	.010
Calcium pantothenate	.010
L-inositol	.050
P-aminobenzoic acid	.050
Choline chloride	.500
D-biotin	.01
Folic acid (crystalline)	.01
Calciferol (vitamin D_2)	.1
Alpha-tocopherol sodium phosphate (vitamin E)	.01
Menadione (2-methyl-1, 4-naphthoquinone) (vitamin K_3)	.01
Crystalline vitamin A	.1
Ascorbic acid (vitamin C)	.05
Lipoid sources:	
Tween 80	20
Cholesterin	.2

Table II. The No. 199 Medium (U). (Continued)

Composition	Mg/liter
Nuclenic acid components:	
Adenine sulfate	10
Xanthine	.3
Hypoxanthine	.3
Thymine	.3
Uracil	.3
Guanine hydrochloride	.3
Adenosine triphosphate sodium	10.0
Adenylic acid	.2
D-ribose	.5
D-desoxyribose	.5
Other substances:	
Sodium acetate	50
l-glutathione	.05
Glucose	1000
l-glutamine	100
Phenol red	20
Ethyl alcohol	16
Antibiotics:	
Penicillin (sodium salt) (units)	100,000
Streptomycin (chlor-calcium complex) (micrograms)	100,000

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NOTE: Method of preparation--Preparation of the No. 199 medium is carried out in three stages:
(a) Preparation of the basic concentrated solutions of the number of ingredients.
(b) Preparation of a tenfold concentrate of the medium.
(c) Preparation of the operating dilution of medium No. 199.
For the preparation of all solutions, bisdistilled water, which is obtained in glass apparatuses, is used.

c. (U) Soviet researchers have explored the nutritional value of the hydrolysates of natural products: casein, lactalbumin, and whole-blood protein (Leibenson), which have been labeled "amino-peptide-2." Amino-peptide-2 is manufactured at the Kirov Factory of Medicinal Preparations of the Leningrad Meat Combine. A medium prepared from meat by the same factory has been reported. Supplemented with additional ingredients, these proteins provide high cell proliferation. The composition of several complex media used by the Soviet investigators is shown in table III.

Table III. Comparative Composition of Media With Fermentative Protein Hydrolysates (gm/liter) (U)

Ingredients	Lactalbumin hydrolysate	Lepine's medium	Leibenson's medium	Levrov's medium	Medium of Smirnova and Ermakova
Lactalbumin hydrolysate-	5.0	---	---	---	---
Casein hydrolysate -----	---	0.5	---	---	1.1
Amino-peptide-2 (ml) ---	---	---	300	50-70	---
Serum (ml) ----------	20	25-50	---	100	25
Glutamine ----------	---	0.1	---	---	.1
Cysteine hydrochloride -	---	.01	---	---	.02
Niacin ----------	---	.001	---	1.0	---
Pyridoxine ----------	---	.001	---	1.0	---
Thiamine ----------	---	.001	---	1.0	---
Riboflavin ----------	---	.0001	---	.1	---
Calcium pantothenate ---	---	.001	---	1.0	---
Para-aminobenzoic acid -	---	.001	---	---	---
Choline ----------	---	.001	---	.01	---
Biotin ----------	---	.001	---	---	---
Folic acid ----------	---	.001	---	.01	---
Alpha-tocopherol -------	---	.001	---	---	0.001
Ascorbic acid ----------	---	.025	---	---	.1
Sodium nucleinic acid --	---	---	---	.02	---
Adenosine triphosphoric acid (1%) (ml)	---	---	5	---	---
Earle's solution (ml) --	---	1000	---	---	1000
Hank's solution (ml) ---	1000	---	700	830-850	---

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2. (c) Tissue Culture Methods

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3. (5) Cell Lines and Cultivation

a. (U) Soviet scientists have employed many of the established cell lines and have initiated many other cell cultures for virus investigations. Some of the cell lines and tissue sources are shown below:

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b. (U) The classic methods, or variations thereof, were used to obtain, for cultivation, dispersed cells from human and animal tissues. Cell suspensions were counted in the Garyaeva chamber before being planted in Rous or Pavitsky bottles. After cells grew on the glass, the standard procedures for maintaining the established cell lines were followed.

c. (U) In recent years, the Soviets have been considerably interested in the cultivation and use of human diploid cells. (b)(6) MNIIVP, isolated 13 strains of diploid cells from human embryo lung tissue and determined the stability of the diploid cells in various media. A long-term study of one line (L-10) showed that the best results were obtained with Eagle's medium No. IX, which contained 10% bovine serum. The diploid complement of chromosomes was preserved, and the line was devoid of oncogenic (tumor-producing) effects. The L-10 cell line was also sensitive to measles, tick-borne encephalitis (TBE), and adenoviruses.

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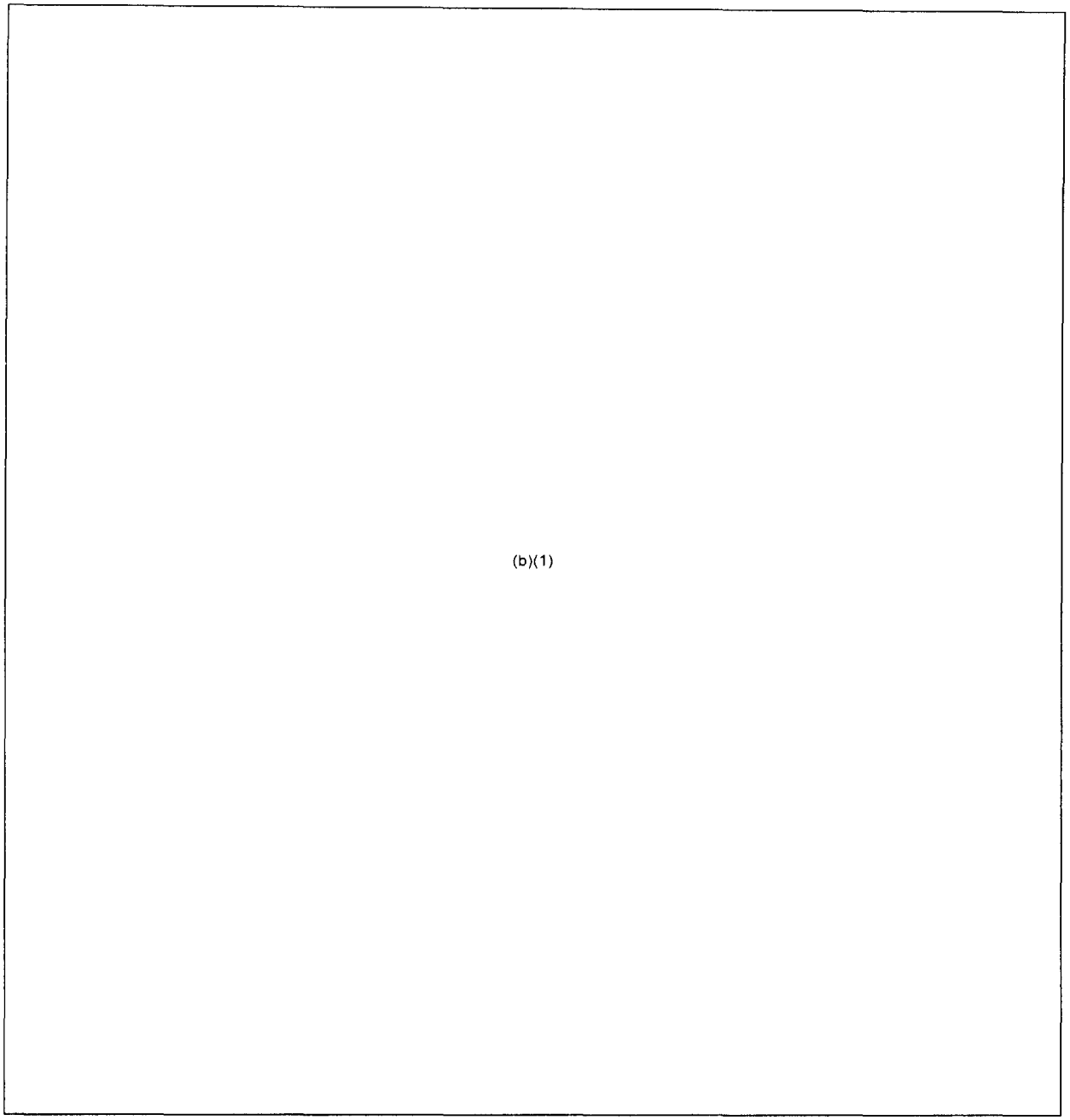

(b)(1)

g. (U) The intensive interest shown by Soviet researchers and the wide distribution of work with human diploid cells indicate a concentrated effort to thoroughly explore the use of diploid cells in virology.

Section III (C)

MASS PRODUCTION METHODS

1. (U) Monolayer Cultures

Soviet researchers have employed monolayer tissue cell cultures to produce vaccines, and the method could be used to grow cells for the production of viral agents. The system is impractical, however, because the contents of large numbers of flasks must be pooled, and the procedure is cumbersome, time consuming, and laden with contamination problems.

2. (U) Roller-Bottle Method

(b)(1)

b. (U) Later, (b)(6) Institute of Virology imeni Ivanovskiy, used a similar system to produce rabies virus in Syrian hamster kidney fibroblasts (BHK-21 cell line). Bottles with capacities ranging from 1 to 20 liters were used, with the volume of medium being about one-twentieth that of the bottle capacity. Inocula were added to give an initial concentration of 4 to 5 X 10^5 cells per milliliter. A special rack with different-sized rollers was designed to rotate bottles, regardless of size, at 0.7 to 0.8 rpm. Cells began to attach to the glass surface 2 hours after inoculation. Most of the cells were attached in 12 to 18 hours, and a complete monolayer was formed after 24 to 48 hours.

c. (U) Primary infection of the cells was accomplished after 24 to 48 hours of cultivation by introducing a 10% suspension of brain cells infected with rabies virus at one-fifth the volume of the medium. Subsequent infections were made by subculturing methods or by mixing infected cells with uninfected cells in fresh medium. Experimental results showed that:

(1) The total number of tissue cells in roller-bottle cultures was three times that obtained in stationary cultures.

(2) The multiplicity of infection was truer in roller bottles than in monolayers because better contact was obtained between cells and virus particles.

(3) During the cultivation of fixed rabies virus in roller bottles by sub-culturing and cell mixing, the virus could be maintained up to the 30th passage as compared with 7 or 8 passages in monolayer cultures.

(4) Maximum titers of $10^{8.8}$ mouse intracranial median lethal dose ($MICLD_{50}$) per ml were obtained on the third day in roller bottles as compared with maximum titers of $10^{8.43}$ $MICLD_{50}$ per ml on the fifth day in stationary cultures.

(5) Cytoplasmic inclusions and CPE's occurred in roller-bottle cultures, and a more regular and more extensive accumulation of specific antigen of rabies virus was detected.

(b)(1)

3. (C) Suspension Cell Cultures

(b)(1)

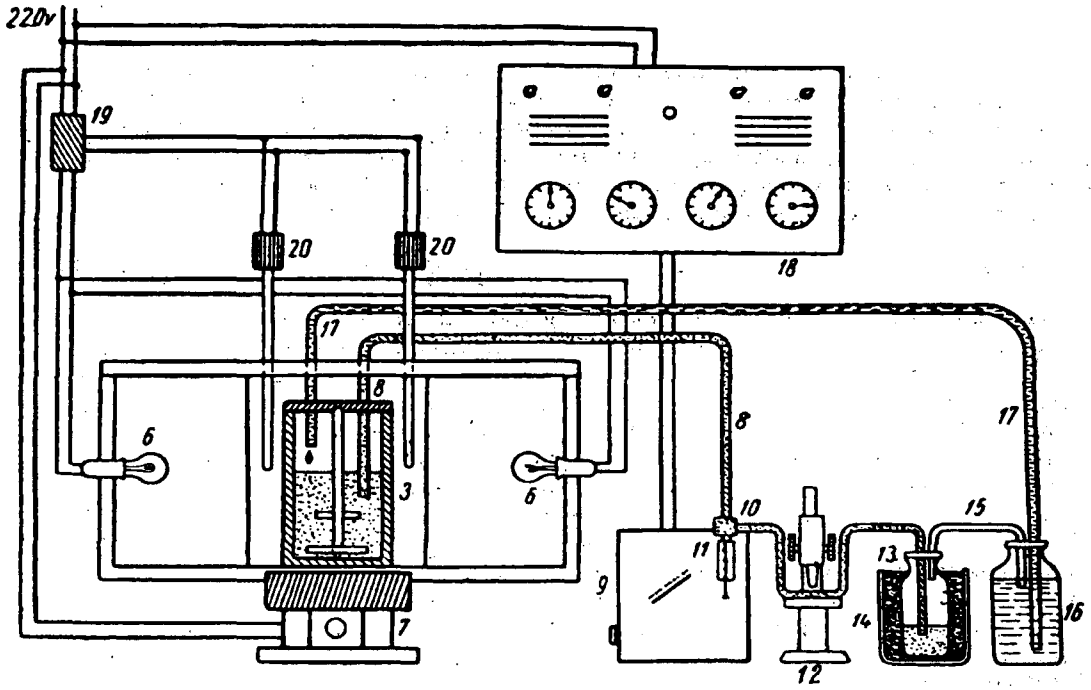

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Diagram of design of a simple hemostat for continuous cultivation of tissue cultures (author's modification) (U)

1 and 2 (missing).
3, plastic reactor
4 and 5 (missing).
6, heater
7, magnetic agitator.
8, polyvinylchloride discharge tube.
9, pouring machine or peristaltic pump.
10, valve adapter.
11, injector.
12, device for microscopic inspection of growing cells.
13, receiving flask.
14, container for ice.
15, connecting pipe.
16, flask with extra nutrient medium.
17, polyvinylchloride feeding tube.
18, electronic device regulating feeding of fresh nutrient medium.
19, thermorelay.
20, contact thermometers.

c. (U) Special nutrient mixtures were used to maintain the viability of cells cultivated in suspension. Nutrient media were supplemented by the addition of amino acids, vitamins, glucose, lactalbumin hydrolysate, and other ingredients. The composition of Pirt and Thackeray nutrient medium for the growth of rabbit kidney cells was cited as an example of medium used for suspended cell cultures. The constitutents of the medium were:

Ingredient	Mg/liter	Ingredient	Mg/liter
Lactalbumin hydrolysate	5000	Hypoxanthine	10.0
l-glutamine	100	Vitamin B_{12}	1.0
l-glutamic acid	300	NaCl	3810
dl-methionine	100	KCl	351
l-arginine hydrochloride	250	$CaCl_2$	300
Inositol	.4	$MgCl_2.6H_2O$	200
Biotin	.4	$NaHCO_3$	2500
Choline	1.2	NaH_2PO_4	500
Folic acid	.04	Phenol red	10
Calcium pantothenate	1.2	Glucose	2500
Niacinamide	1.2	Carboxymethyl cellulose	1000
Pyridoxine hydrochloride	.2	Bovine serum (%)	5
Thiamine	2.0	Neomycin units/liter	100,000
Riboflavin	.2		
Demineralized water (ml)	Up to 1000		

d. (U) To eliminate cell aggregation in suspended cultures, methyl cellulose, darvan, "pluronik," bactopeptone, and polysulfonic acid were added. Introduction of these components increased the yield of viable cells. Other ingredients, such as insulin, protamine sulfate, and aspergillin-o stimulated the multiplication of inoculated cells.

e. (U) The method of continuous cell cultivation is well suited to the industrial production of cell cultures, antigens, viruses, and nucleic acids in mass quantities. The method is more advantageous than ordinary systems for producing viruses and may make it possible to obtain large concentrations of viruses for the solution of many theoretical and practical problems. In addition, the cultivation of TBE, VEE, and adenoviruses shows much promise.

(b)(1)

Section IV (S)

TISSUE CULTURE IN VIROLOGY

1. (S) Viral Reproduction

(b)(1)

2. (S) Plaque Formation

(b)(1)

(b)(1)

3. (U) Diagnosis and Detection of Viruses

a. The application of tissue cell culture techniques for the diagnosis and detection of viruses has been studied extensively by Dr. S. Ya. Gaydamovich's group at the Institute of Virology imeni Ivanovskiy. Diagnosticums for the complement fixation reaction and for inhibition of hemagglutination with TBE, VEE, WEE, and Japanese B encephalitis have been prepared in tissue cells. In addition, a neutralization reaction based on the titration of excess hemagglutinins of TBE and Japanese B encephalitis has been used successfully.

b. The fluorescent antibody staining technique (FAST) has been applied to the detection of arboviruses in tissue cultures. A method of contrasting nonspecific proteins by using rhodamine dyes with the specific fluorescence of arboviruses has shown greater reliability and specificity than conventional methods for the detection of viruses. (b)(6) Military Medical Academy imeni Kirov, found that the addition of red fluorescing rhodamine dyes was quite effective in suppressing nonspecific fluorescence. Pronounced contrasting was obtained by staining nonspecific proteins with sulforhodamine B. Although the background was stained red, the coloring did not suppress the bright green specific fluorescence of the viruses.

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(b)(1)

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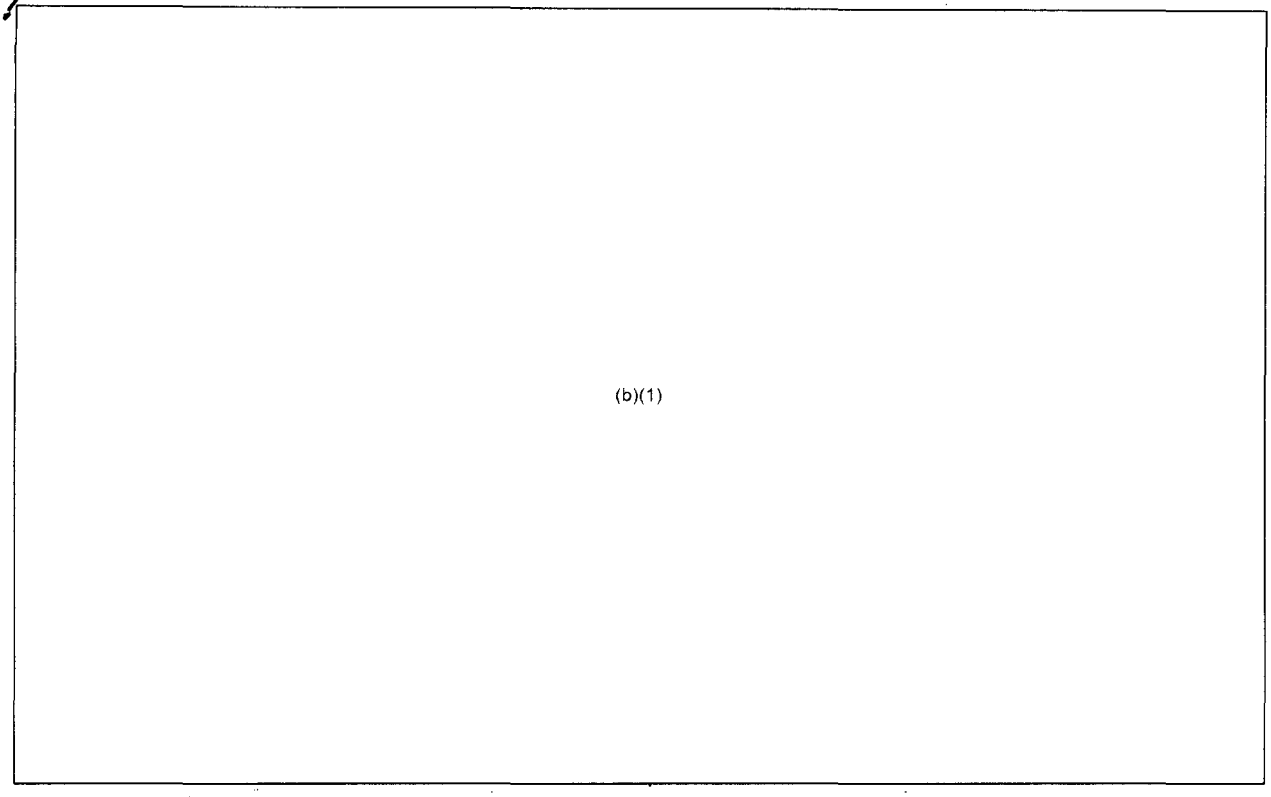
5. (U) Interferon

a. Andzhaparidze studied the interference between TBE and WEE in cultures of chick fibroblasts, human diploid cells, HEP-2, HeLa, and transplantable non-malignant cells. The interference phenomenon varied in the IX-10 strains. The interference activity of viruses that were previously adapted to a cell culture increased. The degree of interference was the same for cultures cultivated at 37°C, but was somewhat lower at 29° C.

b. At the Institute of Poliomyelitis and Virus Encephalitis, Shalunova studied the interference of Japanese B encephalitis with poliovirus in human embryo skin cells, and with the viruses of Newcastle disease and WEE in chick embryo cell cultures. Interference of varying degree was noted after 72 hours in cells infected with Japanese B encephalitis. The highest sensitivity was found in chick embryo cells tested with WEE since interference activity titers were close to the virus titers obtained in mice.

6. (S) Vaccine Preparation

(b)(1)



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Section V ~~(S)~~

TRENDS IN TISSUE CULTURE TECHNIQUES

1. ~~(S)~~ Past

(b)(1)

2. ~~(S)~~ Present

(b)(1)

3. ~~(S)~~ Future

(b)(1)

(b)(1)

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

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Page(s) 1298

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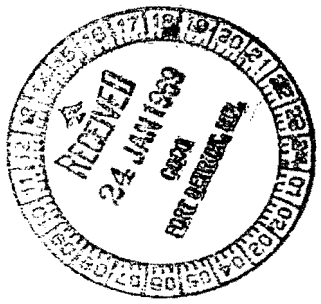

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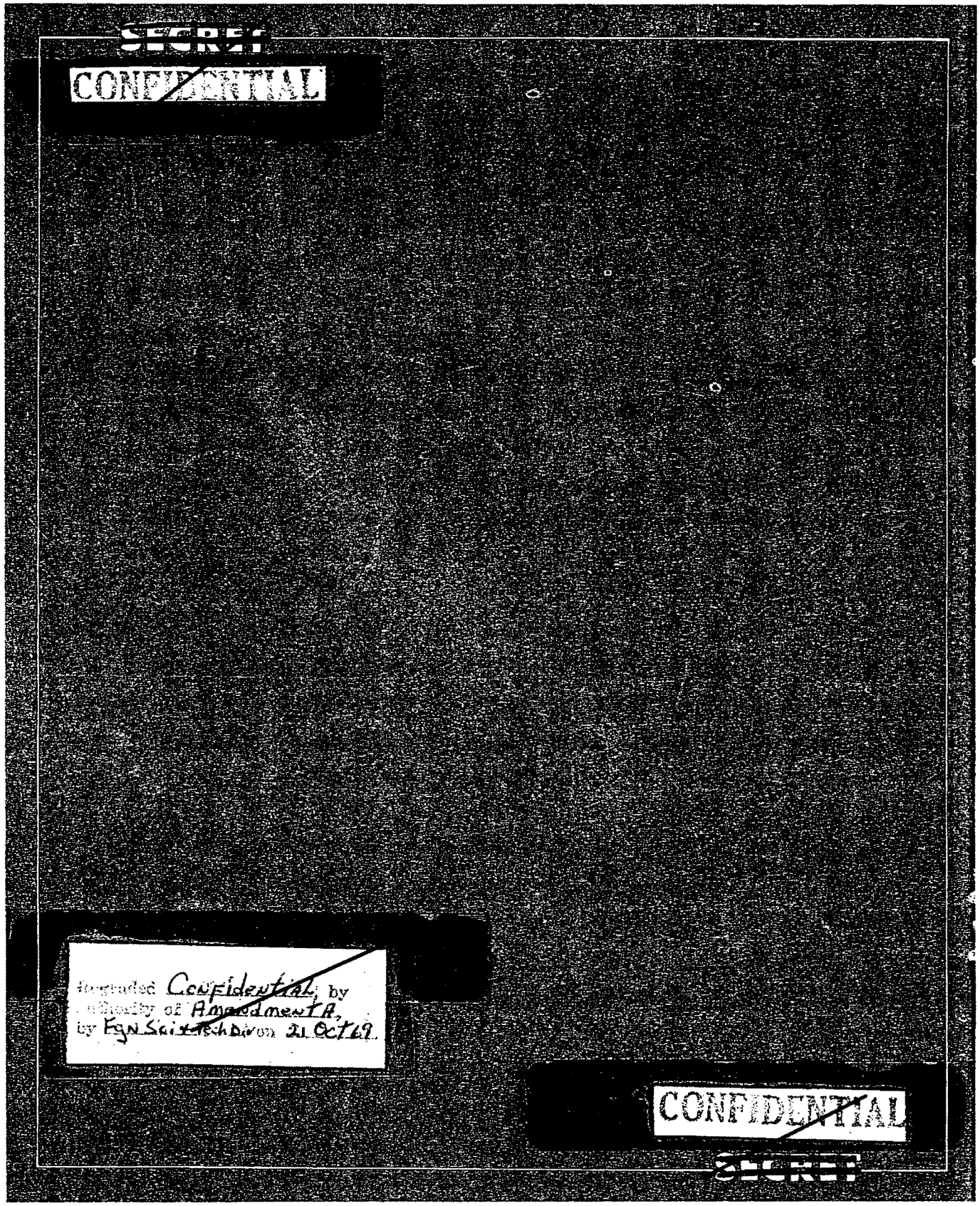
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Requested date:	23-October-2008
Released date:	10-June-2013
Posted date:	13-August-2013
Source of document:	Commander US Army Intelligence & Security Command Freedom of Information/Privacy Office ATTN: IAMG-C-FOI 4552 Pike Road Fort George G. Meade, MD 20755-5995 Fax: (301) 677-2956 Email: FOIA/Privacy Office Online FOIA Request Form
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FREEDOM OF INFORMATION/PRIVACY OFFICE
FORT GEORGE G. MEADE, MARYLAND 20755-5995

REPLY TO
ATTENTION OF:

Freedom of Information/
Privacy Office

10 JUN 2013

This is in further response to your Freedom of Information Act (FOIA) request of October 23, 2008, and supplements our electronic message of May 12, 2010.

Coordination has been completed with another element of our command and other government agencies and records returned to this office for our review and direct response to you. We have reviewed the records and determined the records are partially releaseable to you. A copy of the records are enclosed for your use.

We have completed a mandatory declassification review in accordance with Executive Order (EO) 13526. As a result of our review information has been sanitized and 4 pages have been withheld in their entirety as the information is currently and properly classified TOP SECRET, SECRET and CONFIDENTIAL according to Sections 1.2(a)(1), 1.2(a)(2), 1.2(a)(3) and 1.4(c) of EO 13526. This information is exempt from the public disclosure provisions of the FOIA pursuant to Title 5 U.S. Code 552 (b)(1). It is not possible to reasonably segregate meaningful portions of the withheld pages for release. The records are enclosed for your use. A brief explanation of the applicable sections follows:

Section 1.2(a)(1) of EO 13526, provides that information shall be classified TOP SECRET if its unauthorized disclosure reasonably could be expected to cause exceptionally grave damage to the national security.

Section 1.2(a)(2) of EO 13526, provides that information shall be classified SECRET if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

Section 1.2(a)(3) of EO 13526, provides that information shall be classified CONFIDENTIAL if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

Section 1.4(c) of EO 13526, provides that information pertaining to intelligence activities, intelligence sources or methods, and cryptologic information shall be considered for classification protection.

In addition, information has been sanitized from the records and 4 pages have been withheld in their entirety as the release of the information would reveal sensitive intelligence methods. This information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(7)(E) of the FOIA. The significant and legitimate governmental purpose to be served by withholding is that a viable and effective intelligence investigative capability is dependent upon protection of sensitive investigative methodologies. It is not possible to reasonably segregate meaningful portions of the withheld pages for release.

The withholding of the information described above is a partial denial of your request. This denial is made on behalf of Major General Stephen G. Fogarty, the Commanding General, U.S. Army Intelligence and Security Command, who is the Initial Denial Authority for Army intelligence investigative and security records under the FOIA. You have the right to appeal this decision to the Secretary of the Army. Your appeal must be postmarked no later than 60 calendar days from the date of this letter. After the 60-day period, the case may be considered closed; however, such closure does not preclude you from filing litigation in the courts. You should state the basis of your disagreement with the response and provide justification for a reconsideration of the denial. An appeal may not serve as a request for additional or new information. An appeal may only address information denied in this response. Your appeal is to be made to this office, for forwarding, as appropriate to the Secretary of the Army, Office of the General Counsel.

Coordination has been completed and we have been informed by the Central Intelligence Agency (CIA) that information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(1) and (b)(3) of the FOIA.

The withholding of the information by the CIA constitutes a denial of your request and you have the right to appeal this decision to the Agency Release Panel within 45 days from the date of this letter. If you decide to file an appeal, it should be forwarded to this office and we will coordinate with the CIA on your behalf. Please cite CIA #F-2010-01292/Army #57F-09 assigned to your request so that it may be easily identified.

Coordination has been completed and we have been informed by the Defense Intelligence Agency (DIA) that their information is exempt from public disclosure pursuant to Title 5 U.S. Code § 552 (b)(1), (b)(2) (b)(3) and (b)(4) of the Freedom of Information Act and Executive Order (EO) 13,526 § 1.4 (c) (d) and (h). The statute invoked under Title 5 U.S. Code 552 (b)(3) is 10 U.S.C. §424, which allows for the protection of organizational and personnel information for DIA.

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You have received all Army intelligence investigative records pertaining to this request.

There are no assessable FOIA fees.

If you have any questions regarding this action, feel free to contact this office at 1-866-548-5651, or email the INSCOM FOIA office at: INSCOM_FOIA_ServiceCenter@mi.army.mil and refer to case #57F-09.

Sincerely,

Brad S. Dorris
Director
Freedom of Information/Privacy Office
Investigative Records Repository

Enclosure

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October 1972

ST-CS-03-148A-72

Publication No.
ST-CS-03-148-72
Amendment A

US ARMY MATERIEL COMMAND
FOREIGN SCIENCE AND TECHNOLOGY CENTER
220 7th St., N.E., Charlottesville, Va. 22901

BIOLOGICAL WARFARE CAPABILITY--ASIAN COMMUNIST COUNTRIES (U)

Publication No. ST-CS-03-148-73, March 1972, is amended as follows:

1. The old pages listed below are to be removed and destroyed in accordance with existing security regulations and new pages are substituted therefor, or are added.

Remove old pages	Insert new pages
---	0.i and 0.ii
iii through xiv	iii through xviii
21 and 22	21 through 22.2
27 and 28	27 through 28.2
---	48.1 through 48.4
53 through 56	53 through 56.2
63 and 64	63 through 64.2
67 and 68	67 through 68.2
---	114.1 and 114.2
---	119 and 120

2. Make pen and ink changes as listed on the following pages.

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Schedule of Executive Order 11652
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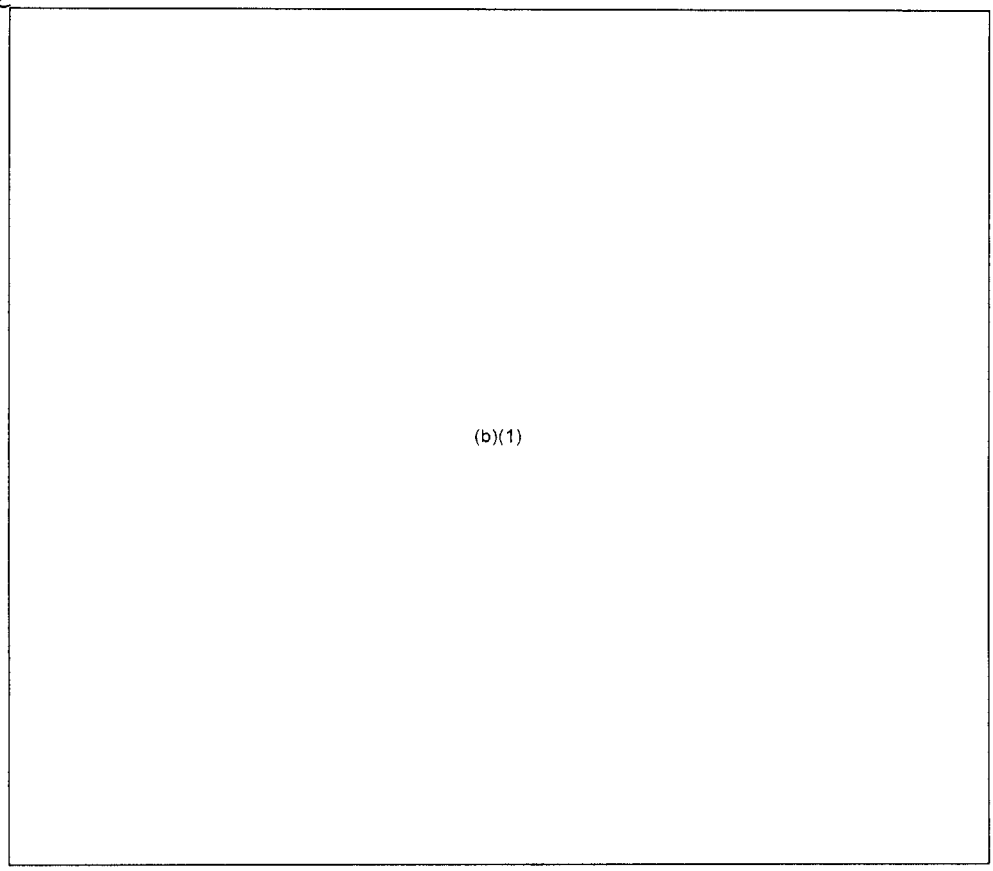
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ST-CS-03-148A-72
October 1972

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ERRATA

Publication No.
ST-CS-03-148A-72

US ARMY MATERIEL COMMAND
FOREIGN SCIENCE AND TECHNOLOGY CENTER
Charlottesville, Va. 22901

BIOLOGICAL WARFARE CAPABILITY-
ASIAN COMMUNIST COUNTRIES (U)

1. Change paragraph 1, "Insert new pages," line 3 of the amendment instructions to read "21 thru 22.2" instead of "21 thru 22.4".

2. Instructions, page 3, line 17: Delete pen-and-ink change beginning "Page 54, para b...".

3. To front cover, title page, Amendment A instruction sheet, and back cover, add: RELEASABLE TO UK, CANADA, AUSTRALIA, AND NEW ZEALAND.

4. To front cover, add: (see first page).

5. To pages 113 and 114.1, add "-Rel to UKCanAusNZ" to Item 2a.

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BIOLOGICAL WARFARE CAPABILITIES ASIAN COMMUNIST COUNTRIES (U)

(b)(6)

ST-CS-03-148-72

DIA Task No. T70-03-11

March 1972

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PREFACE

(U) The purpose of this publication is to assess all information concerning the biological warfare capabilities of the People's Republic of China, North Vietnam, North Korea, and Mongolia. For each of these countries information is included concerning: order of battle for biological warfare; identification and description of biological warfare materiel; production installations and capabilities; stockpiles and storage facilities; doctrine and procedures which would govern the use of biological warfare; defensive measures to be taken in the event biological warfare was initiated; and applicable research, development, and testing programs.

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(U) Constructive criticism, comments, and suggested changes are solicited and should be forwarded to the Defense Intelligence Agency, Washington, D. C. 20301, ATTN: DT-1A.

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LIST OF EFFECTIVE PAGES

SUBJECT MATTER	PAGE NUMBERS	DATE
Title Page	None	March 1972
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List of Tables	xiii (Reverse Blank)	October 1972
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SUBJECT MATTER	PAGE NUMBERS	DATE
DD Form 1473 ----------	113 and 114	Original
	114.1 and 114.2	October 1972
Distribution List ----------	115 thru 117 (Reverse Blank)	Original
	119 and 120	October 1972

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RECORD OF CHANGES

CHANGE NUMBER	DATE OF CHANGE	DATE ENTERED	SIGNATURE, RANK/RATE AND ORGANIZATION OF INDIVIDUAL ENTERING CHANGE
amend. A Errata	1 Oct 72 MH	3 JAN 73 3 JAN 73	(b)(6)

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Section I.

COMMUNIST CHINA

A. INTRODUCTION

1. (C) Historical Background

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3. (C) Geographical and Political Factors

a. (U) Communist China is the third largest country in the world, occupying about 3.7 million square miles, and the population comprises about one-fifth that of the world. To the North and West an extensive boundary is shared with the Soviet Union, a boundary which separates the two most powerful communist countries. To the South, China borders on several weak, unstable countries, one being North Vietnam. She has used North Vietnam as a base for Communist operations against neighboring countries. China also shares common borders with North Korea, Mongolia, Afghanistan, India, Nepal, Bhutan, Burma, and Laos. The mainland is within 2500 nautical miles of every major target in Asia as well as European USSR. Two-thirds of China's area is mountainous or desert-like, and ninety percent of the population live in one-sixth of the country, primarily in the fertile plains and deltas of the east.[8]

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4. (C) Military Organization

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5. (C) Military Equipment

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6. (C) Military Training

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Figure 1. CBR reconnaissance troops in light protective clothing (U).

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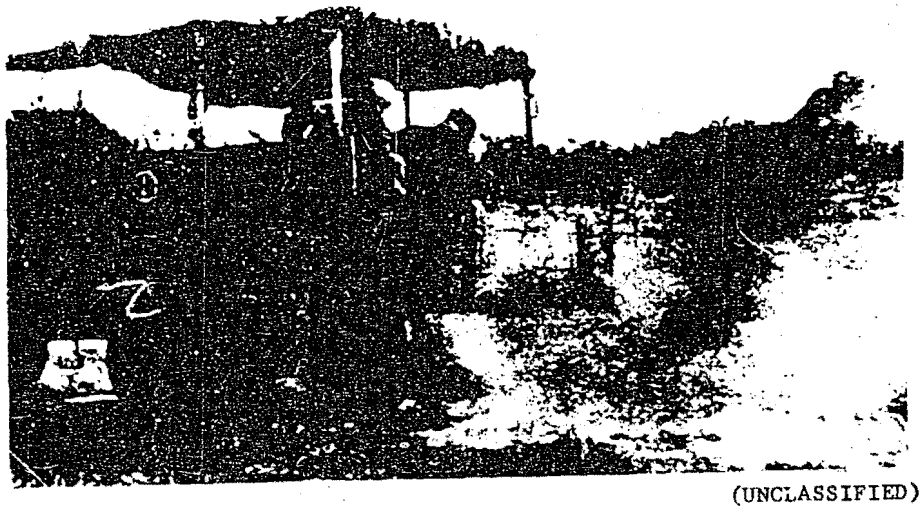

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Figure 2. Vehicle ground decontamination exercises (U).

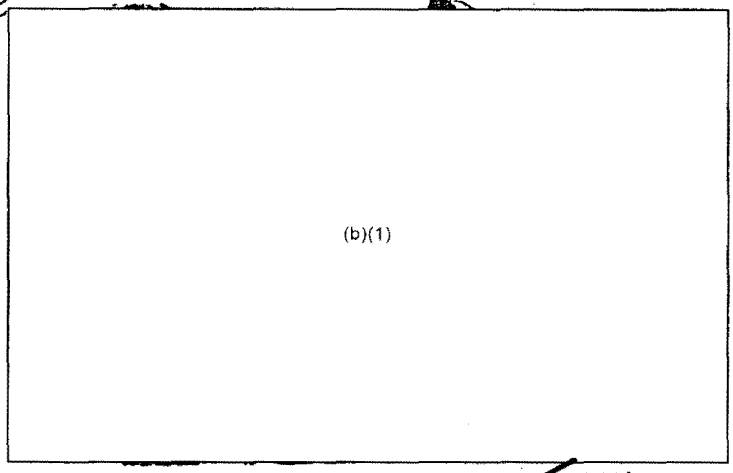

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Figure 3. Troops preparing to ford stream in full protective clothing (U).

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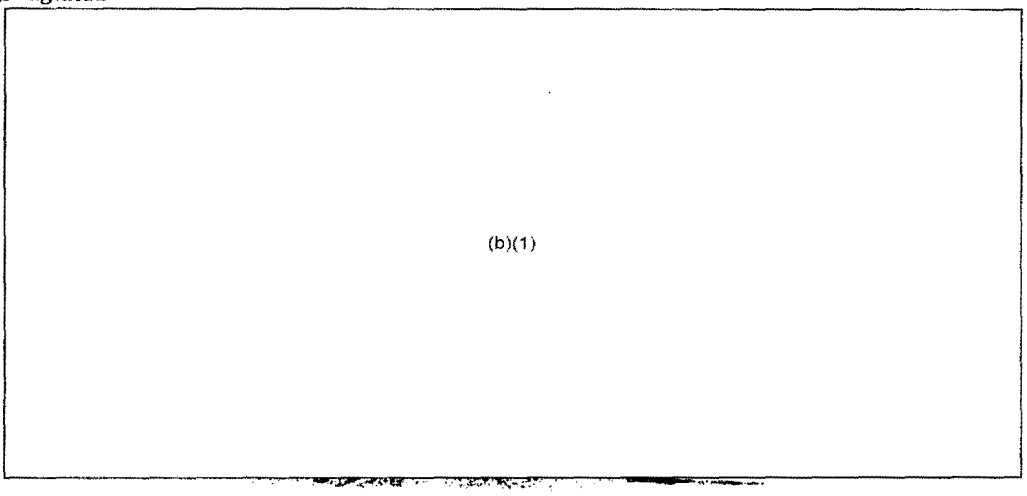

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Figure 4. CW school and research station at Ch'ang-p'ing (U).

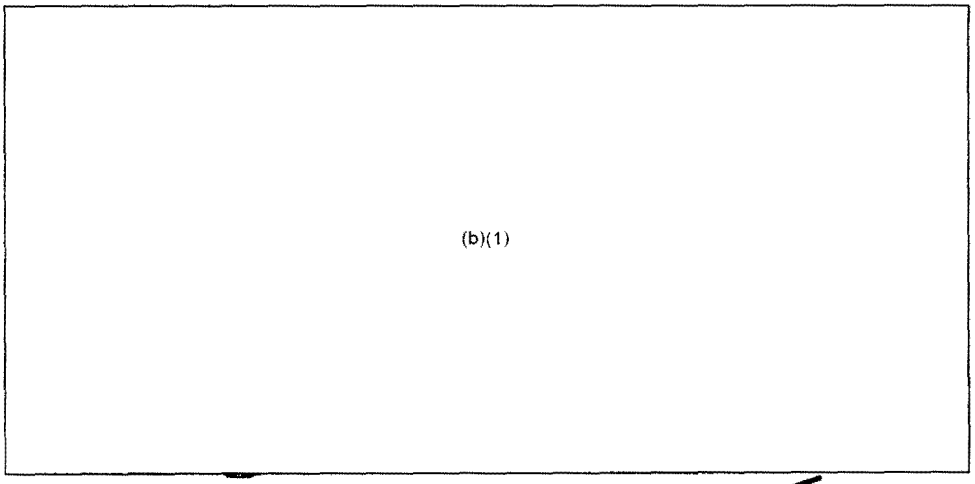

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Figure 5. Decontamination exercise at CW school at Ch'ang-p'ing (U).

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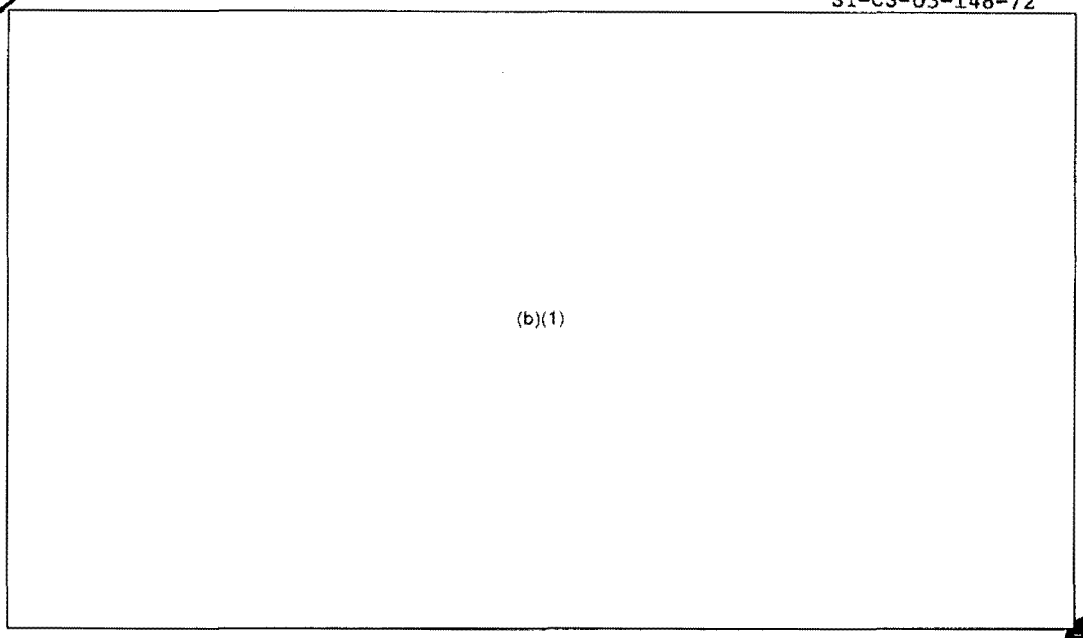

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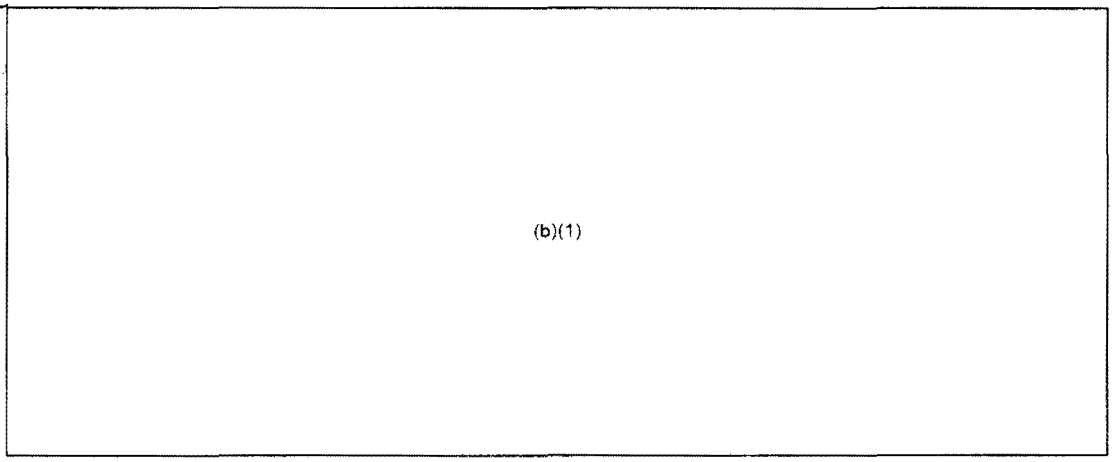
Figure 6. Troops in full protective clothing training with detector kits at CW school (U).



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c. (U) ChiCom pictorial magazines have shown naval personnel operating a one-man back pack decontamination apparatus. Another illustration shows sailors washing down the decks with hoses and scrub brushes. There are no recent reports to indicate what, if any, improvements have been made in equipment for decontamination onboard ships (figs 7, 8, 9).[16]

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Figure 7. Battle training at sea (U).

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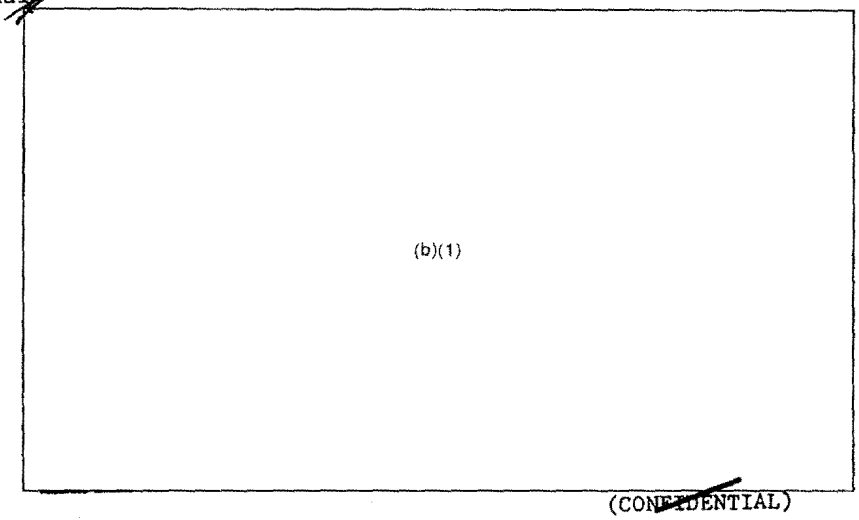

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Figure 8. Decontamination exercise aboard ship (U).

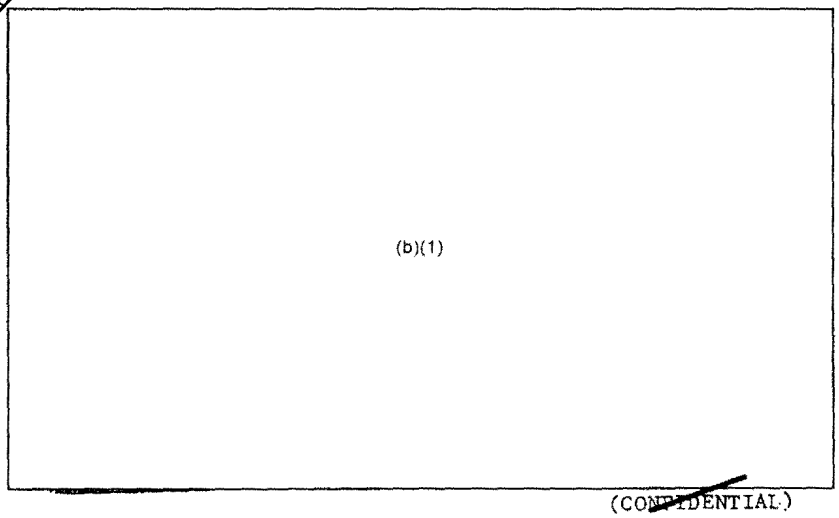

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Figure 9. CBR exercise aboard Chinese ship (U).

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C. POLICY, STRATEGY AND TACTICS REGARDING USE OF BW

8. (C) Policy

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9. (C) Procedures

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D. POLICY, STRATEGY AND TACTICS REGARDING DEFENSE AGAINST BW

10. (C) Policy

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11. (S) Procedures

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12. (C) Agents

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13. (C) Delivery Systems

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d. (U) The Chinese have studied the transovarian transmission of Rickettsia tsutsugamushi by two types of Trombicella deliensis which provides basic information for establishing vector colonies and their subsequent infection for possible use in a vector-agent system.[41] In a 1966 publication Lu Pao-lin urged that extensive studies of insect culture be undertaken in order to remain abreast of foreign developments.[42]

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F. BW MATERIEL (DEFENSIVE)

14. ~~(c)~~ Decontamination

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15. (C) Detection and Identification

a. (U) There is little indication that the Chinese have conducted research to develop means of detecting and identifying biological agents. The results of some related research could be exploited for such a purpose. Tseng Fan-chi of the Wuhan Army General Hospital obtained rapid results in identifying 55 different species of bacteria by their biochemical reactions. The time required to identify bacteria by this technique was 20-24 hours as opposed to 4-5 days by conventional means.[33] An unknown author summarized a method in 1964 for determining the generation time of Bacillus anthracis.[34] The following year Li Liang-shan compared a broth method with the agar method to demonstrate the string-of-pearls reaction for B. anthracis. Details of the test were not given, however, the author claimed that results were identical. Possibly the modified reaction would have contributed to more rapid identification of B. anthracis.[35] Other studies suggestive of rapid identification were published by Chiang Shun-Ch'iu who experimented with incomplete antibodies for the diagnosis of brucellosis[36] and by Yun Chao-Chuan who compared various methods for identifying Brucella.[37]

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16. (C) Medical Protection

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b. (U) Chinese military cadre are inoculated with a combined cholera and typhoid vaccine once a year. Claims have been made that all people of the nation have received vaccination for smallpox, and that the disease has been eradicated. Vaccines or antisera for typhoid, paratyphoid, typhus, diptheria, tetanus, rabies, plague, cholera, yellow fever, and Japanese B encephalitis have been developed, but the scale of use is not known. The use of live vaccines has been exploited in China. Live vaccines for brucellosis, plague, and anthrax are available.[3] Vaccines for the more serious animal diseases, such as, swine plague, hog cholera, rinderpest, and foot-and-mouth disease have been developed. A method of aerosol immunization was introduced into veterinary practice in 1964. The vaccine materiel was sprayed or dusted in a room so that animals were exposed and immunized.[57] There are no known instances concerning immunization of humans by the aerosol route. Continued efforts in aerosol research could have provided means for the mass immunization of the population and of animals in the event biological agents are used.

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G. PRODUCTION FACILITIES

17. (C) Agents and Munitions

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18. (C) Defensive Equipment

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H. BW RESEARCH, DEVELOPMENT, AND TESTING

19. (U) General

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20. (a) Military Facilities (u)

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c. (U) The CPLA Veterinary University of China. The location of this institute and its true military affiliation cannot be verified. It could be part of the China People's University in Peking, or it might be misnamed because of incorrect translation.[74] An investigator, Liu Ching-hua, reportedly associated with the University, has studied the various types of Pasteurella isolated from 11 species of animals and fowl.[75] His observations of morphological, physiological, and biochemical properties indicated that there were no consistent host/bacterial specificities which could be reliably used to classify the 62 types of Pasteurella isolated. In general, although one strain Pasteurella might attack many species of domestic animals and fowl, a single species of animal might be infected by several strains of the bacteria. All strains isolated in nature could give rise to variant types when grown in artificial media. Although this study was apparently conducted to advance veterinary immunology, the basic data concerning susceptibility of animals to this disease and the genetic selection of mutant strains could be applied to other infectious diseases.

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e. (C) The Institute of Zoology, Kun-ming.

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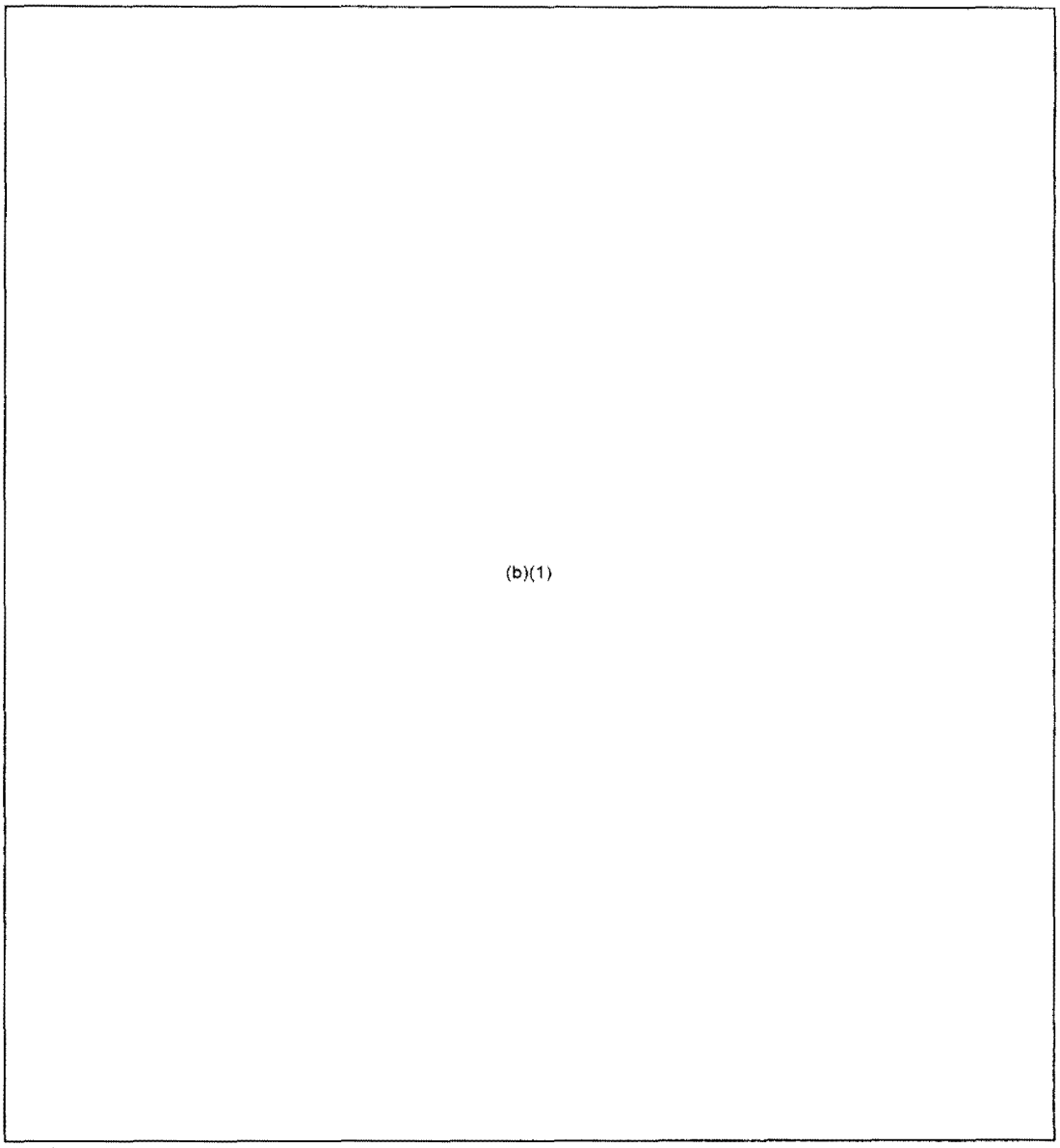

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21. ~~(C)~~ Non-Military Facilities

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b. (C) The Institute of Virology, Pekin

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(3) (U) Ch'en Po-ch'uan, Hsu Chao-hsiang, Liu Yuan-yuan, and Fan Jui-lien, studied the infectivity of JBE virus in 1963.[95] They concluded that a plaque assay could be used for the routine titration of viral infectivity. A similar study was conducted the following year when these same investigators studied the plaque-forming characteristics of several different strains of this pathogen.[96]

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(6) (U) Mao Chiang-sen studied the effect of temperature and pH on the production of JBE virus and the effect of those parameters on interferon subsequently synthesized in chick embryo cell cultures.[104] The optimal temperature for virus growth was found to be 33.5° C, although interferon production increased as higher temperatures were reached. The optimal pH for interferon production ranged between 7.1 and 7.6, while the optimal pH for production of the infective virus was 7.8. These data suggest, therefore, that at pH7.8 and at 34.5° C, the Peking strain of JBE virus would propagate to maximum titers under conditions severely inhibiting the production of interferon. The Peking strain of JBE virus is the most virulent of those known.

(7) (U) Many other investigators at this institute have contributed also to general knowledge of the JBE virus. Included are P'ang Chi-fang who in 1964 reported observations made with an electron microscope while the virus of JBE was developing in chick embryo fibroblasts and in hamster kidney cells.[105] Wang Chin, 1960, studied

comparatively the growth of JBE virus in the brain and in the extra central nervous tissues of white mice; coauthor of the finished report was Huang Chen-hsiang.[106-107]

(8) (U) Hsu performed studies involving the use of mice in determining the mechanism of immunization against JBE.[108] Lieu investigated the enzymatic activity and effects of ribonucleic acid of JBE on mouse brain tissue.[109] Much of the data obtained from these studies relative to the growth characteristics of the JBE virus would be essential to support any effort to mass produce this virus as a potential BW agent.

c. (C) Institute of Epidemiology and Microbiology, Peking

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(2) (U) Other work on brucella involving the agar diffusion reaction has been done by Yun Chao-ch'uan.[111] This spotty interest in brucellosis shown by Chinese investigators suggests that China is not free of the consequence of this chronic disease. Attempts to resolve problems affecting public health and the practice of veterinary medicine will generate a great deal of data, some of which would be applicable to the development of brucella pathogens for BW.

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(3) (U) In 1962, Wang Yung-chi, Lu Chin-han, Li Mei-jung, and Chang Yung-fu induced allergic encephalomyelitis in guinea pigs, albino rats, white mice, rabbits, and monkeys.[113] It was found that the pathological changes observed were much more complex in monkeys; this might have been used as a parameter to determine similar results in man.

(4) (U) In a paper presented at the 1963 Symposium sponsored by the Microbiology Society of China[114] Wang Yung-chi and coworkers described their findings of an interferon-like substance in chick embryo cultures infected with either type B epidemic encephalitis virus or yellow fever virus. Effective inhibitory concentrations were still present, even upon dilution of 1:160, a fact which indicated a need to make further adjustments in concentration to reduce the plaque count to 50%. In a follow-up study (1964), Wang investigated JBE virus culture, and elucidated the nutritional aspects of viral growth using monolayer tissue cultures.[115]

(5) (U) Other notable research conducted at the institute was that by Han Hung-lin and Pan Jen-chiang who studied the activation of botulinum type E toxin by trypsin.[116] This study confirmed the

previous observations of others. Available published research on the incidence of botulism in China is scarce, and the extent of research on the toxin is not apparent. Research on botulism would probably be in consonance with similar studies in other countries to combat its incidence, but might also aid any effort to develop this potential BW agent.

f. (U) Chengtu Institute of Biological Products (Chengtu Vaccine and Serum Institute), Chengtu.

(1) (U) Wei Wen-pin characterized an interferon-like substance found in the supernatant fluid of a suspension of mouse lung tissue infected with a virulent strain of Rickettsia prowazekii.[117-118] The substance exhibited some properties quite distinct from other interferons. Wei and his coworkers were subsequently able to propagate R. prowazeki in monolayer cultures of embryonic mouse lung cells. Wei from 1946 to 1951 was engaged in research at the Pasteur Research Institute in France. In 1952 he was a member of the Chinese Committee to Investigate Alleged US Use of Bacterial Warfare in Korea.

(2) (U) Tung Tien-shun and K'ang Hsien-yuan are responsible for several original studies on Salmonella typhosa, causative agent of typhoid fever.[119] Chou has also done original work in isolating new subtypes of Shigella flexneri, causative agent of dysentery.[120] Studies on the rickettsiae and on the enteric pathogens make up much of China's efforts in microbiology. Work in these areas probably enjoys an emphasis second only to that given to JBE. The endemicity and epidemicity of these diseases demand that such work be performed primarily to upgrade the public health standards in attempts to eradicate these diseases from the environment. The studies they perform and data gathered therefrom could be used to support applicable R&D efforts.

g. (C) Changchun Institute of Vaccines and Serum, Changchun.

(b)(1)

(2) (U) Yang Chung-ch'i has published a paper entitled "Changes in the Amino Acids Composition of Culture Fluid of Pasteurella *(Yersinia) pestis EV strain During Their Growth."[121] The study revealed that various amino acids originally present in the growth medium were utilized by P. pestis according to a definite sequence--proline, serine, and theonine first, followed by glutamic acid only when the first three had been exhausted, and then aspartic acid. Glycine and alanine were utilized only after aspartic acid had been exhausted. Plague, carried chiefly by the tropical rat flea, has occurred in China for centuries and is likely to be present for some time to come. Data realized from studies of the pathogen are applicable to establishing growth parameters of this pathogen.

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(1) (U) Investigators at the Fukien Institute of Epidemiology, Foochow have studied the vectors of Rickettsia tsutsugamushi,[128-129] the detection of Leptospira,[130-133] and immunological methods for identifying Coxiella burnetii. An Infectious Diseases Hospital at Foochow and the Fukien Provincial Hospital have also been mentioned. Studies on antibiotic resistant dysentery bacilli[134] and the serological variability of Shigella flexneri[135-136] were conducted there.

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*The use of the genus name Yersinia is consistent with current taxonomic practice, however because of past common usage and the greater familiarity of investigators with the genus name Pasteurella, the latter term will be used throughout this report.

(2) (U) Ch'en, China Medical College, studied the antibiotic resistance of a large number of strains of Shigella.[137] The Inner Mongolia Medical College, Huhekot published results of efforts to isolate drug resistant variants of Shigella flexneri.[138] The Institute of Antibiotics, Peking has evaluated various nitrogen sources for growth of Shigella species,[139] and the effect of additives on growth has been determined.[140] These studies might have some application in a BW program, although the enteric diseases are prevalent public health problems.

22. (C) Potential Agent Development

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23 Molecular Biology as Related to BW Agent Research and Development

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Table I. Potential BW Agents (U).

Causative Agent	Disease Produced
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Table II. Suspected Chinese Biological Warfare Agent Production Facilities (U).

Organization	Location	Activity
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Table II. Suspected Chinese Biological Warfare Agent Production Facilities (U). (Continued)

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24. (C) Biofermentation/Bioengineering as Related to BW Agent Developments

a. (U) If a successful BW program is ever to be established, fundamental data derived from R&D efforts must first be scaled-up, through process research, so that large volumes of precisely defined biological materiel ultimately can be produced at will. Unfortunately for those who are working very hard to identify this effort, equipment and facilities used for these purposes are simply not unique. For instance: processes by which biological agent fills are produced need differ but slightly from those schedules which are used to manufacture bulk volumes of vaccine materiel; and fermentors already in use to cultivate yeasts and actinomycetes for established commercial purposes could be adapted easily to produce pathogenic organisms with but appropriate modifications for safety purposes. The facilities used for this research in China appear to be under civilian control but nevertheless these could be used to support military needs for the development of BW agents.

b. (U) Chiao Jui-shen, an investigator at the Institute of Plant Physiology, CAS, spoke at the 1963 Symposium on Progress in Microbiology held in Wuhan University and pointed out that although current emphasis

h. (U) Another significant accomplishment has been the development of an automatic defoaming method for use in the fermentation industry.[149] Shen Yung-hsing described details of this development which compared in quality to the work of the Czechoslovaks, who have recently acquired equipment which controls automatically pH, foam, etc.

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25. (U) ~~(C)~~ Preservation of Microorganisms as Related to BW Agent Development

a. (U) Another prerequisite for the militarization of biological materiel is an appreciation of the technology needed to stockpile agents in a viable state, so as to assure their availability for offensive use when required. The Chinese have conducted various studies which increased their knowledge of the applicable technology, mainly laboratory techniques associated with lyophilization (freeze-drying).

b. (U) In 1959, an improved method of lyophilization was described by Hsieh Chen-yang of the Second Military Medical College, Shanghai, CPLA Academy of Medical Science.[151] Many strains of fungi and influenza viruses, together with strains of bacteria which cause anthrax, cholera, brucellosis, and plague, were maintained in a lyophilized state without loss of cultural or physiological properties. These studies demonstrated the competence of Chinese investigators to control the stability, viability, and virulence of potential agents for BW purposes.

c. (U) Hsing Tsu-p'ei of the Hungshan Sanitation and Antiepidemic Experimental Institute, Wuchang, studied the survival of lyophilized Rickettsia tsutsugamushi (orientalis).[152] The results indicated that the rickettsiae retained their viability up to 9 years when stored at -10 to -20° C in sucrose solutions.

d. (U) Li Tut'ang and Hsu Hung-li of the Institute for Biological Products Research (Ministry of Public Health), Peking, studied survival rates of Vibrio cholerae after lyophilization.[153] V. cholerae was chosen as a model because of its marked sensitivity to physical and chemical factors associated with biological decay. The investigators found that after 10 years in the lyophilized state, cholera organisms survived without undergoing significant changes in morphological, biochemical, or serological properties.

e. (U) In 1965, investigators in the laboratory of the Wuhan Municipal Contagious Disease Hospital reported on a "simple and practical way of preserving bacteria," which allowed them to keep their cultures either in a refrigerator or at room temperature.[154] This method was used for 3 years and proved effective.

f. (U) Chu Cheng-ch'ing and Tung Ts'un of the Shanghai Insitute of Medical Industry, Ministry of Chemical Industry, Shanghai have also conducted a study of microbial preservation by refrigeration and desiccation.[155]

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I. ANTICROP RESEARCH

27. (U) General

a. Communist China, the world's third largest country, with an area of 3.7 million square miles, is the world's second largest agricultural producing country after the United States. Communist China, with only 7.8% of the world's cultivated area, supports almost one-fourth of the world's population.

b. This unfavorable population-land balance, which provides less than 0.4 acre of cultivated land per person, has been a major deterrent to the country's economic progress. Between 80% and 85% of the population are engaged in farming, and agriculture currently supplies one-third to one-half of the national income. Agriculture also supplies the bulk of the raw material base. Farm products and the finished agricultural products constitute 60% to 70% of total exports.

c. During the first decade of Communist rule, gains in agricultural production were registered almost every year. Then 4 years of devastating reverses in agriculture, because of the reckless adventure of the Great Leap Forward (1958-60) and unfavorable weather during 1959-61, dropped farm output to a dangerously low level and resulted in a near collapse of the economy.

d. Under the guise of central planning during the Great Leap Forward, officials had ignored traditional farming culture--thereby badly upsetting one of the most intricate farming systems in history. Because of the successive crop reverses, the regime beat a hasty retreat and announced a new policy of giving priority to agriculture. Since that time, gains have occurred in numerous industries designated to support agriculture.

e. Although sufficient justification exists for official claims that the current level of food consumption exceeds that of the 1959-61 period, agricultural production in the socialist sector has failed to make a net per capita gain since 1964, and remains substantially below levels of production achieved before the Great Leap Forward. Large imports of grain and substantial production increases on private plots of land account for most of the increased consumption since 1961. On socialist farms, the production of food crops in 1966 failed to meet consumer needs for the eighth consecutive year.

f. Although exports of agricultural commodities have increased significantly since 1962, they apparently have not regained the 1959 level. Thus, almost a decade after the Great Leap Forward that was to solve China's economic problems within a few years, the country's agriculture is still in a state of stagnation. As one authority observed, "It may turn out that the Great Leap Forward will have cost the Chinese economy roughly a decade of growth."

28. (U) Major Crops

Rice is by far the most important crop in Communist China. The production of rice is more than three times that of all the other major crops

combined; wheat is next in acreage and production. Other principal crops are soybeans, peanuts, rapeseed, and cotton. Acreage and production figures of the major crops grown in Communist China are listed in table III.

Table III. Acreage and Production of Major Crops in Communist China (U).

Crops	Acres	Production (tons)
Rice	---	91,800,000
Wheat	62,114,000	22,927,000
Soybeans	20,433,000	8,100,000
Peanuts	4,339,000	2,209,000
Rapeseed	2,830,000	965,000
Cotton	10,950,000	1,241,000

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29. (C) R&D Against Naturally Occurring Crop Pests and Anticrop Warfare Agents

(b)(1)

b. (U) Research on Rice Diseases and Insects. Since rice is the most important source of food in Communist China, its diseases would be expected to receive the greatest attention of ChiCom scientists. This opinion seems to have no basis in fact, however, since the rust diseases of wheat apparently are the object of much more research.

(1) (U) Investigations on rice diseases. Rice blast is a serious disease in Communist China, especially in the northeast, but only one article since the beginning of 1965--concerning the application of kasugamycin, a Japanese antibiotic, for the control of rice blast--has been noted in a Chinese Communist publication.[156] The study on which the article was based was conducted by a Japanese scientist. During the same time period, three papers on other rice diseases appeared:

(a) (U) The Mycelial Activities of the Rice Sheath Blight Fungus in Relation to the Disease Development;[157]

(b) (U) Studies on the Spore Dispersal of Helminthosporium oryzae;[158]

(c) (U) Field Control of Bacterial Leaf Streak (Xanthomonas oryzicola) of Rice in Kwangtung.[159]

(2) (U) Rice insects. The following two papers on rice insects have been noted; both concern research on the control of the paddy borer:

(a) (U) Outbreak, Rhythm, and Control Techniques of Paddy Borer (Tryporyza incertellus Walker) in Huang, Hsin, Hsi, and Demonstration Regions in Hopeh Province;[160]

(b) (U) Forecasting the Third Generation Paddy Borer (Tryporyza incertellus Walker) and Chemical Control Techniques.[161]

c. (U) Research on Wheat Disease and Insects.

(1) (U) Races of wheat stem rust. The physiological races of the fungus causing stem rust of wheat were analyzed in 1964. Stem rust was epiphytotic in all areas of China in 1964, being generally more serious in the north than in the south. In 1964 a total of 2835 samples of stem rust spores was collected from 229 cities and districts within 26 provinces; 2006 of them have been identified. The identifications were conducted from November 1964 to March 1965 according to the usual international procedure and rules. The races and types found were: 17, 19, 21, 21C1, 21C2, 21C3, 34, 34C1, 34C2, 40, and 194. The predominance of race 21 has

been gradually decreasing, whereas race 34 has been increasing in occurrence, as seen from the analyses of the physiological races found from 1962 to 1964. This survey was conducted by personnel from the Mukden Agricultural College, Heilungkiang Agricultural Research Institute, and the Kirin Agricultural Research Institute, all in Northeast China.[162]

(2) (U) Control of wheat diseases. Four effective means of stripe rust control have been developed in China: (a) breeding of rust-resistant varieties, (b) postponing the sowing time from 100 days to 80 days before the winter solstice, (c) destroying disease-infested plants, and (d) applying fungicides like sodium fluorosilicate and sulfanilamide.[163] According to available statistics, 6 million acres were sown with about 100 varieties of good rust resistant strains of wheat in Shansi, Hopeh, Shantung, Honan, Shensi, Kansu, and Northern Kiangsu in the autumn of 1964.[164] The variety Nei-hsiang 36 was reported to be immune to stripe rust but susceptible to leaf and stem rusts. A second variety, Hopeh Agriculture University 3, is almost immune to stripe rust and is resistant to stem rust, while a third variety, Hsu-chou 4, is almost immune to all three types of rust.[165]

(3) (U) Development of chemical rust fungicides. Sulfonic acid, a systemic fungicide against wheat rust, has been tested in the field. The optimum concentration found was 6.5 to 13 pounds of 65% acid per acre. Methods for producing the acid have been developed.[166,167]

(4) (U) Development of antibiotic fungicides. During 1965, seven papers were published on antibiotic fungicides. All but one concerned the fungicide "Nung-K'ang-101," and isocycloheximide isolated from Streptomyces aureus, by the Pharmacology Institute, Chinese Academy of Sciences, Shanghai. Nung-K'ang-101 was tested and found to be effective against wheat rust and Gibberella disease of wheat.[168-174]

(5) (U) Research on control of wheat insect pests. The oriental army worm, Leucania separata Walker, is the pest most destructive of cereal crops in Kirin Province, Northeast China. Studies have been conducted on its life history and the effects of microclimate on its population density. The wheat stem fly, Meromyza saltatrix Linn, is a serious pest of wheat in Shensi. Differences in varietal susceptibility have been noted; plants growing in fertile soils sustain less injury. Benzene hexachloride (BHC) or parathion provide very effective control of the adult fly. One paper describes the development of the aphid Macrosiphum granarium--the chief wheat pest in the province of Hsi-Nan.[175-179]

d. (U) Research on Soybean Diseases and Pests. Although the soybean is a major crop in Communist China, research on its diseases and pests is sketchy. Only three papers have been noted: one on the analysis of the soybean mosaic virus, and two on the soybean pod porer. The latter is a serious pest of soybeans in Northeast China. Recommended control methods are the use of resistant varieties of soybean, proper cultural practices, and insecticides like BHC together with DDT.[180-182]

e. (U) Research on Rape Disease and Pests. The Institute of Microbiology has conducted an intensive study of the rape mosaic viruses. The Chinese Communists have identified and characterized 40 strains of the virus. A partial purification of the virus has been accomplished, and its properties have been described. Another institute has studied the epidemic relations between the vector aphid, Myzus persicae Salz, and the virus.[183-185]

f. (U) Research on Cotton Disease and Pests. Analysis of the published research papers indicates that the principal diseases and insects of cotton are: fusarium wilt, verticillium wilt, and pink bollworm. Stopping the spread of fusarium wilt and verticillium wilt appears to be the principal difficulty. Use of BHC and DDT is recommended to control the bollworm.[186-188]

g. (U) Insect Pest Control Research.

(1) (U) Chemosterilants. Two forestry institutes have been investigating the use of the chemosterilants to control Dendrolimus punctatus Walker, Bombyx mori, and other insects. Chemosterilants selected experimentally included Thio-TEPA, 5-fluorouracil, 5-fluorourotic acid, colchicine, nitrogen mustards, and thiocarbamide. The effects of the various chemosterilants on the different insects were described.[189-192]

(2) (U) Organic insecticides. Research on chemical insecticides in Communist China appears to concern chiefly the testing of Western-developed organophosphorus and organochloro insecticides on Chinese crops. The development of synthetic processes for producing the desired insecticides for Chinese crops also is of concern.

(3) (U) Biological control. Spores of the bacteria B. bassiana and B. thuringiensis are used to control such insects as D. punctatus Walker, the pine caterpillar Grapholithe glycinivosella, and Cylas formicarius. Applications of the insect fungus, Spicaria fumoso-rosea, have been considered for the control of a wide range of insects, including L. separata Walker and Pyrausta nubilalis Huebner. The use of Chinese bees and the insect Trichogramma australicum to control the sugar cane borer has been investigated and has produced satisfactory results.[193-196]

30. (U) Assessment of Communist China's Anticrop BW Capabilities u

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J. CONCLUSIONS

31. (C) Offensive Posture u

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32. (C) Defensive Posture u

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K. TRENDS AND FORECASTS

33. (C) Trends

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34. ~~(c)~~ Forecasts

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b. Mid-Range (5-10 Year Projection).

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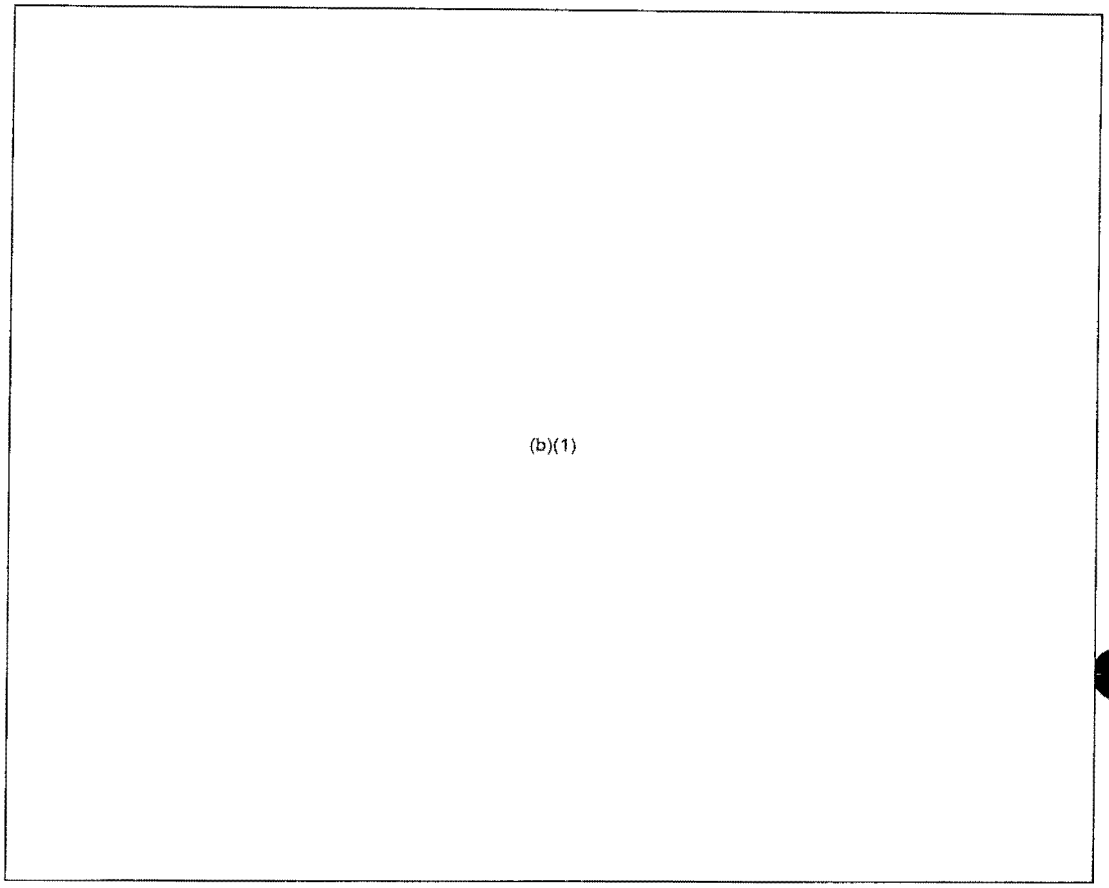
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Section II.

NORTH VIETNAM

A. INTRODUCTION

1. (C) Historical Background and Competence in Microbiology (U)

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b. (U) When the Communists assumed control of North Vietnam in 1954, there was no central public health group capable of effectively instructing the people and instituting disease control procedures. Modern sanitation and public health facilities were essentially nonexistant. A Ministry of Public Health on the pattern of Communist China was established in Hanoi that year. The health organization extends down to interzonal and provincial levels, each having its own hospital or health center, along with its own medical and provincial administrators.[203] Little attempt was made to control scientific activities until 1958 when the State Science Committee was formed to aid the government in the organization and direction of scientific activities.[204] In 1960, the first attempt was made to draft a comprehensive scientific and technical program which evidenced the attempt to plan for the orderly development of scientific effort by the State Science Committee.[205] The government

has claimed improvement in public health and sanitation but the number of medical personnel is inadequate and most of them are poorly trained. After 1960, the Bacteriological Institute was made responsible for the production of vaccines against diseases of an epidemic nature. Vaccines against smallpox, tetanus, polio, and cholera have been produced, but the institute and other production facilities could not manufacture sufficient quantities to immunize all the population.[206] Since 1965, eastern European countries have significantly increased assistance to North Vietnam in the medical field, including construction of new hospitals and medical facilities, most of which probably serve military needs.

2. (U) Geographical and Political Factors

a. North Vietnam lies in the northeastern part of the Indochina Peninsula, bordering the Gulf of Tonkin. This relatively small and irregular shaped country narrows from a maximum width of 375 miles in the north to about 30 miles in the south. The maximum north-south axis is about 450 miles. Its size approximates that of the State of Washington. The population of about 18.5 million is chiefly concentrated in the Red River Delta and along the coastal plains. Of the 1850 miles of land boundaries, about 800 miles borders on Communist China and about 1000 miles on Laos. There are two rail routes into North Vietnam from Communist China, and a number of highway connections. Two selected routes from Laos contain a road suitable for vehicular movement, but are poor access routes because of the mountainous terrain and inferior roads. The best air approaches are from the east, over the South China Sea.

b. The DRV Government is a highly centralized structure paralleled by the Lao Dong (Communist Party) organization, composed of more than half a million members. Civil obedience is maintained by an elaborate police and security service backed up by the military service. The economy is tightly controlled and the people are held to an austere level of living. North Vietnam's position in the Communist World was greatly enhanced by the personal stature of Ho Chi Minh. The Soviet Union and Communist China have each actively sought the support of the DRV in their contention for leadership in the Communist world. This has been done partly by making competitive grants of both military and economic assistance. North Vietnam, although heavily dependent on the larger and more advanced Communist countries for military and economic aid, has remained largely independent in the formulation of its domestic and foreign policies. The DRV controls its own territory through the usual Communist machinery and methods.[198]

c. The government structure was substantially reorganized in 1960. A new constitution was promulgated for further centralization and for an elected National Assembly. The constitution was modeled extensively on the Chinese constitution and serves as an organic law for the government as well as a propaganda document for the Lao Dong. Like all Communist constitutions, it ascribes considerably more responsibility and authority to the governmental organization than exists in actual practice. The most important centers of power within the government are the executive agencies--the President of the Republic; the Premier; the Council of Ministers; and the administrative committees of the local governments. The Council of Ministers is the organization closest to the policy making process, and the most important ministries of the Council are the Ministries of National Defense, Foreign Affairs and Public Security. Each of these Ministries is headed by Politburo members. The Communist regime has continued to reshuffle local government organizations and generally has developed a unified, nationwide system of local administration, dominated by Lao Dong Party members.[198]

B. ASSESSMENT

3. (C) Order of Battle u

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4. ~~(C)~~ Doctrine and Procedures

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b. Defense.

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5. (C) BW Equipment

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6. (C) Production and Stockpiling

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7 (C) Research, Development, and Testing u

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8. (C) Conclusions

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9. (c) Trends and Forecasts

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b. Forecasts.

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Section III.

NORTH KOREA

A. INTRODUCTION

1. (C) Historical Background and Competence in Microbiology (U)

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2. (U) Geographical and Political Factors

a. North Korea is a rugged land which occupies the northern part of the Korean peninsula between the Yellow Sea on the west and the Sea of Japan on the east. It adjoins Communist China and the USSR on the north and South Korea on the south. North Korea has an area of about 47,000 square miles, or approximately the size of Pennsylvania. Because

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3. ASSESSMENT

3. (C) Order of Battle

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4. (C) Doctrine and Procedures (U)

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5. (C) BW Equipment *u*

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7. ~~(C)~~ Research, Development, and Testing

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8. (C) Conclusions

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9. (C) Trends and Forecasts

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Section IV.

THE MONGOLIAN PEOPLE'S REPUBLIC

A. INTRODUCTION

1. (U) Historical Background and Competence in Microbiology

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2. (U) Geographical and Political Factors

a. Mongolia's proximity to the Trans-Siberian railroad in the Soviet Union, and its position between the USSR and Communist China

lends it a unique strategic significance. It provides road and rail routes from the USSR to the coast of Communist China. The main strategic area is Ulan Bator, the capitol city. A single track railroad links Ulan Bator with the Trans-Siberian Railroad in Russia and extends southeast to connect with the Communist Chinese system at Erk-lien. Of Mongolia's boundaries, 2600 miles border Communist China and 1850 miles border the Soviet Union. Since tensions arose between the USSR and Communist China, Mongolia has been used as an advanced position for the Soviet Army. Soviet units reportedly are stationed in Mongolia, and the Chinese border is constantly under observation.[262] Geographically, Mongolia includes vast desert plains in the south and east, long mountain ranges in the west, and hills mountains with broad valleys in the north. The climate is continental with great daily and seasonal extremes of temperature.

b. The Mongolian People's Republic is governed by a Communist dictatorship which maintains control through a centralized system modeled on that of the USSR. The Politburo is the center of power and the source of all executive, legislative, and judicial authority in the country. Soviet influence dominates public health planning and activities in Mongolia. The USSR has provided technical assistance since 1925 in establishing a public health program, epidemiological systems, and laboratory facilities for investigating diseases. In 1931 the Soviet Union established at Ulan Bator the first antiplague laboratory which became the Central Antiplague Station in 1936. Prophylaxis is the basic philosophy in Mongolia, and all health care and medical research units are owned and maintained by the state. The Ministry of Public Health is responsible for all health and medical services. The political reliability and loyalty to the Communist party often outweigh qualities, professional skill, and ability in the selection of scientific administrators. For this reason the effectiveness of the public health services and the advancement of scientific programs are often hampered.[271]

B. ASSESSMENT

3. (C) Order of Battle

(b)(1)

4. (U) Doctrine and Procedures

The Mongolians are not known to have policies or procedures for conducting biological warfare.

5. ~~(C)~~ BW Equipment

a. (U) The Mongolians do not have biological warfare agents or munitions. Some vaccines, antibiotics, and sera are available for defense.

(b)(1)

b. (U) A Bacteriological Research Office was formed in 1932 by combining several small laboratories in Ulan Bator. This was the first facility under the Ministry of Health to conduct microbiological research. Diseases for which vaccines have been prepared at this facility include typhus, rabies, smallpox, dysentery, typhoid fever, and brucellosis.[274] A Soviet specialist, L. S. Rezninkova, assisted in directing research programs for the development of vaccines and medicines during the late 1950's.

c. (U) The Office for Studying and Combating Especially Dangerous Infectious Diseases which was an outgrowth of the Anti-Epidemic Office now has five substations under its jurisdiction. It is probably the largest Mongolian organization which supports studies of measures for preventing diseases, such as anthrax, glanders, plague, poliomyelitis, and tularemia. During 1966, the organization prepared and administered vaccines to an estimated 150,000 persons.[274]

(b)(1)

8. (C) Conclusions

a. Offensive Posture. Mongolia does not have the scientific and technical capability to conduct biological warfare research and development. A doctrine governing the offensive use of biological agents is not known to exist, nor has interest been expressed for their development. A capability to stockpile agent materiel would be negligible. The organization most likely to be made responsible for agent research would probably be the Office for Studying and Combatting Especially Dangerous Infectious Diseases.

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9. (C) Trends and Forecasts

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APPENDIX I.

SELECTED MEDICAL MATERIEL MANUFACTURERS AND

MEDICAL LABORATORIES, COMMUNIST CHINA (1971)

Annexes — Page

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ANNEX A.

MANUFACTURERS OF MEDICAL MATERIEL

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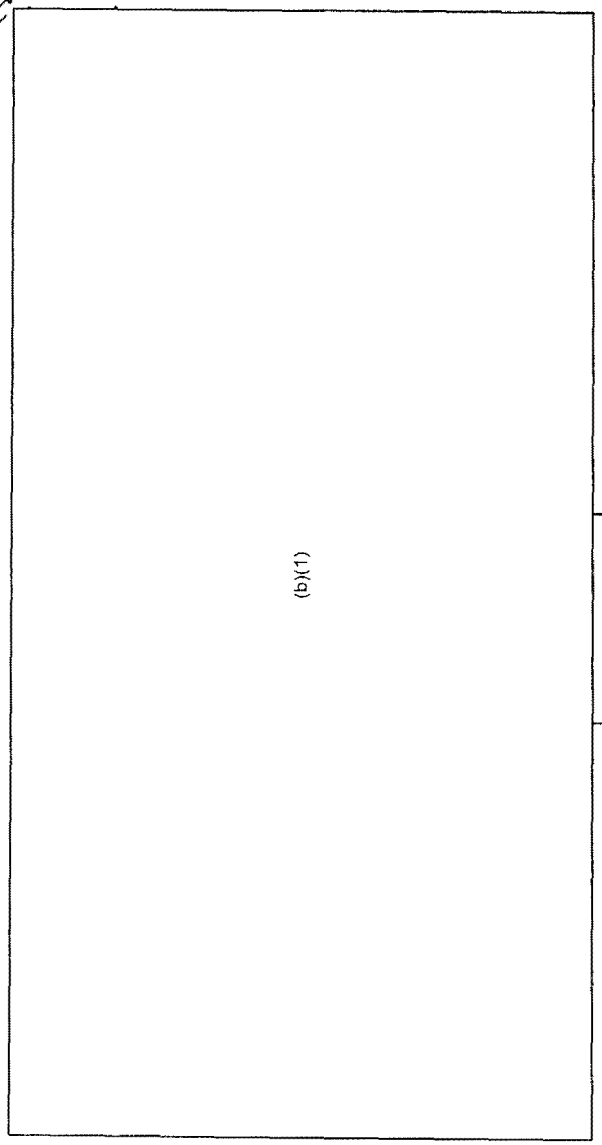
ANNEX B.

MEDICAL LABORATORIES



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MEDICAL LABORATORIES (Continued)

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MEDICAL LABORATORIES (Continued)

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MEDICAL LABORATORIES (Continued)

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MEDICAL LABORATORIES (Continued)

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MEDICAL LABORATORIES (Continued)

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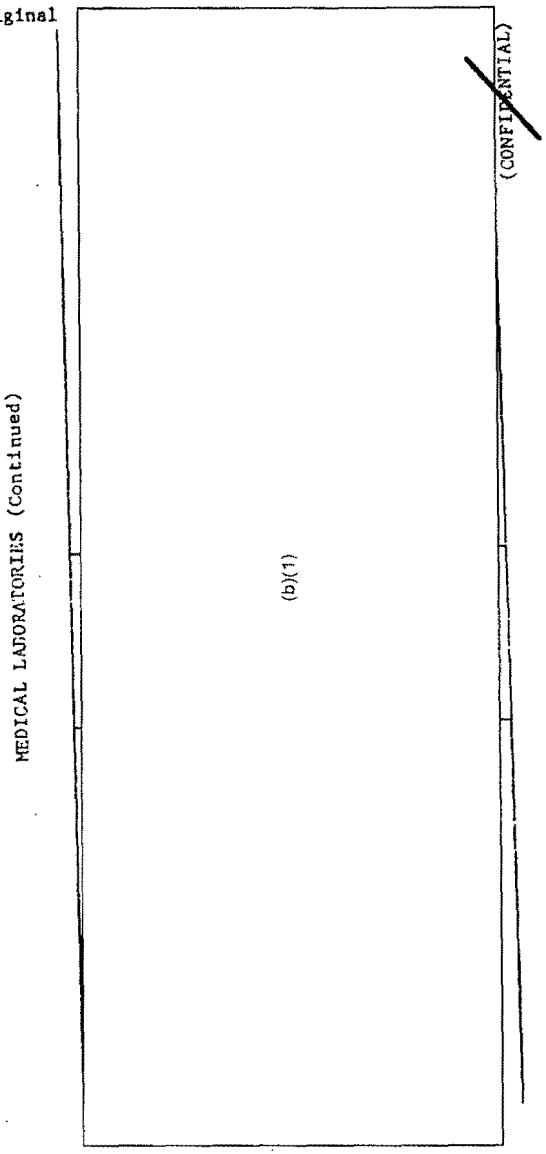

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APPENDIX II.

SELECTED MEDICAL MATERIEL MANUFACTURERS AND MEDICAL LABORATORIES, NORTH VIETNAM (1971)

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ANNEX A.

MANUFACTURERS OF MEDICAL MATERIEL

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MANUFACTURERS OF MEDICAL MATERIEL (Continued)

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ANNEX B.

MEDICAL LABORATORIES

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MEDICAL LABORATORIES (Continued)

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APPENDIX III.

SELECTED MEDICAL MATERIEL MANUFACTURERS AND

MEDICAL LABORATORIES, NORTH KOREA (1971)

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ANNEX. A.

MANUFACTURERS OF MEDICAL MATERIEL

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ANNEX B.

MEDICAL LABORATORIES

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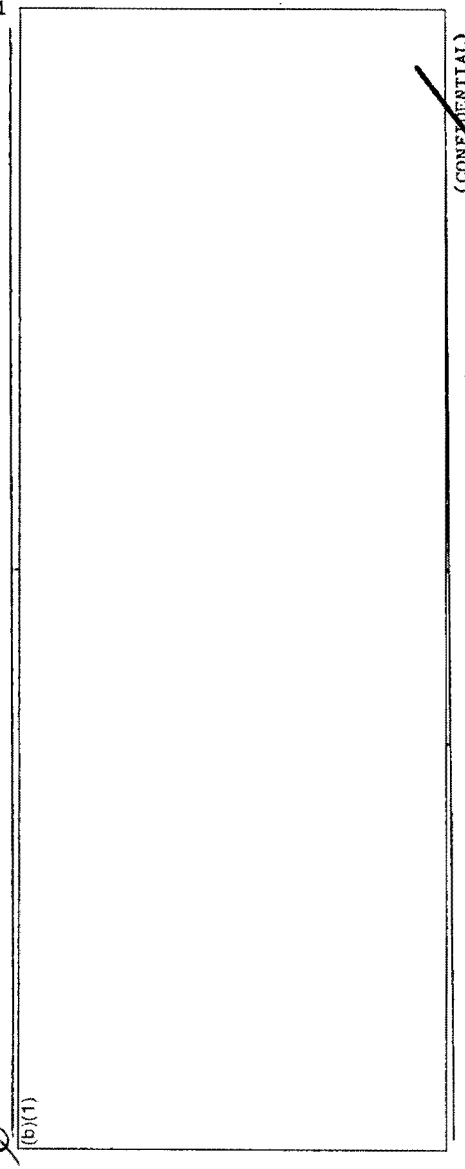

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APPENDIX IV.

SELECTED MEDICAL MATERIEL MANUFACTURERS, MONGOLIAN PEOPLE'S REPUBLIC (1971)

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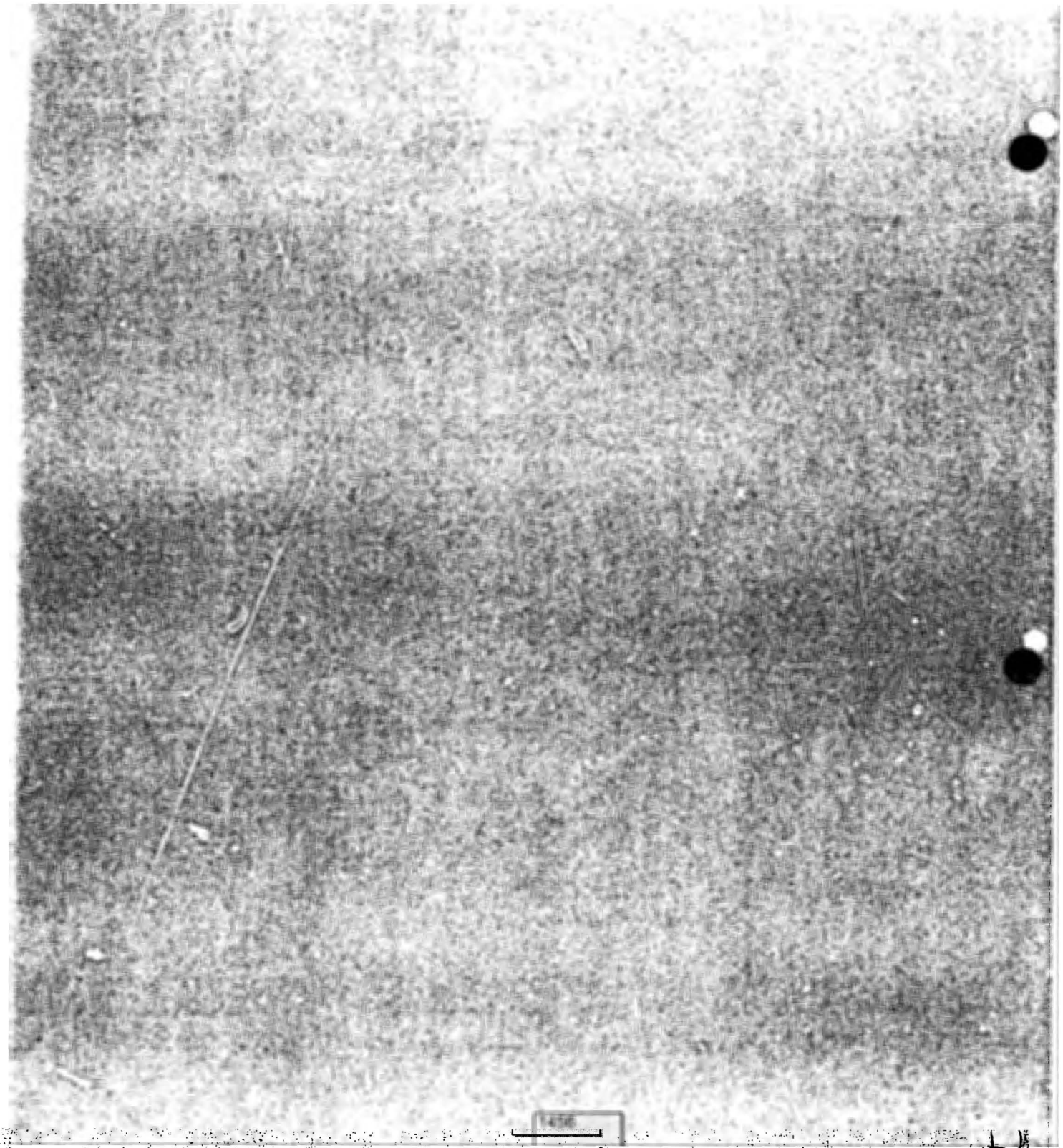

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Requested date:	23-October-2008
Released date:	10-June-2013
Posted date:	13-August-2013
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DEPARTMENT OF THE ARMY
UNITED STATES ARMY INTELLIGENCE AND SECURITY COMMAND
FREEDOM OF INFORMATION/PRIVACY OFFICE
FORT GEORGE G. MEADE, MARYLAND 20755-5995

REPLY TO
ATTENTION OF:

Freedom of Information/
Privacy Office

10 JUN 2013

This is in further response to your Freedom of Information Act (FOIA) request of October 23, 2008, and supplements our electronic message of May 12, 2010.

Coordination has been completed with another element of our command and other government agencies and records returned to this office for our review and direct response to you. We have reviewed the records and determined the records are partially releaseable to you. A copy of the records are enclosed for your use.

We have completed a mandatory declassification review in accordance with Executive Order (EO) 13526. As a result of our review information has been sanitized and 4 pages have been withheld in their entirety as the information is currently and properly classified TOP SECRET, SECRET and CONFIDENTIAL according to Sections 1.2(a)(1), 1.2(a)(2), 1.2(a)(3) and 1.4(c) of EO 13526. This information is exempt from the public disclosure provisions of the FOIA pursuant to Title 5 U.S. Code 552 (b)(1). It is not possible to reasonably segregate meaningful portions of the withheld pages for release. The records are enclosed for your use. A brief explanation of the applicable sections follows:

Section 1.2(a)(1) of EO 13526, provides that information shall be classified TOP SECRET if its unauthorized disclosure reasonably could be expected to cause exceptionally grave damage to the national security.

Section 1.2(a)(2) of EO 13526, provides that information shall be classified SECRET if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

Section 1.2(a)(3) of EO 13526, provides that information shall be classified CONFIDENTIAL if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

Section 1.4(c) of EO 13526, provides that information pertaining to intelligence activities, intelligence sources or methods, and cryptologic information shall be considered for classification protection.

In addition, information has been sanitized from the records and 4 pages have been withheld in their entirety as the release of the information would reveal sensitive intelligence methods. This information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(7)(E) of the FOIA. The significant and legitimate governmental purpose to be served by withholding is that a viable and effective intelligence investigative capability is dependent upon protection of sensitive investigative methodologies. It is not possible to reasonably segregate meaningful portions of the withheld pages for release.

The withholding of the information described above is a partial denial of your request. This denial is made on behalf of Major General Stephen G. Fogarty, the Commanding General, U.S. Army Intelligence and Security Command, who is the Initial Denial Authority for Army intelligence investigative and security records under the FOIA. You have the right to appeal this decision to the Secretary of the Army. Your appeal must be postmarked no later than 60 calendar days from the date of this letter. After the 60-day period, the case may be considered closed; however, such closure does not preclude you from filing litigation in the courts. You should state the basis of your disagreement with the response and provide justification for a reconsideration of the denial. An appeal may not serve as a request for additional or new information. An appeal may only address information denied in this response. Your appeal is to be made to this office, for forwarding, as appropriate to the Secretary of the Army, Office of the General Counsel.

Coordination has been completed and we have been informed by the Central Intelligence Agency (CIA) that information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(1) and (b)(3) of the FOIA.

The withholding of the information by the CIA constitutes a denial of your request and you have the right to appeal this decision to the Agency Release Panel within 45 days from the date of this letter. If you decide to file an appeal, it should be forwarded to this office and we will coordinate with the CIA on your behalf. Please cite CIA #F-2010-01292/Army #57F-09 assigned to your request so that it may be easily identified.

Coordination has been completed and we have been informed by the Defense Intelligence Agency (DIA) that their information is exempt from public disclosure pursuant to Title 5 U.S. Code § 552 (b)(1), (b)(2) (b)(3) and (b)(4) of the Freedom of Information Act and Executive Order (EO) 13,526 § 1.4 (c) (d) and (h). The statute invoked under Title 5 U.S. Code 552 (b)(3) is 10 U.S.C. §424, which allows for the protection of organizational and personnel information for DIA.

The withholding of the information by the DIA constitutes a partial denial of your request and you have the right to appeal this decision directly to the DIA. If you decide to file an appeal, it should be forwarded to the Director, Defense Intelligence Agency, ATTN: DAN-1A-FOIA, Washington, DC 20340-5100. Please cite MDR #0155-2010 assigned to your request so that it may be easily identified.

You have received all Army intelligence investigative records pertaining to this request.

There are no assessable FOIA fees.

If you have any questions regarding this action, feel free to contact this office at 1-866-548-5651, or email the INSCOM FOIA office at: INSCOM_FOIA_ServiceCenter@mi.army.mil and refer to case #57F-09.

Sincerely,

Brad S. Dorris
Director
Freedom of Information/Privacy Office
Investigative Records Repository

Enclosure

c

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CIRC NICD

DST-1620S-145-77

DEFENSE INTELLIGENCE AGENCY

[SMOKE, FLAME, AND INCENDIARY MATERIALS AND DEVICES–FOREIGN (U)]

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MAY 1977

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SMOKE, FLAME, AND INCENDIARY MATERIALS AND DEVICES—FOREIGN (U)

(b)(6)

DST-1620S-145-77

DIA Task PT-1620-09-76

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NATIONAL SECURITY INFORMATION
Unauthorized disclosure subject to criminal sanctions

This is a Department of Defense Intelligence Document prepared by the Foreign Science and Technology Center of the US Army Materiel Development and Readiness Command under the Department of Defense Scientific and Technical Intelligence Program, with contributions from the Defense Intelligence Agency, the US Army Medical Intelligence and Information Agency, the Naval Intelligence Support Center, and the Foreign Technology Division of the US Air Force Systems Command.

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PREFACE

(U) This study assesses the capabilities of foreign countries to conduct smoke, flame and incendiary warfare. On the basis of available information, trends in research and development (R&D) have been projected, and forecasts made, for the next 10 years.

(U) The study includes information relative to the smoke, flame, and incendiary capabilities of the Eurasian Communist countries and the Middle East countries less Israel. For simplification, however, the term Eurasian Communist countries (ECC) as used throughout the study includes the Middle East countries less Israel. Because the bulk of subject materiel and equipment is of Soviet origin or design, Soviet capabilities are emphasized. The study also covers known capabilities of the Free World countries, Israel, and non-aligned countries. Again, for simplification the term free world (FW) countries includes Israel and non-aligned countries. Appendixes are included to provide technical characteristics of specific free world munitions and a comparison of these munitions with their counterparts in the Eurasian Communist countries.

(U) Further technical data and related weapon characteristics may be found in TB-381-5-05 (FOMCAT Vol. 5), dated 10 March 1976, and in F10-CST-1-76, dated June 1976.

(b)(1)

(U) This document will be used to satisfy the needs of US policy planners, Department of Defense staff, military departments, commanders in the field, intelligence collectors and analysts, and R&D personnel. It will also be used to satisfy Department of Defense quick-reaction requirements, both formal and informal.

(U) This study is being disseminated devoid of bibliographical material to facilitate wider distribution. A compiled bibliography has been prepared separately and can be made available to authorized recipients upon request to the Defense Intelligence Agency, ATTN: DT-1A, Washington, DC 20301. Individuals making such requests are cautioned that the addition of the bibliography to (or its association with) the study makes mandatory a more restricted distribution of the study. When the bibliography is attached, the study must carry the additional caveats DISSEMINATION AND EXTRACTION OF INFORMATION CONTROLLED BY ORIGINATOR NOT RELEASABLE TO CONTRACTORS OR CONTRACTOR/CONSULTANTS.

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

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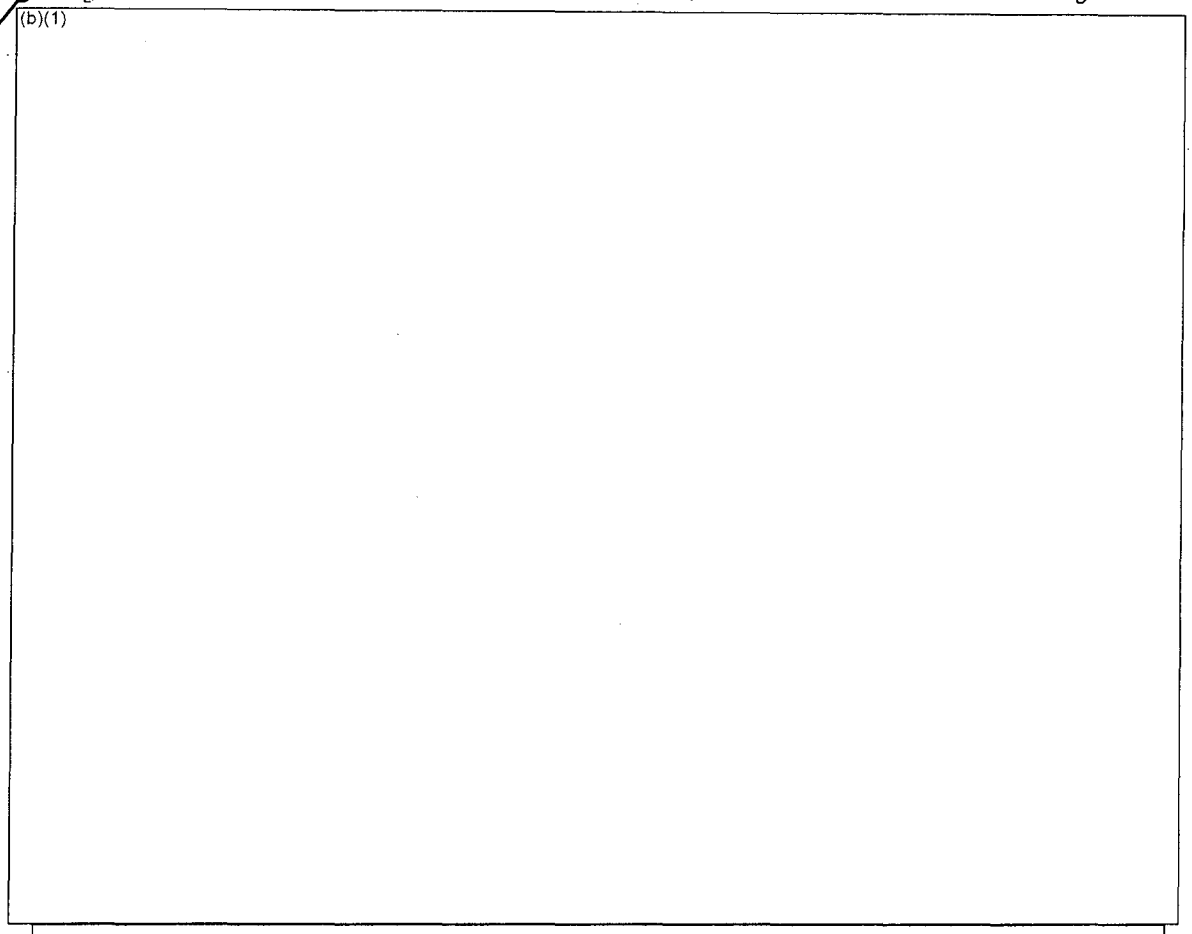

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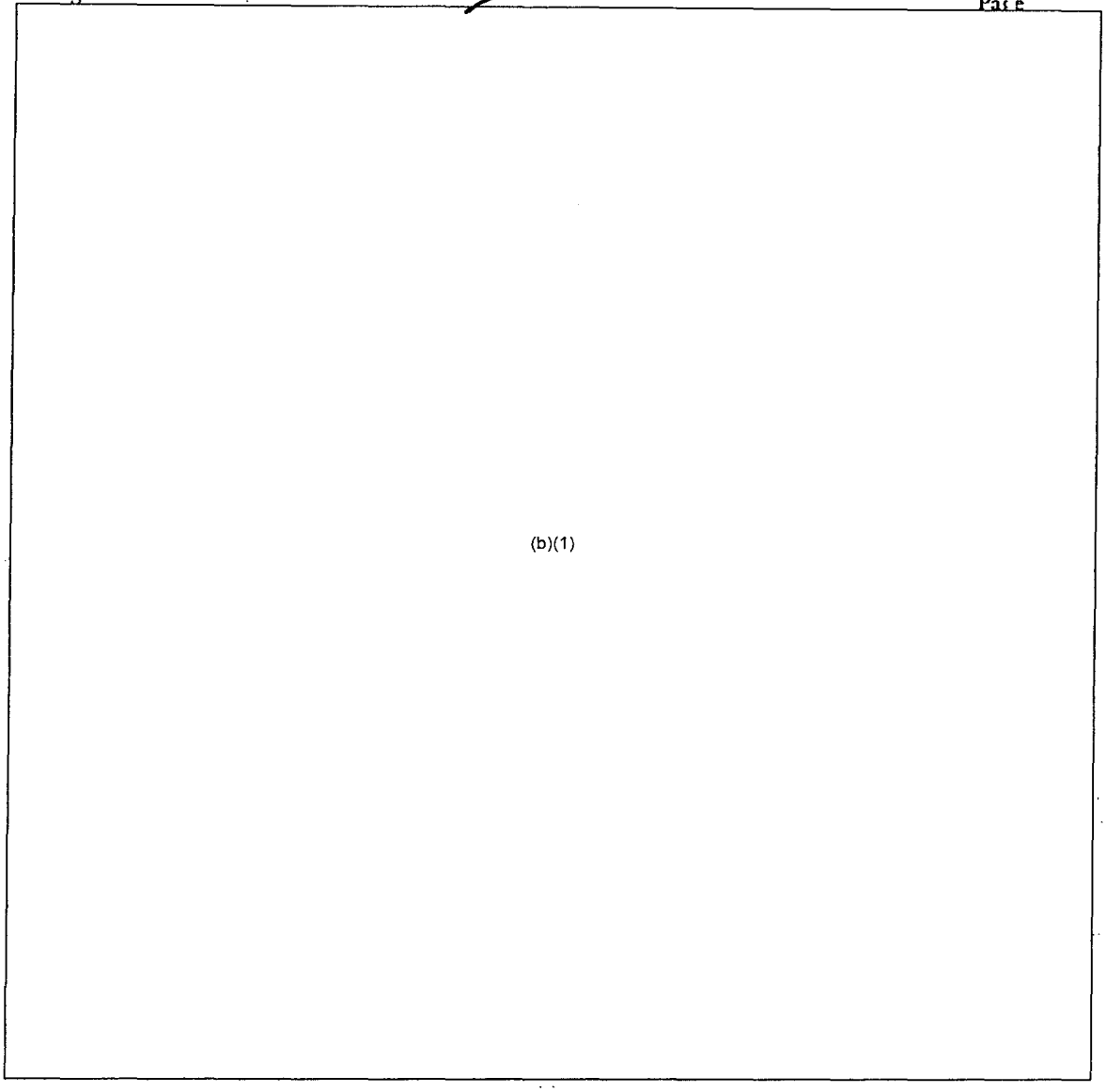
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SUMMARY

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*In this document the term ECC includes the Middle East countries less Israel (see Preface).

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Section I.

INTRODUCTION

1. (U) General

Smoke may be defined as "an artificially produced aerosol, that is, a suspension of solid or liquid particles in the atmosphere, which attenuates the passage of visible light or other forms of electro-magnetic radiation." Although generated (by burning wet straw, leaves, or burlap soaked with potassium nitrate) during a few isolated battles, smoke was not developed specifically for use in military operations until World War I.[1] [2] During World War I, smoke, used rather extensively both in offensive and in defensive operations, proved to be a decisive factor affecting the outcome of many battles. The development of smoke systems continued from World War I throughout World War II. Following World War II, the introduction of electro-optical surveillance and guidance systems caused the interest in smoke to decline because its use seemed less applicable with these modern systems of warfare.[2] During the 1960s, renewed interest in the military applications of smoke began to appear in a number of foreign countries, notably in the Eurasian Communist countries (ECC). Subsequently, the extensive use of smoke during the Yom Kippur (October) War reestablished that the proper use of smoke in offensive and defensive operations provided a decided advantage for the user. This historical evidence, in addition to the continuing emphasis placed on smoke operations by potential adversaries, indicates that smoke will play a major role in future conflicts.

2. (U) Standard Smoke Agents

a. Smoke agents have not changed significantly since World War II. Suspected or known smoke agents included in foreign military inventories are those derived from World War I and World War II technology. Variations of some of these standard smoke mixtures have been noted (these will be discussed later), but no innovative types are apparent.[3] The following agents are commonly found in smoke inventories.[1] [2]

(1) Liquid agents.

(a) Smoke acid. Smoke acids include chlorosulfonic acid, sulfur trioxide, and fuming sulfuric acid. Normally, mixtures of these acids are used to produce maximum screening properties, although satisfactory smoke screens can be obtained with individual components. Stated optimum concentrations of a smoke acid mixture designated by the Soviets as "S-4" are 54% to 60% chlorosulfonic acid, 35% to 43% sulfur trioxide, and 3% to 5% sulfuric acid. The components of this mixture, atomized at about 400 kPa, react to form sulfuric and hydrochloric acids, which combine with moisture in the air to produce smoke. The size of the particles formed varies, depending upon the relative humidity of the air. Although corrosive and irritating, the acid smoke is economical to produce and probably is used widely to produce large-area smoke screens as well as for training purposes. Smoke acids can be used under extreme climatic conditions, since they react with ice and snow in the same manner as with water.

(b) Chloride mixtures. Liquid chloride agents are composed primarily of titanium, silicon, or tin tetrachlorides. Of these, titanium tetrachloride has the best screening power. Sprayed into the air, titanium tetrachloride reacts with moisture to form titanium trichloride and hydrochloric acid. The smoke, therefore, is somewhat corrosive and irritating. When ammonia is present, it reacts with the hydrochloric acid to form ammonium chloride. The smoke produced by this latter mixture is more dense and less irritating than titanium tetrachloride used alone. The chloride agents can be used in sprays from aircraft, by smoke vehicles, and in bombs and shells.

(c) Fog oil. "Fog oil" or "smoke oil," which is derived primarily from crude oil or byproducts of petroleum distillation, is relatively economical, safe to handle, nonirritating, and noncorrosive. A common mixture contains 70% petroleum distillate and 30% fuel oil. The smoke formed by pumping this mixture into the hot exhaust (about 1200°C) from combustion chambers, is a combination of incomplete combustion products and simultaneously evaporated excess oil. It is black-gray in color and has satisfactory screening power and stability. Armored vehicles, equipped with a special device, use fuel oil instead of fog oil as the smoke agent.

(2) Pyrotechnic mixtures.

(a) Berger mixtures. The so-called Berger mixtures contain a metal (aluminum, zinc, iron), a chlorocarbon [carbon tetrachloride, hexachloroethane (HC)], and other additives, such as zinc oxide, to improve burning. A mixture used by the Soviet Union during World War I contained 41% carbon tetrachloride, 35% zinc dust, 9% sodium chlorate, 8% magnesium carbonate, and 7% potassium nitrate. During World War II, improved Berger

mixtures were prepared by substituting HC, octachloropropane, and hexachlorocyclohexane for carbon tetrachloride. A German improved mixture comprised 40% HC, 44% zinc dust, 2% zinc oxide, 2% powdered magnesium, 2% calcium, 4% silicon dioxide, and 6% absorbents or stabilizers. Despite good screening effects, Berger mixtures have the disadvantage of a high combustion temperature and a delay time of 10 to 20 seconds between ignition and smoke production.

(b) Yershov mixtures. These solid smoke compounds contain a smoke compound and fuel (anthracene, naphthalene, paraffin), and an oxidant (potassium chlorate, sodium chlorate). A widely used mixture consists of 25% anthracene, 30% ammonium chloride, and 45% potassium perchlorate. Producing noncorrosive and nonirritating smoke, these pyrotechnic compounds have great importance on the battlefield because they can be used in small, easily manipulated devices to establish smoke screens in any tactical situation.

(3) Phosphorus. Two forms of phosphorus, white and red, are used in smoke munitions. The most widely used is white phosphorus (WP), which is employed either in the native form or mixed with a plasticizer. WP alone burns rapidly in air, and the smoke is inclined to pillar. Mixed with a plasticizer, like butyl rubber, WP burns more slowly and pillaring is reduced. WP ignites on exposure to air while red phosphorus (RP) requires an igniter. RP has less tendency to pillar and is easier to handle and package into munitions than WP. During the burning of either form of phosphorus, phosphoric acid is produced and combines with moisture in the air to form a dense, white smoke that is both corrosive and irritating to the respiratory tract. The screening power of phosphorus smoke is excellent.

b. The preceding examples of smoke agents represent those used by the ECC. The same types of mixtures, with some modifications, are used by other countries, including the United States. ECC representatives have discussed the use of smokes for attenuating radiation in regions of the spectrum other than the visible, but there is no evidence that the military forces of these countries have such a capability. Some research, both in the ECC and in free world countries, indicates that efforts are underway to develop attenuating smokes.

3. (U) Munition/Dispersion Systems

The USSR has a wide variety of systems for smoke dissemination. The systems include bursting- and burning-type munitions, pressurized and gravity-flow spray devices, and injection-type generators. With the exception of oil-smoke generators, the USSR and other ECC apparently have expended little effort to improve their smoke-producing capabilities. Unlike the free world countries, such as the United Kingdom and Sweden, there has been no

evidence that the ECC have developed and produced smoke munitions for firing from infantry antitank weapons, such as the RPG-7 or SPG-9 rocket launchers, or from tank guns. The non-Soviet ECC are equipped primarily with Soviet munition/dispersion systems or domestic copies of these systems.

4. (U) Flame and Incendiaries

Flame and incendiary materials were in use for centuries prior to the appearance of the first incendiary rocket during the Napoleonic wars.[4] Following the invention of the backpack flamethrower in 1898, the development of flame and incendiary devices continued during and after World War I. During World War II, incendiary devices were used on a broad scale by the armed forces of most combatants. These devices are still considered to be effective combat weapons and occupy an important place in overall armament systems. Equipment and concepts for employment, however, have not changed significantly during the past 10 to 15 years.

Section II.

EURASIAN COMMUNIST COUNTRIES

A. POLICY AND DOCTRINE

1. ~~(C)~~ Policy

(b)(1)

2. ~~(C)~~ Doctrine

a. ~~(C)~~ Smoke.

(b)(1)

(b)(1)

b. (U) Flame and Incendiary.

(1) (U) Flame devices are used extensively in defensive operations.[3] Static flame operations are employed along expected troop avenues of approach in accordance with defensive obstacle plans. Flame weapons may be fired by remote control, timing devices, or pressure.

(2) (U) In withdrawal operations all types of flame weapons are utilized to carry out a scorched-earth policy. Mechanized flamethrowers are used in ambushes of advancing detachments and in general support of motorized rifle and tank units.

(3) (U) On the offense, flame weapons may be used to breach enemy forward areas for assault troops. Mechanized flamethrowers reinforce landing elements of main assault and exploitation forces. They are also effective for use in combat in built-up areas.

B. ORGANIZATION, TACTICS, AND TRAINING

3. (C-NOFORN) Organization

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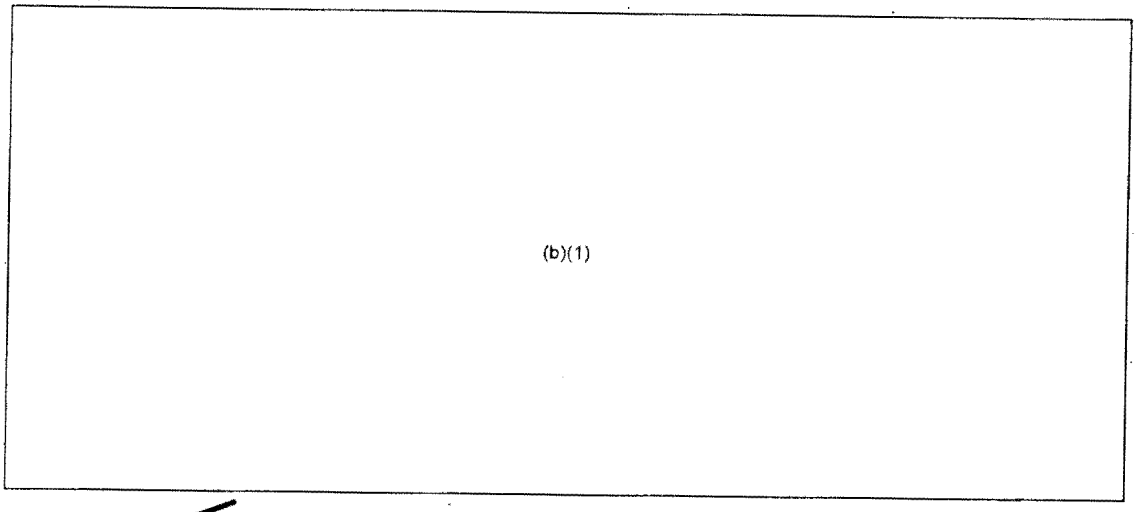

4. (C-NOFORN) Tactics

a. (C) Smoke.

(1) (U) In general, Soviet tactical principles are based on surprise and the employment of massive forces on a broad front. The Soviets maintain that when firing is done from a position covered with smoke, at targets located outside the smoke, effectiveness decreases approximately 10 times; when only the targets are concealed by smoke, effectiveness decreases 4 times. Laying down a smoke screen, especially an unexpected one, is also credited with having a significant psychological effect on enemy troops, giving them a sense of uncertainty and uneasiness. The Soviets recognize that it is particularly important for small-unit commanders, when planning for an attack, to study terrain features that can be used for concealment as well as to provide reference points for navigating in smoke.[12] Tank directional gyrocompasses can be used to maintain orientation and assist the movement of motorized rifle and artillery units to designated areas.

(2) (U) Artillery is expected to engage antitank weapons, including ATGMs. There should be direct and indirect fire and preplanned use of smoke. Antitank weapons close to the forward edge of the battle area (FEBA) in the 2-km zone can be expected to be engaged with a mix of smoke and high-explosive (HE) fire. Smoke fired from one weapon will be used to adjust fire. The remainder of the battery will fire smoke on the first volley, followed by mixed salvos and volleys of HE.[13]

(3) (U) In the past, Soviet doctrine has stated that during penetration, and in [illegible] attack across a broad front, smoke will normally be employed. It is believed that this doctrine is still valid, and that the use of smoke will be included in Soviet artillery fire planning. A variety of smoke agents and dissemination means, including field-artillery projectiles, gives the Soviets the capability to impair observation posts, to blind enemy weapons, to screen river crossings, to reduce the effectiveness of night-vision equipment, and to screen the flanks of attacking troops. During night combat, artillery smoke projectiles may be used to adjust fire when targets are not illuminated.[14]

(4) (U) During adjustment for a smoke mission, fire is conducted using an alternate point; then is shifted to the target. In this way, short rounds during adjustment will not obscure the target. The adjustment is fired, using one weapon, and continues until a 200-meter bracket is obtained for point targets, such as an observation post, or a 400-meter bracket is obtained for area screening targets, such as river-crossing sites. A battery salvo is fired when these brackets are split. The smoke from this salvo is observed and further adjustments continue to be made.

(5) (U) To blind a target when the wind is blowing toward the enemy, the mean point of impact should be 50 to 100 meters in front of a point target and 100 to 400 meters in front of an area target. If the wind is parallel or oblique to the target, the mean point of impact should be moved 50 to 100 meters toward the direction from which the wind is blowing. If there is a headwind, the center of impact should be adjusted onto the target.

(6) (U) A platoon or battery firing at a point target uses converged sheaf (the horizontal and vertical planes of the trajectories intersect at the target). A battery firing at an area target that is subjected to headwind, tailwind, or light crosswind uses parallel sheaf (the trajectories of all weapons are parallel). For screening the flanks, converged sheaf is used regardless of wind direction.

(7) ~~(C)~~ (b)(1)

(b)(1)

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(b)(1)

*For wind of 6 to 7 m/s increase number of rounds by 1.5 times.

Average Ammunition Expenditure to Screen Point Targets for 15 min

(b)(1)

(8) (C) (b)(1)

(b)(1)

(b)(1)

(10) (U) The Kostroma Chemical Defense Higher Military Command School, Kostrama (57-46N 40-55E), reportedly has devised a hand calculator for determining the number of various smoke dispensers required for a smoke mission.[21] Wind direction and velocity are taken into account. The use of such a calculator could indicate that smoke devices are being used in large quantities.

(11) (U) Because smoke can restrict optical, TV, and laser instruments as well as visual observations, smoke devices probably are widely used by various units on the front line and not handled by specialized units only.

b. (C-NOFORN) Flame and Incendiary.

(b)(1)

(2) (C-NOFORN) (b)(1)

(b)(1)

5. (S-NOFORN) Training

a. (U) Smoke.

(1) (U) The ECC are well aware of the necessity for training troops to use smoke and to operate in a smoke environment. A Soviet military author has stated: "Practical experience shows that a smoke screen can reduce losses of attacking tanks and motorized infantry by 60% to 80%. The extensive use of smoke weapons during tactical and other types of exercises enables personnel to acquire the experience required to ensure that maximum use is made of smoke weapons in the interest of achieving victory on the battlefield."[24] A number of reports describing smoke operations during field exercises indicate that the Soviets are preparing for extensive use of smoke both in offensive and in defensive operations.

(2) (C) (b)(1)

(b)(1)

(3) (U) River-crossing exercises using TDA as well as other means to lay smoke screens have also been described.[28]

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b. (S-~~NOFORN~~) Flame and Incendiaries.

(1) (~~C~~) (b)(1)

(b)(1)

(4) (U) During infantry training Polish troops are taught how to fight in a napalm attack. Troops are drilled over a napalm obstacle course that includes running through tunnels of burning napalm, jumping through napalm fire walls and burning buildings, and jumping over flaming ditches. The soldiers train while wearing masks; the training is repeated until the soldiers lose their fear of burning napalm.

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(5) (U) The Soviet Chemical Defense School of the Kostromskiy High Military Command has a flamethrower training area. Training displays have been set up on a row of stands. The area contains a preparation section where flame fuels are mixed in the MSAO-1 mechanical mixer, two areas with shelters in which light and heavy flamethrowers are loaded, and a target area for flamethrower unit practice. Training emphasis is placed on assembling, disassembling, loading, and servicing flamethrowers under field conditions.

C. STANDARD SMOKE AGENTS AND MUNITION/DISPERSION SYSTEMS

6. (U) Standard Agents

a. (b)(1)

(b)(1)

(2) (U) A KSP-4 distress signal contained 36% coal tar, 62% potassium chlorate, 0.5% magnesium, and 1.5% shellac.[34]

(3) (U) A patent covers an improved mixture for use in practice antiaircraft rounds. The mix consists of about 46% potassium chloride, 38% naphthalene, and 16% thiourea.[35]

(4) (U) A mixture intended to quench underground fires contained 35% to 50% oxidizing agent (potassium chlorate or potassium nitrate), 15% to 40% fuel (nitrogen-containing compounds such as dicyanamide, nitroguanidine, or urea), 22% to 35% carbonate, and about 3% iditol.[36]

c. (U) The attenuation characteristics of common smokes will be discussed along with research and development (R&D) efforts later.

7. ~~(C-NOFORN)~~ Munition/Dispersion Systems

a. (U) General. The ECC possess a variety of devices and munitions that give them great versatility in the employment of smoke screens. Man-portable, vehicle-mounted, and emplaced devices, as well as artillery and mortar shells, are known to exist.

b. ~~(C)~~ Grenades.

(b)(1)

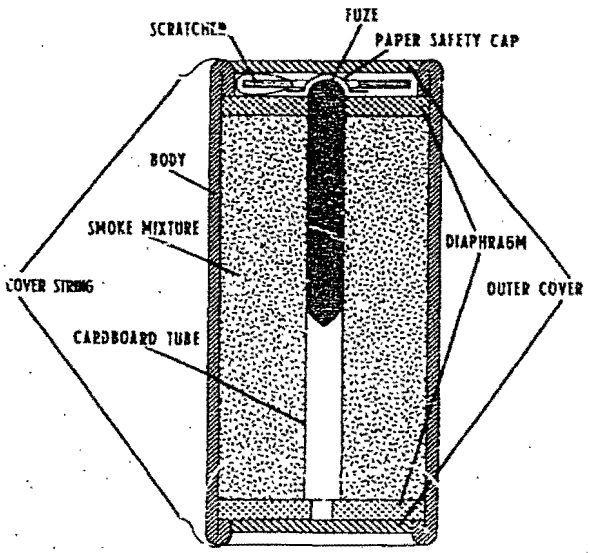

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Figure 2-1. Soviet smoke hand grenade (U).

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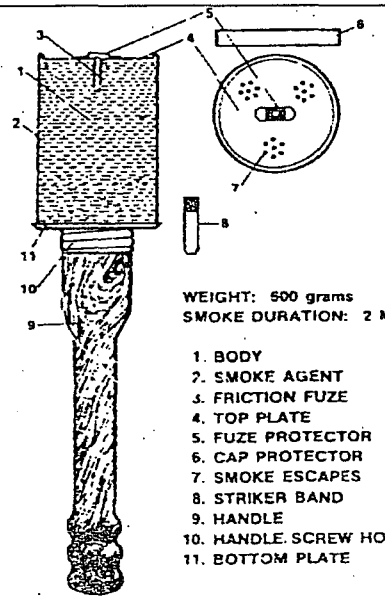

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Figure 2-2. Yugoslav smoke hand grenade (U).

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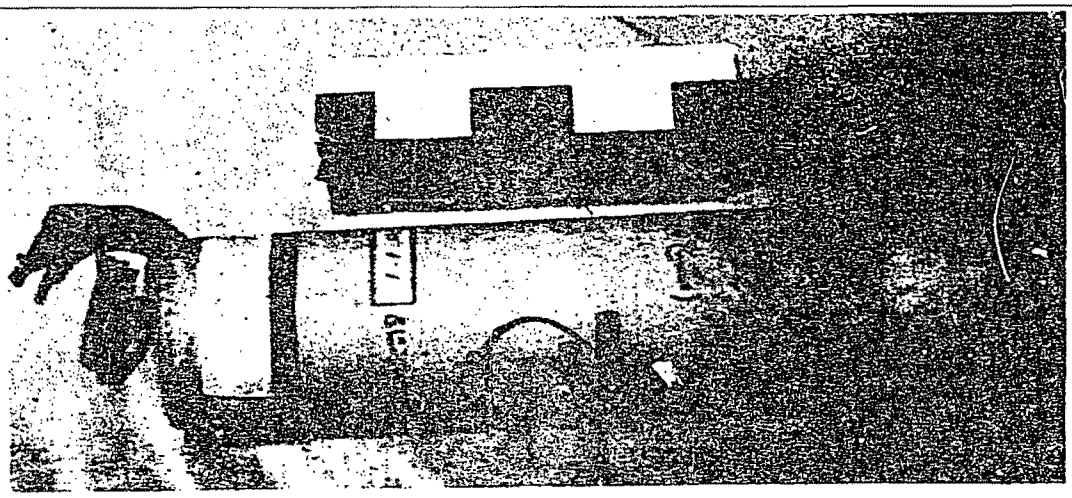

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Figure 2-3. Egyptian smoke hand grenade (U).

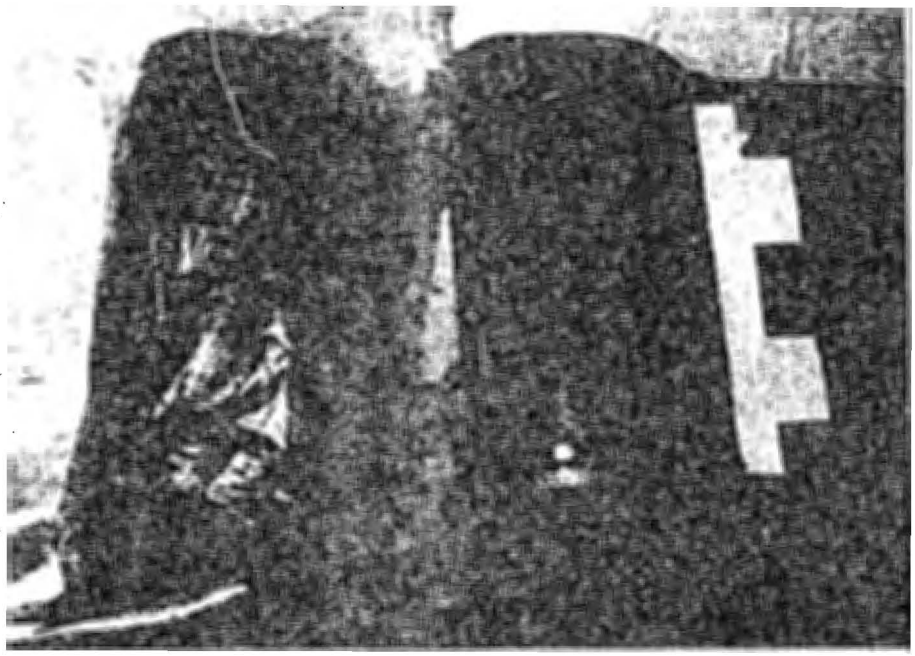

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Figure 2-4. Egyptian toxic smoke grenade (U).

(6) ~~(C)~~ (b)(1)

(b)(1)

Table 2-I. Technical Characteristics of ECC Smoke, Hand, and Rifle Grenades (U)

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(1) (C) Smoke pots.

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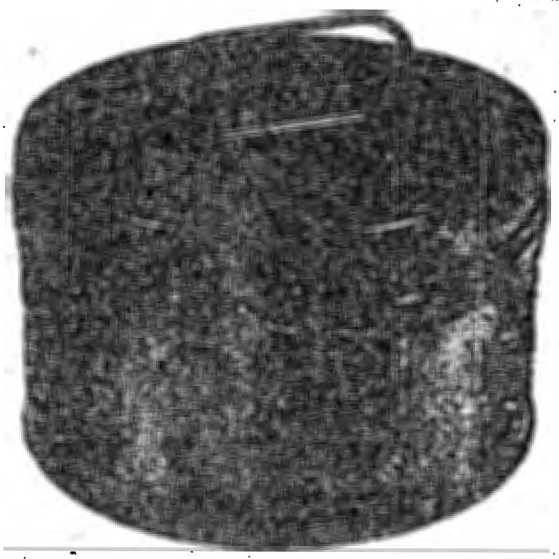

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Figure 2-5. Soviet DM-11 smoke pot (U).

(b)(1)

(c) (C) (b)(1)

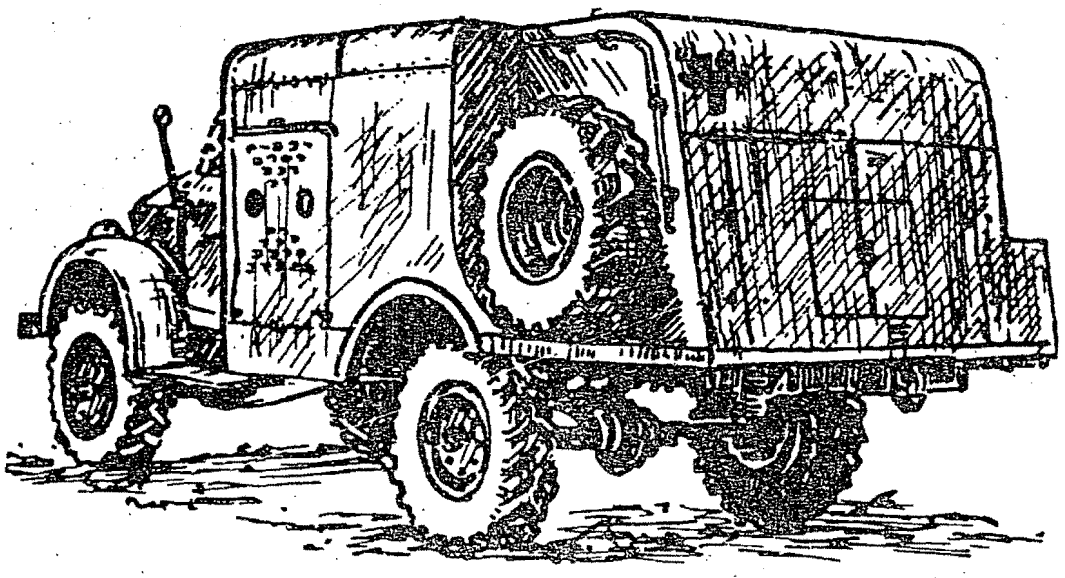
(b)(1)

(2) (C) Smoke barrels.

(b)(1)

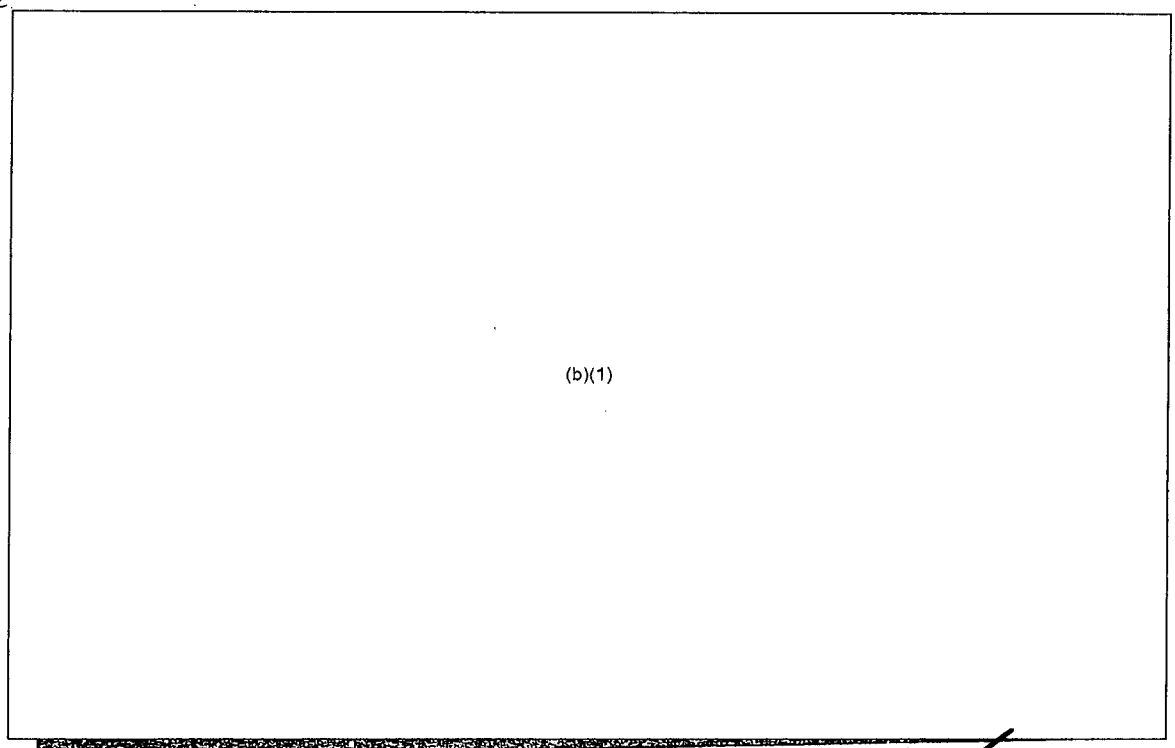
(b)(1)

(b)(1)



Neg. 522848 (UNCLASSIFIED)

Figure 2-7. East German GAZ-63 smoke-generating vehicle (U).



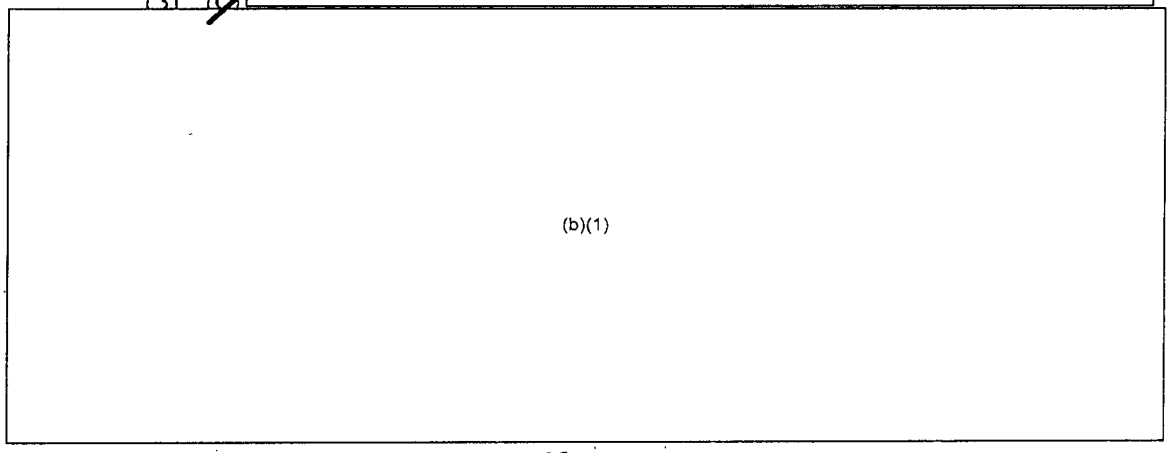
Neg. 554986

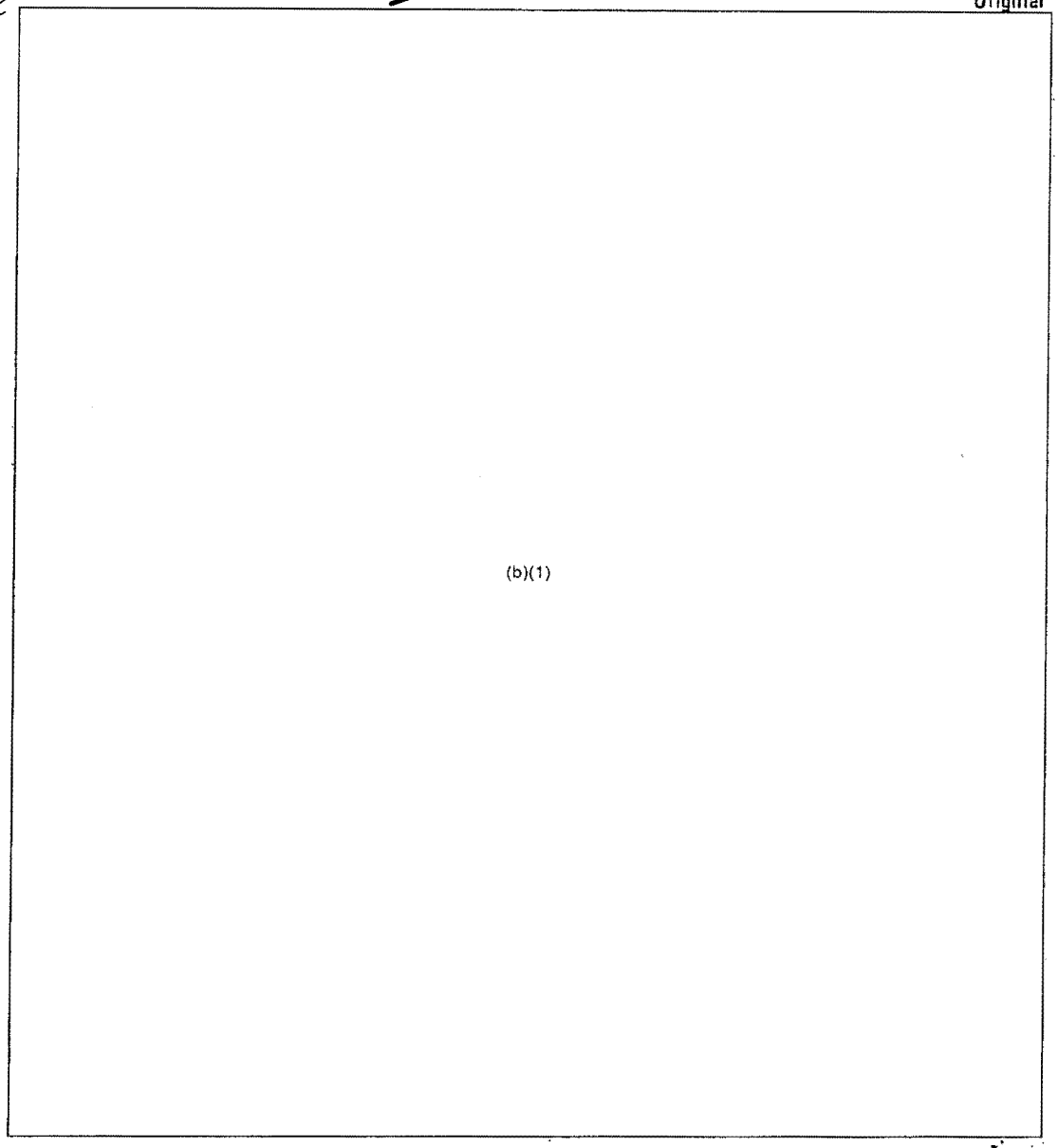
(CONFIDENTIAL)

Figure 2-8. Vehicle making smoke (U).

(3) (C)

(b)(1)





FUEL FLOW SCHEMATIC, SMOKE GENERATOR SYSTEM

Neg. 554987

(CONFIDENTIAL)

Figure 2-9. Engine installation and schematic diagram of TDA system (U).

Original

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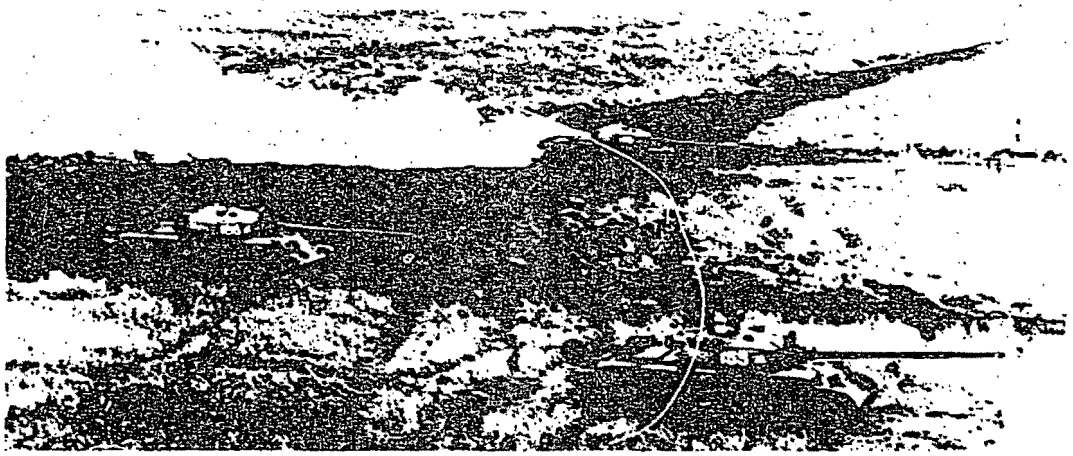


Neg. 515836

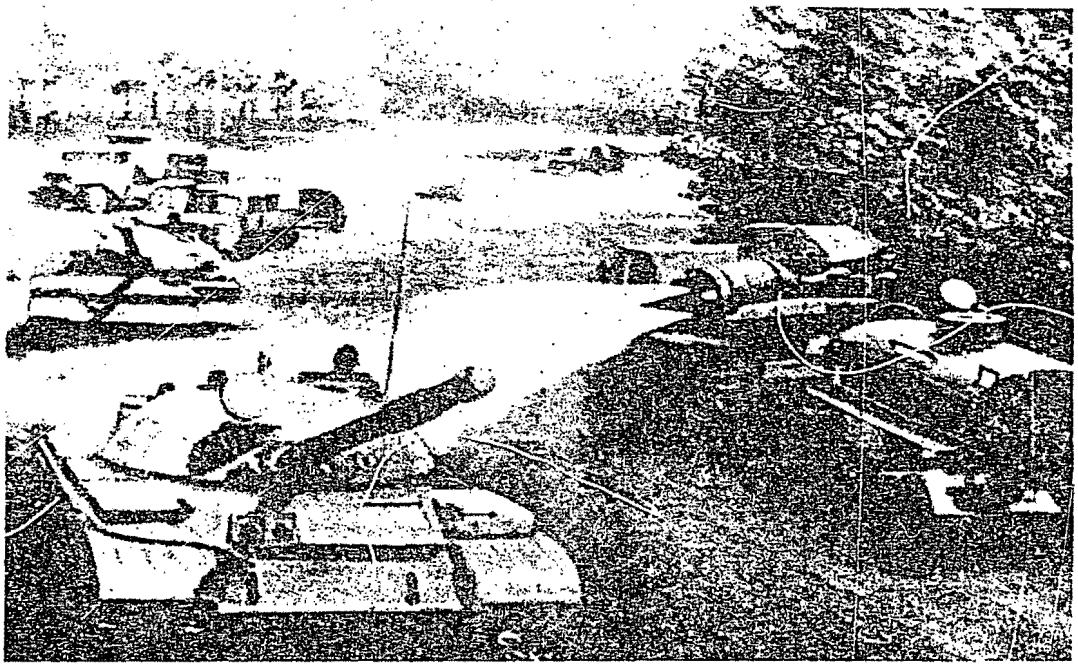
(UNCLASSIFIED)

Figure 2-10. Tanks producing smoke (U).

(4) (C)

(b)(1)

(b)(1)



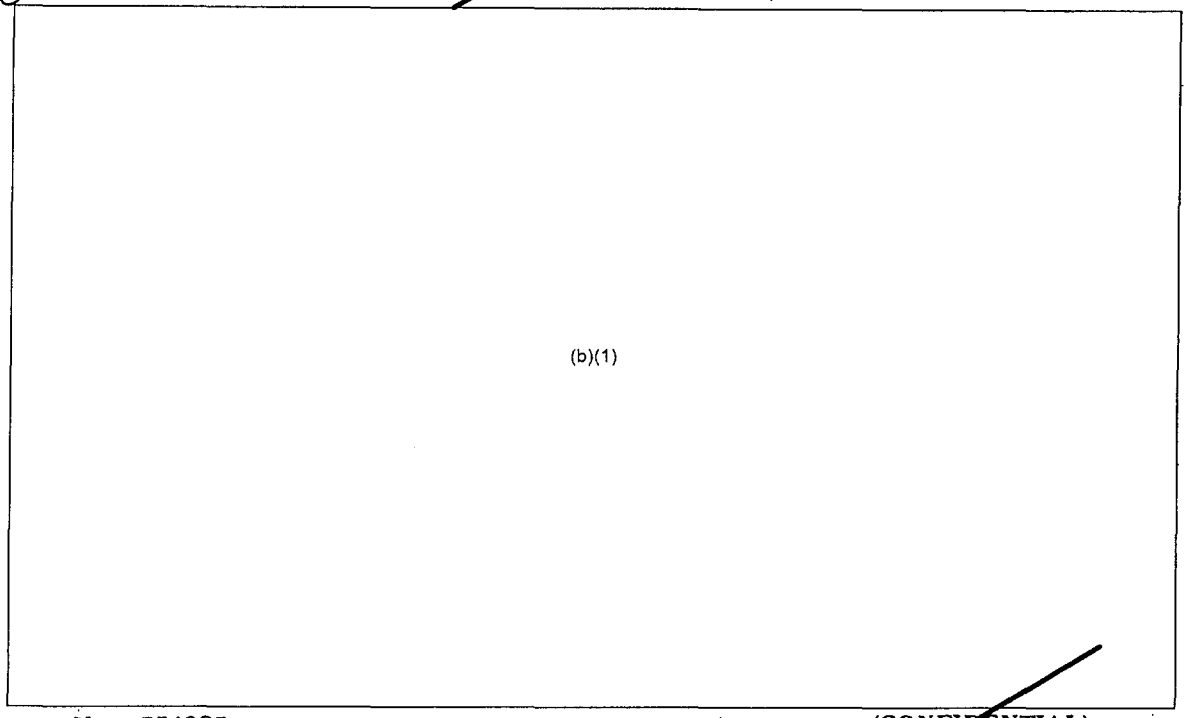
Neg. 511110 (UNCLASSIFIED)

Figure 2-11. Soviet decontamination vehicle, TMS-65 (U).

(b)(1)

Neg. 554984 (CONFIDENTIAL)

Figure 2-12. Soviet MAG-3 jet engine forger (U).

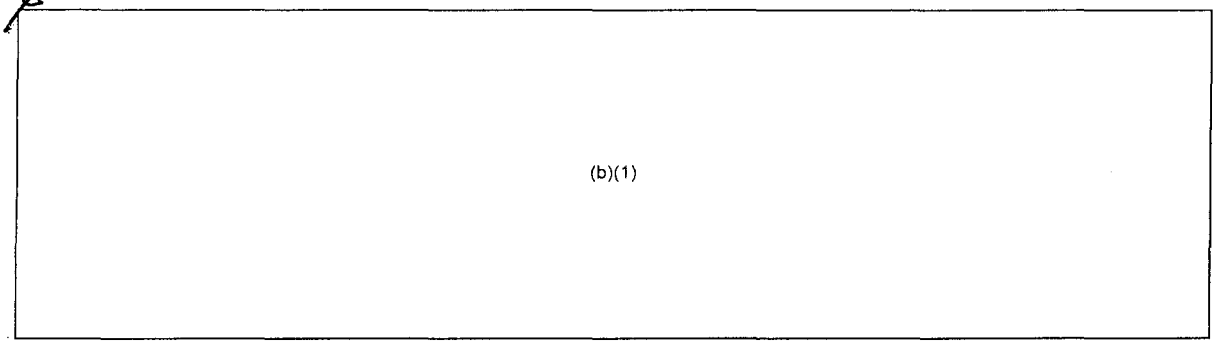


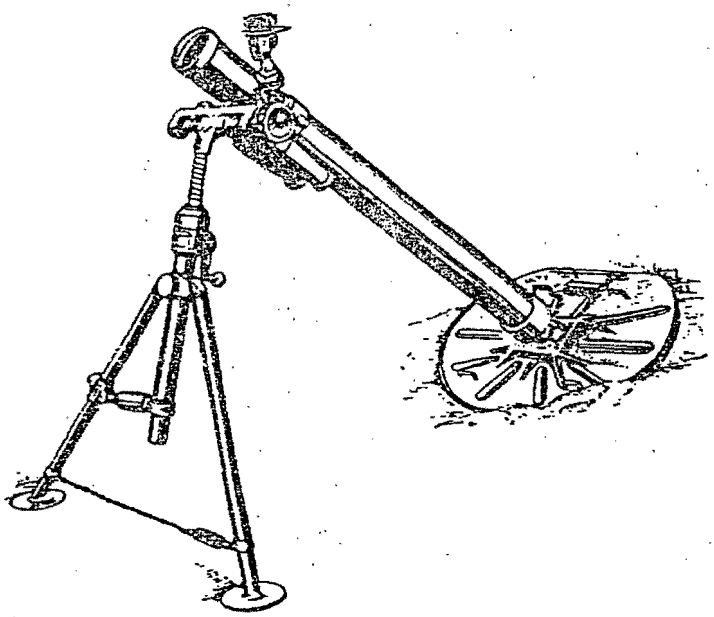
Neg. 554985 (CONFIDENTIAL)

Figure 2-13. Tractor-mounted jet engine (U).

c. (C-NOFORN) Mortar Projectiles.

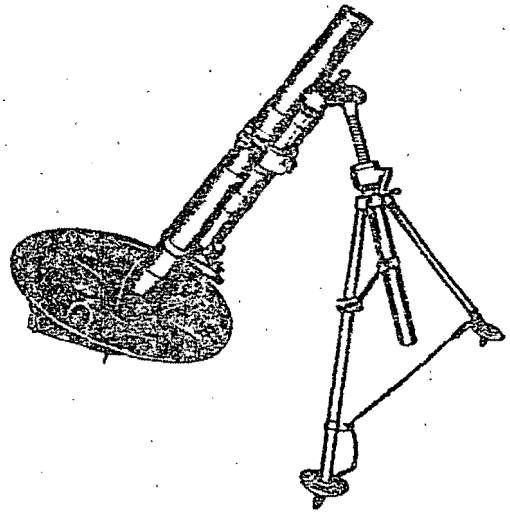
(1) (C-NOFORN) General.





Neg. 500182 (UNCLASSIFIED)

Figure 2-14. Soviet 1937 82-mm mortar smoke projectile (U).

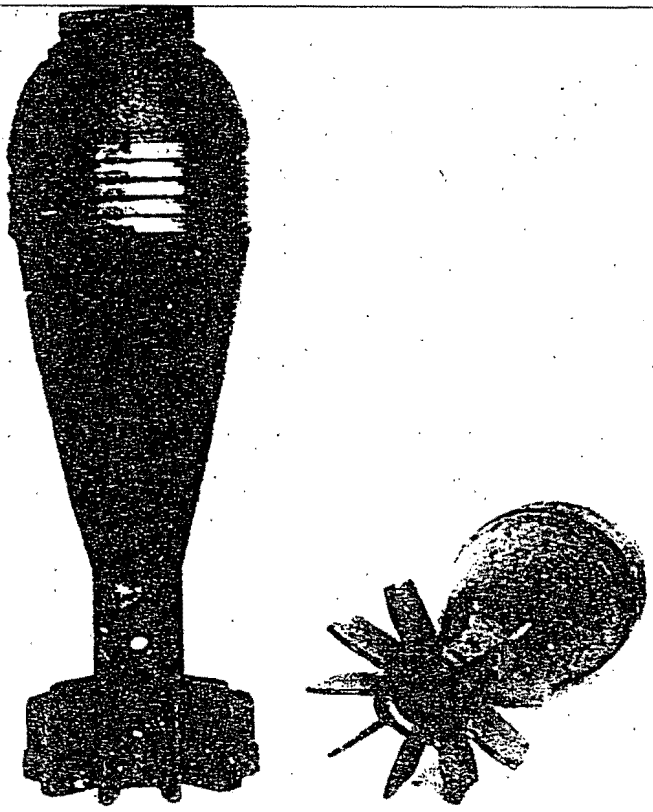


Neg. 508665 (UNCLASSIFIED)

Figure 2-15. Soviet 1943 120-mm mortar smoke projectile (U).

(U) (C-NOFORN) (b)(1)

(b)(1)



Neg. 522849 (UNCLASSIFIED)

Figure 2-16. Soviet 82-mm mortar smoke projectile, Model D-832, unfuzed (U).

NOT RELEASABLE TO FOREIGN NATIONALS

Table 2-II. Foreign Smoke (Smoke/Incendiary) Mortar Ammunition (U)

(b)(1)

(CONFIDE

NOT Rreleasable to foreign nationals

CONFIDENTIAL

Table 2-II. Foreign Smoke (Smoke/Incendiary) Mortar Ammunition (U)

DST-1620S-145-77

CONFIDENTIAL

(b)(1)

E

(CONFIDENTIAL)

Original

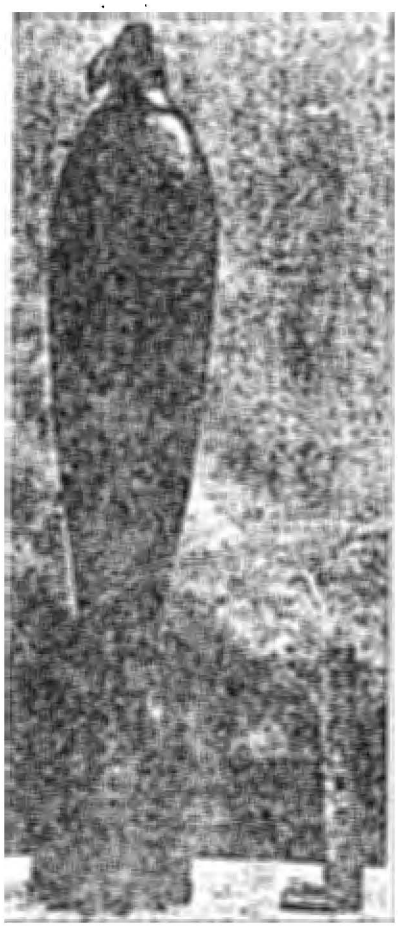
(2) (c) (b)(1)

(b)(1)

(3) (C) 120-mm smoke projectile, D-843A.

(a) (C) Description.

(b)(1)



Neg. 522850 (UNCLASSIFIED)

Figure 2-17. Soviet 120-mm mortar smoke projectile, Model D-843A (U).

2. (C) (b)(1)

(b)(1)

(b) (C) Performance.

(b)(1)

f. (C-~~NOFORN~~) Artillery Projectiles.

(b)(1)

DST-1620S-145-77 Original

(b)(1)

(2) (b)(1)

(b)(1)

Table 2-III. Technical Characteristics of ECC Artillery Smoke Ammunition (U)

(b)(1)

(CONFIDENTIAL)

NOT RELEASABLE TO FOREIGN NATIONALS

Table 2-IV. Average Consumption of Smoke Ammunition per Kilometer Front for 15 Minutes (U)

(b)(1)

(CONFIDENTIAL NOFORN)

Table 2-V. Average Consumption of Smoke Ammunition to Screen an Isolated Target for 15 Minutes (U)

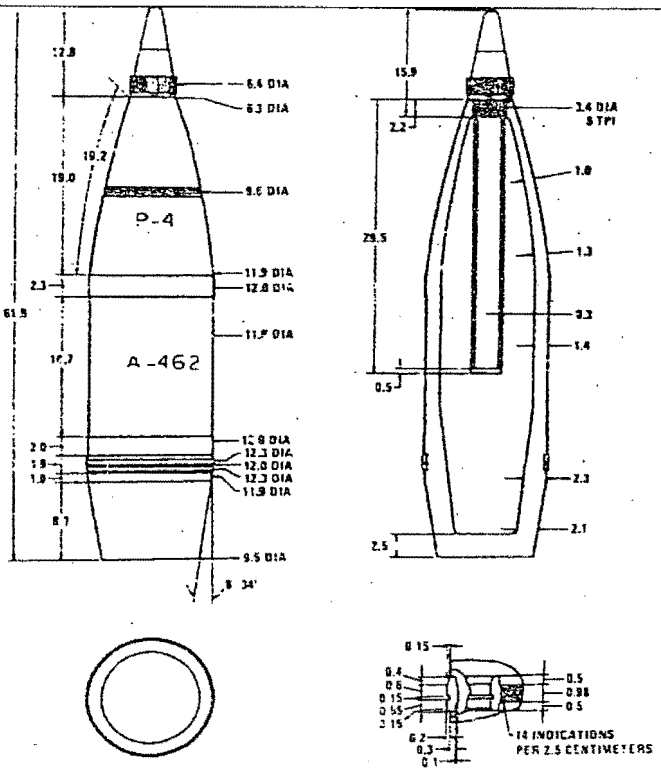
(b)(1)

(CONFIDENTIAL NOFORN)

NOT RELEASABLE TO FOREIGN NATIONALS

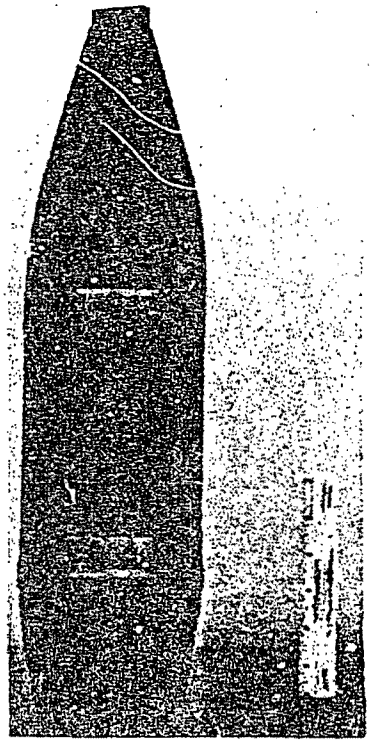
(5) (C) (b)(1)

(b)(1)



Neg. 502888 (UNCLASSIFIED)

Figure 2-18. Soviet 122-mm smoke projectile, Model D-462, without fuze (U).

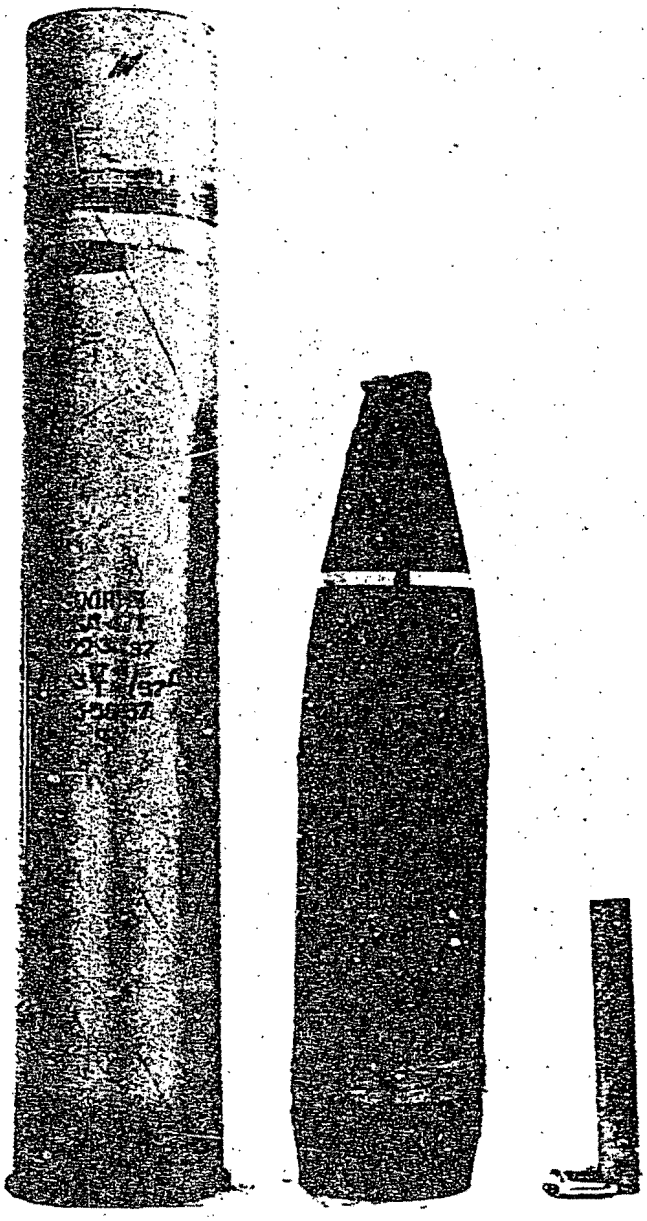


Neg. 522851 (UNCLASSIFIED)

Figure 2-19. Soviet 122-mm smoke projectile, Model D-462 (U).

(b) (C) (b)(1)

(b)(1)



Neg. 522852 (UNCLASSIFIED)

Figure 20. Soviet 122-mm smoke projectile, Model DTS-471, without fuze, with propelling charge ZLD-471 (U).

(b)(1)

(8) (U) Yugoslav 76-mm smoke projectile. The 76-mm mountain howitzer B-1 is standard in the Yugoslav Army. The smoke cartridge for the 76-mm mountain howitzer M1948 (B-1) is of the semifixed, adjustable propelling charge design.[56] The WP-filled projectile has a full-length burster initiated by the Yugoslav M51A5. Other characteristics of this cartridge are unknown.

D. STANDARD FLAME FUELS AND FLAMETHROWERS

8. (C) Flame Fuels

(b)(1)

9. (C) Flamethrowers

a. (C) (b)(1)

(b)(1)

b. (U) Manpack flamethrowers. The latest known standard manpack flamethrower, Model LPO-50, comprises a flamegun, a hose, and a backpack assembly of three fuel tanks.[3 41] Each tank of fuel can be fired individually by setting a switch on the gun and pulling the trigger. Batteries in the gun's stock are used to ignite the pyrotechnic cartridges that pressurize the tanks and those that ignite the fuel as it leaves the gun. The weapon's effective range is 18 to 72 meters. The empty weight is 15 kg; the weight when filled with 10 liters of flame fuel is 23 kg. The Chinese version of the LPO-50 is the Model 58. Vietnamese references to a Model F-50 (and possible K-5, AT-60 and AT-64) relate to Soviet and Chinese versions.

c. (C) (b)(1)

(b)(1)

d. (U) Emplaced or Fougasse Flamethrowers. The Model FO emplaced flamethrower comprises a fuel tank, an ejection nozzle, pyrotechnic pressurizing and ignition cartridges, and an electric wiring system that leads to a remote firing-control position.[3] These flamethrowers are placed in shallow pits or are otherwise concealed at anticipated points of attack. Flame fuel may be emitted horizontally from a one-direction nozzle or from one that disseminates the burning fuel in five horizontal directions. The Model FO holds 25 liters of fuel. The range with the single nozzle is 127 meters, and with the multiple direction nozzle, 91 meters. The flamethrower weighs approximately 53 kg when filled and 34 kg when empty.

e. (C) (b)(1)

(b)(1)

E. INCENDIARY AGENTS AND MUNITIONS

10. (U) Incendiary Agents

Incendiary agents are considered extremely effective in combat operations. Continued Soviet interest is reflected in the large number of articles appearing in their military journals dealing with defense training against incendiaries.[3] A variety of incendiary-agent-filled ground and aerial munitions has been developed for use against a wide spectrum of tactical and strategic targets. The standard or possible incendiary agents available (table 2-VI) apparently do not represent new or unusual concepts, but some experimental compounds, such as the pyrophoric metals and the alkyl-metal compounds, could advance incendiary capabilities.

11. ~~(C)~~ Incendiary Ground Munitions

(b)(1)

a. (U) Bullets. The 7.62-mm ZP bullet, which contains an incendiary fill of magnesium, aluminum, and barium nitrate, can be used against unarmored fuel tanks and also for the adjustment of fire.[3] Type-Z incendiary tracer bullets—composed of magnesium, aluminum, strontium nitrate, and barium oxide—can be used to ignite easily combustible materiel and fuel contained in tanks made of metal up to 3 mm thick.

b. ~~(C)~~ (b)(1)

(b)(1)

Table 2-VI. Known or Possible Incendiary Agents (U)

(b)(1)

(CONFIDENTIAL)

F. PRODUCTION, STORAGE, AND STOCKPILES

12. (C-NOFORN) Production

a. (C-NOFORN)

(b)(1)

(b)(1)

f. (C-NOFORN) (b)(1)

(b)(1)

v. (C-NOFORN) (b)(1)

(b)(1)

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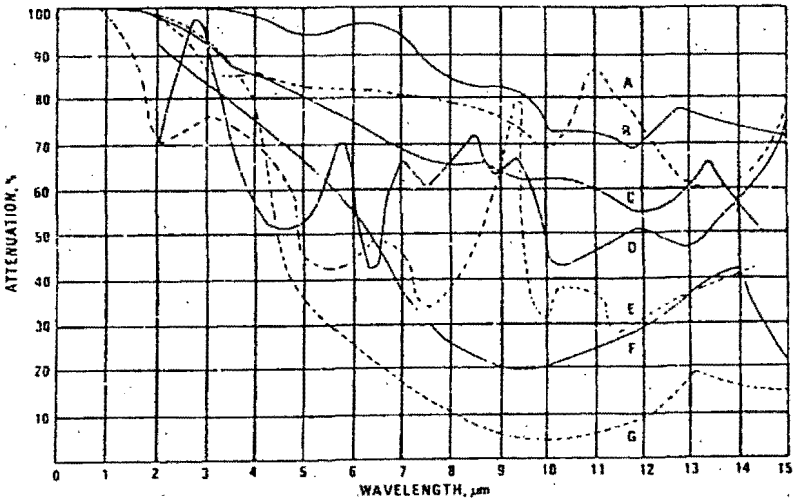
G. DEFENSE

14. (C-NOFORN) Electro-Optical Countermeasures

a. (C-NOFORN) (b)(1)

(b)(1)



INFRARED ATTENUATION PRODUCED BY SMOKE AGENTS
SMOKE CONCENTRATION 100 mg/ℓ
PATH LENGTH 31m

Neg. 519112 (UNCLASSIFIED)

Figure 2-21. Smoke attenuation of infrared radiation (U).

NOT RELEASABLE TO FOREIGN NATIONALS

b. (C) (b)(1)

(b)(1)

c. (U) Soviet military publications show that defense against ATGM is a serious consideration and possibly takes precedence over other forms of smoke use. Examples of these writings are given below:[80]

- As is known, the most effective means of combating tanks at the present time is considered to be antitank guided rockets (PTURS). Therefore, they should be destroyed with the fire of rockets, artillery, tanks, and infantry. In addition, the effectiveness of the fire of the PTURS can be lowered with the help of smoke. However, for this purpose, one should know the weak sides of guided rockets and skillfully exploit them. Thus, at the start of its flight, for a sector of up to 400 meters, the rocket is difficult to control. Therefore, in open terrain PTURSs can damage tanks only in a zone from 300-400 meters up to 2 to 3 kilometers (the maximum flight range of the rocket). For this purpose, the launcher operator must simultaneously observe both the target and the rocket.

- Tanks cross a path of 2-3 kilometers in 8-12 minutes. If, during this time, the PTURS positions are blinded or the tanks are covered by a masking smoke screen (of course, under favorable meterological conditions), the problem will be solved. This can be done with the help of smoke rounds as well as using the existing smoke equipment of tanks (thermal smoke apparatus TDA or large smoke cartridges BDSh).

- Let us assume that a tank battalion is advancing on a prepared enemy defense. With an oblique or a frontal wind towards the enemy, 2-3 tank platoons with TDA which will screen with smoke the entire front of the attackers are sufficient for the reliable screening of the firing positions of the PTURSs. These platoons are required to move ahead of the battalion at a distance of 300-400 meters.

- Some tanks are equipped with two smoke cartridges BDSh-5 or BDSh-15. The duration of the burning of the cartridges is 9-11 minutes, and the length of the zone which cannot be seen through from one cartridge with a wind speed of 5 meters per second is up to 500 meters and its width is approximately 100 meters. They can also be used successfully for blinding PTURSs.

- With the help of BDSh, it is possible to lay an immobile smoke screen with a frontal wind towards the enemy too. In this, the distance between the "smoking" tanks should not exceed 100 meters. In order to lay a screen along the front of the attack of a tank battalion, it is necessary to detail one or two tank platoons.

- In order to reduce the effectiveness of the fire of the PTURSs, tanks should move at increased speeds, rapidly maneuver on the field of battle and exploit the protective properties of the terrain. With the fire from all weapons, and first of all artillery weapons, the launchers of the antitank guided rockets should be destroyed. At the same time smoke should occupy their place in this fight. Therefore, tankers should learn to operate confidently under conditions of smoke.

d. (C-NOFORN) (b)(1)

(b)(1)

15. (U) (S-NOFORN-WNINTEL) Therapy

a. (U) (S-NOFORN-WNINTEL) Smokes.

(1) (C-WNINTEL) (b)(1)

(b)(1)

(2) (U) In addition to inhalation injuries that may be caused by smokes, some liquid agents (e.g., sulfur trioxide, chlorosulfonic acid, and titanium tetrachloride) will also cause burns when they come in contact with the skin. Recommended treatment consists of copious washing of affected areas with water, followed by a wash with a soda solution.[88]

(3) (U) There is little information from the PRC concerning the treatment of smoke inhalation injuries. Initial therapy for irritation of the mucous membranes of the respiratory tract would probably be similar to that recommended for treatment after mustard gas (HD) inhalation. For relief of the coughing and irritation resulting from HD exposure, a Chinese military handbook recommends that the victim inhale the vapor resulting from a mixture of 20 ml of ethyl ether, 40 ml of chloroform, and 40 ml of ethanol, to which five or six drops of ammonia water are added. To treat acid burns that may occur on the skin, the affected area is to be flushed with water or soaked in a water bath.[89]

(4) (C) (b)(1)

(b)(1)

b. (U) Flame and Incendiary.

(1) (U) Available Soviet and Warsaw Pact information on recommended treatment of injuries due to flame and incendiary agents deals primarily with napalm and phosphorus. Articles pertaining to napalm indicate that burns are not the only medical concern. Other effects include a strong negative psychological reaction among troops; high temperatures, which may cause dehydration; oxygen depletion; and poisoning by carbon monoxide generated during combustion. In the case of napalm burns it is of primary importance to extinguish the agent and prevent it from reigniting. Once this is accomplished, the casualty should be led from the battlefield and treated for shock, renal insufficiency, and acute toxemia, which may result from byproducts in burned areas of the body. Casualties are given anesthetics, are washed down with disinfectants, and fluids are replaced intravenously.[93-95] One article recommends the application, after the agent is extinguished, of a 5% solution of potassium permanganate to the burned area.[89] East German treatment for napalm burns includes the additional application of a salve-impregnated bandage that is to be changed two or three times a week.[96] Further treatment of serious burns would then require the removal of necrotic tissue and, subsequently, skin-graft operations.

(2) (U) The major medical problem resulting from the use of phosphorus is burns. Burning phosphorus on the skin may be extinguished by complete immersion of the affected area in water, or by covering it with sand or dirt. The phosphorus should then be removed from the skin with a small wooden board. The burned area should be washed with a 10% solution of copper sulfate, calcium chloride, or potassium permanganate and then treated conventionally.[93]

(3) (U) The treatment of burns has been studied extensively in the PRC since the early 1950s. Much Chinese burn therapy consists of a combination of Western and traditional Chinese (herbal) medicine.

(4) (C) (b)(1)

(b)(1)

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(5) (C) (b)(1)

(b)(1)

(6) (U) There is no information available on specific North Korean treatments. The Koreans, however, have received extensive aid in the past from both the USSR and the PRC; it is probable, therefore, that their burn therapy is based on procedures followed in one or both of these countries. No information is available on flame and incendiary casualty treatment for the Mongolian Peoples Republic, the Khmer Republic (Cambodia), or Laos.

(7) (C) (b)(1)

(b)(1)

H. RESEARCH AND DEVELOPMENT

16. (C) Agents

a. Smoke.

(b)(1)

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(b)(1)

(b)(1)

c. Incendiary.

(b)(1)

(b)(1)

17. (C) Munition/Dispersion Systems

(b)(1)

I. AEROSPACE SMOKE, FLAME, AND INCENDIARY CAPABILITIES

19. (S-NOFORN) General

a. (C-NOFORN) (b)(1)

(b)(1)

b (S) (b)(1)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

c. (S-NOFORN) Considerable intelligence gaps exist with regard to the capability

(b)(1)

(b)(1)

20. (S-NOFORN) Standard Agents and Dispersion Systems

a. (S-NOFORN) Smoke

(b)(1)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(b)(1)

(3) (S-NOFORN) (b)(1)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(b)(1)

*Unknown (SECRET)

b. (S-NOFORN) Flame and Incendiary Capabilities.

(1) (S) (b)(1)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(2) (S) (b)(1)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

Table 2-VIII. Soviet Aerial Incendiary Munitions (U)

(b)(1)

*Concentrated-action.
**Dispersed-action.

(CONFIDENTIAL-NOFORN)

NOT RELEASABLE TO FOREIGN NATIONALS

(7) (S)

(b)(1)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

Table 2-X. Soviet Incendiary Munition Color Coding (U)

(b)(1)

(SECRET NOFORN)

21. (S-NOFORN) Research and Development

(b)(1)

b. (S-NOFORN) (b)(1)

(b)(1)

22. (S) Trends and Forecast.

a. Trends.

(b)(1)

(b)(1)

J. NAVAL SMOKE, FLAME, AND INCENDIARY CAPABILITIES

23. (S-NOFORN) Standard Agents and Dispersion Systems

a. (U) Introduction

(1) (U) There is no information available that describes Warsaw Pact naval incendiary/flame capabilities or operations. There is information, however, to indicate a substantial Warsaw Pact capability for utilizing smoke and aerosol obscurant (AO) agents.

(2) (U) The methodical and planned use of smoke agents in battle was largely a development of World War I. The original purpose of smoke utilization was either to blind the vision of the enemy or to screen friendly forces or terrain from enemy visual observation.

(3) (U) The terminology "aerosol obscurants" has been adopted by the Joint Technical Coordinating Group to define current chemical agents and their specific function to obscure or decoy microwave and EO guided terminal homing munitions or reconnaisance sensor systems. Some of the World War I chemical smokes will, in fact, screen both visual and EO sensing devices. Chemical compounds have been or are being developed specifically to counter sensing devices. The primary purpose for the use of chemical agents, as described in this section, is to obscure or decoy terminal homing munitions or reconnaisance sensor systems.

b. (U) The Threat.

(1) (U) The outcome of future military operations will become increasingly dependent upon the ability of force commanders to perform missions within a hostile environment which includes EO and microwave (radar) devices. These devices will be utilized by the enemy for directing gun-fire, guiding missiles, and for surveillance operations. The successful completion of a force's mission will, to a great extent, be a function of how well the commander can play "hide and seek."

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(2) (C) (b)(1)

(b)(1)

c. (C) Technical Issues.

(1) (C) Aerosol obscurants.

(b)(1)

(b)(1)

(b)(1)

§

(b)(1)

d. (S-NOFORN) Screening Capabilities

§

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

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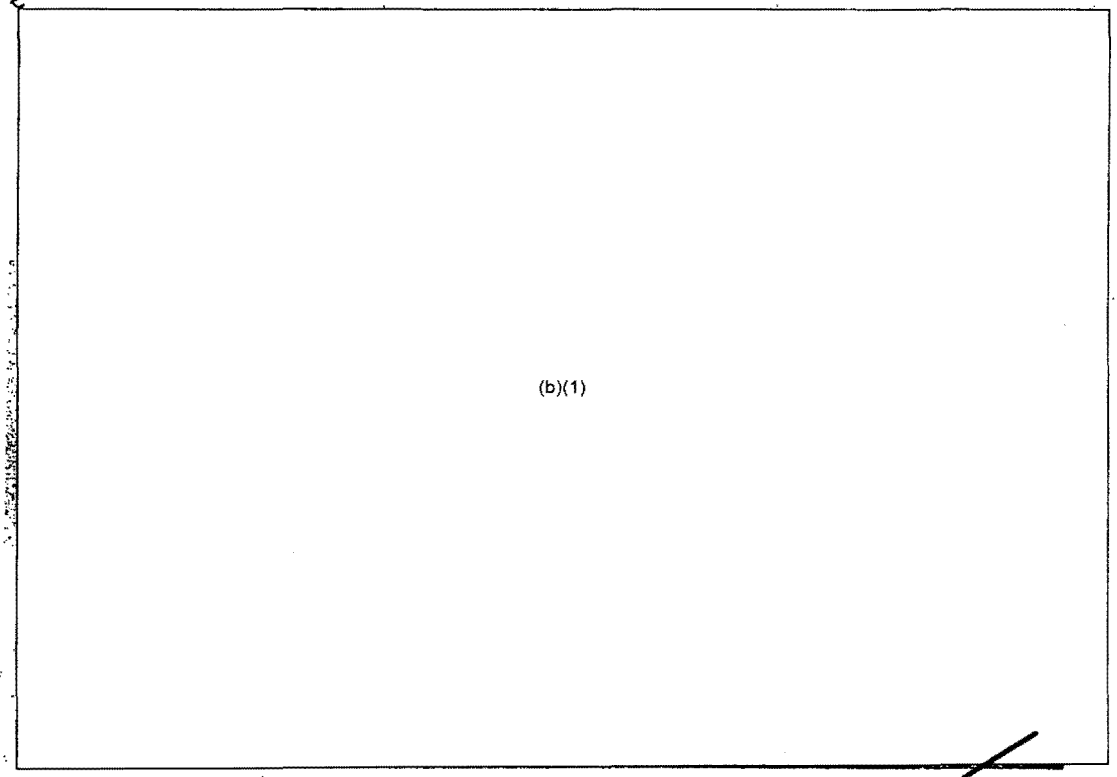
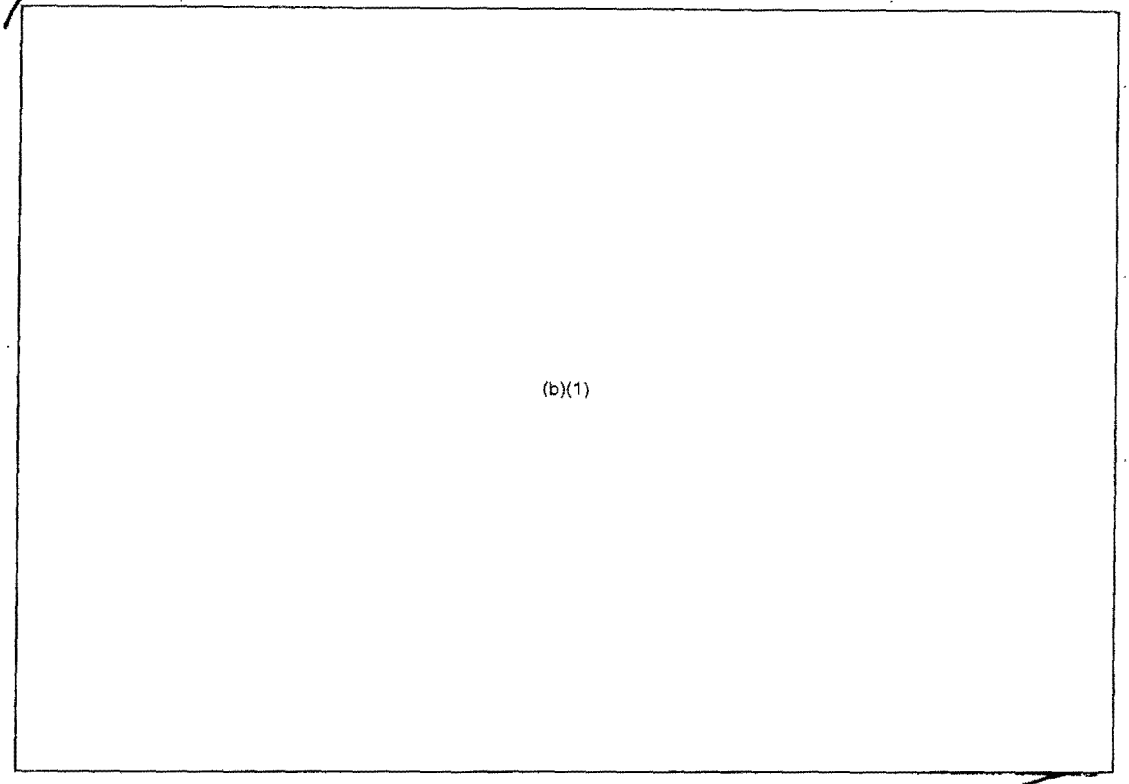


Neg. 552783 (CONFIDENTIAL)

Figure 2-22. DON Class AS MAGOMET GADZHIEV submarine tender laying smoke, 1965 (U).

NOT RELEASABLE TO FOREIGN NATIONALS

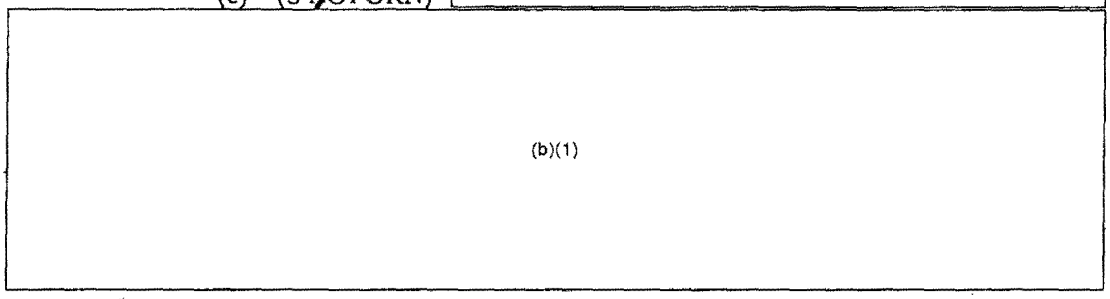


Neg. 554983

(CONFIDENTIAL)

Figure 2-23. MDSh-type smoke boxes on POTI Class PCE, 1965 (c).

(c) (S-NOFORN) (b)(1)



NOT RELEASABLE TO FOREIGN NATOINALS

DST-1620S-145-77 Original

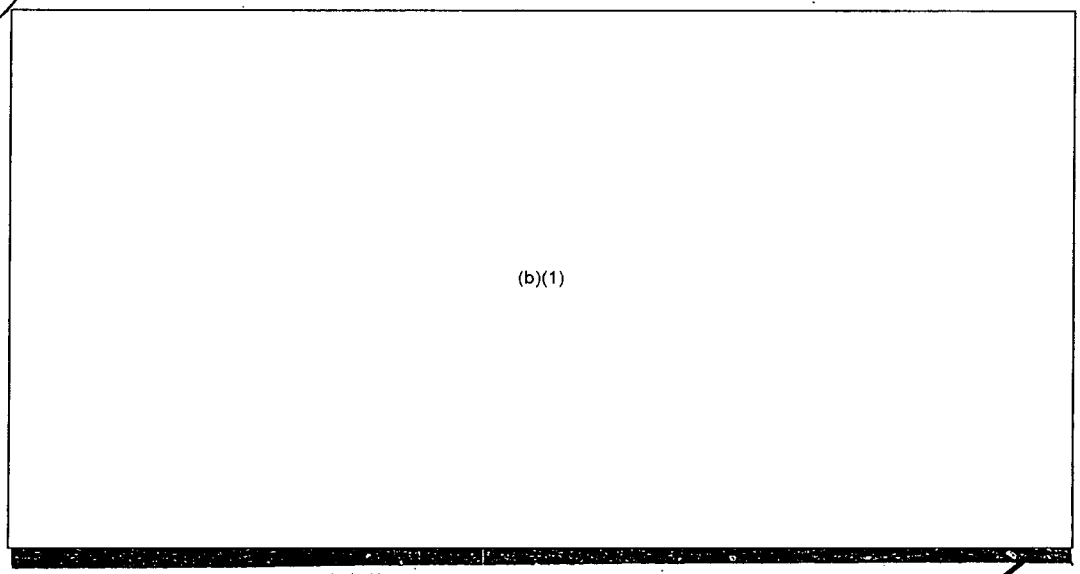


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Figure 2-24. KRESTA II Class CLGM laying smoke, 1975 (C-NOFORN).

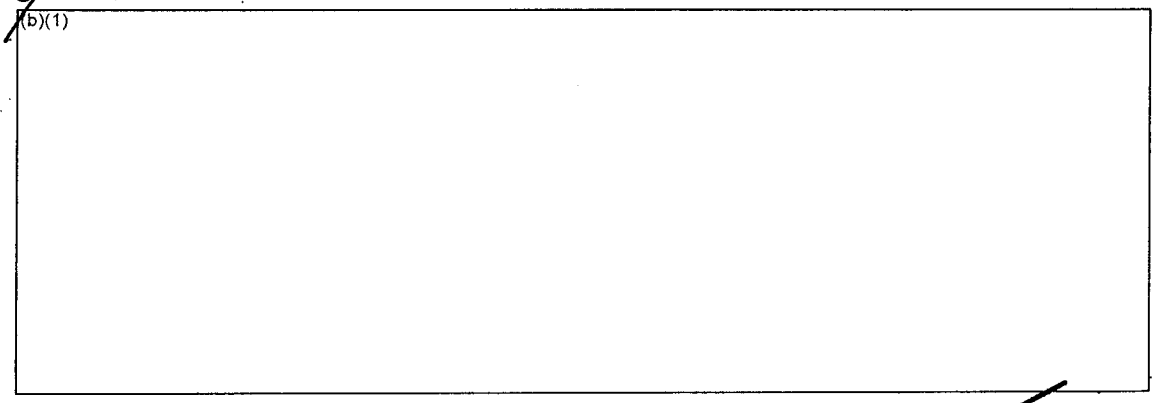

Figure 2-25. POINOCNY Class LSM deploying smoke, 1976 (C) CONFIDENTIAL.

NOT RELEASABLE TO FOREIGN NATIONALS

(d) (SECRET NOFORN)

(b)(1)

(b)(1)

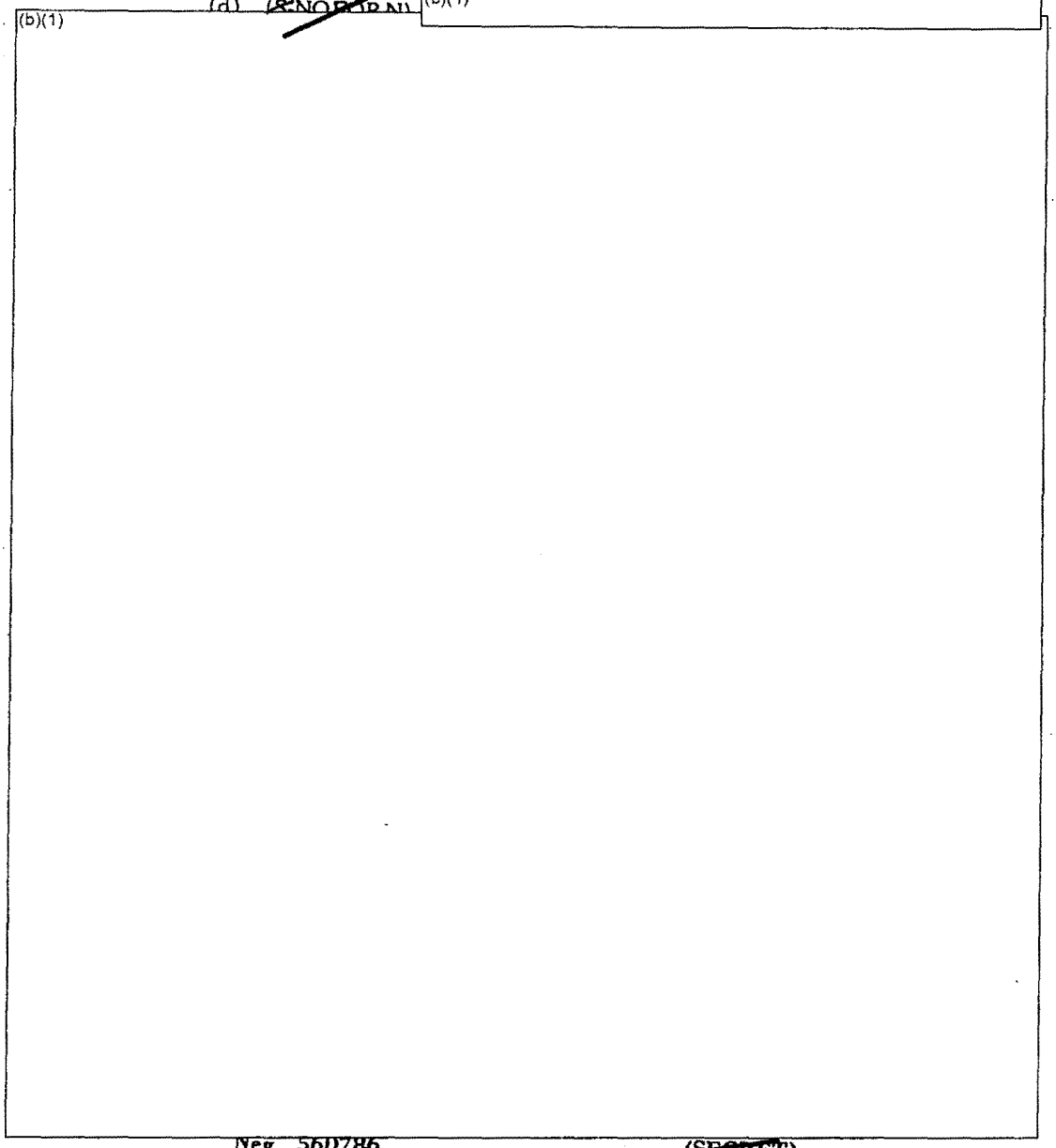

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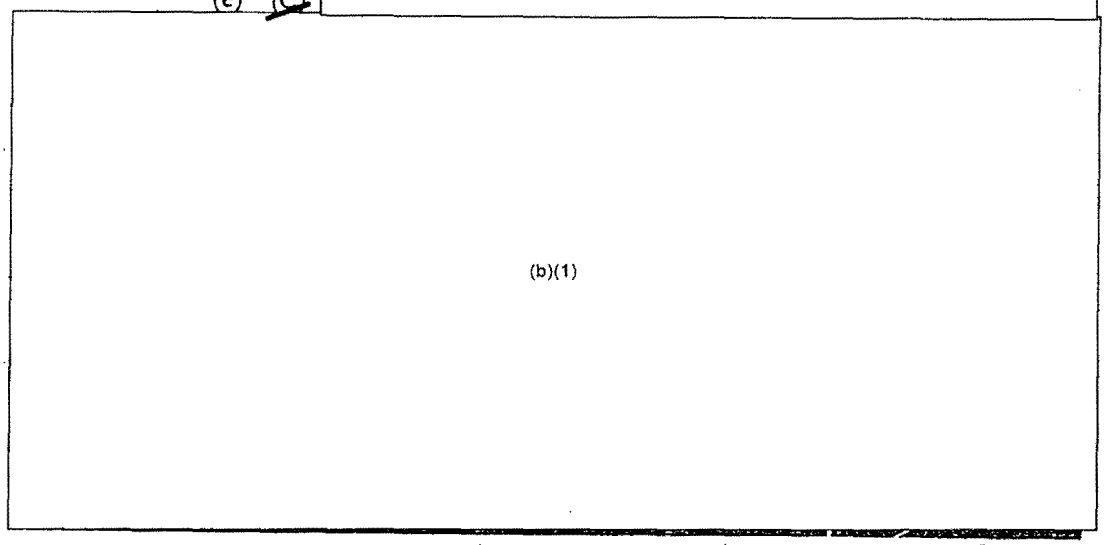
Figure 2-26. KASHIN Class DLG laying smoke, 1975 (S).

NOT RELEASABLE TO FOREIGN NATIONALS

(c) (C) (b)(1)



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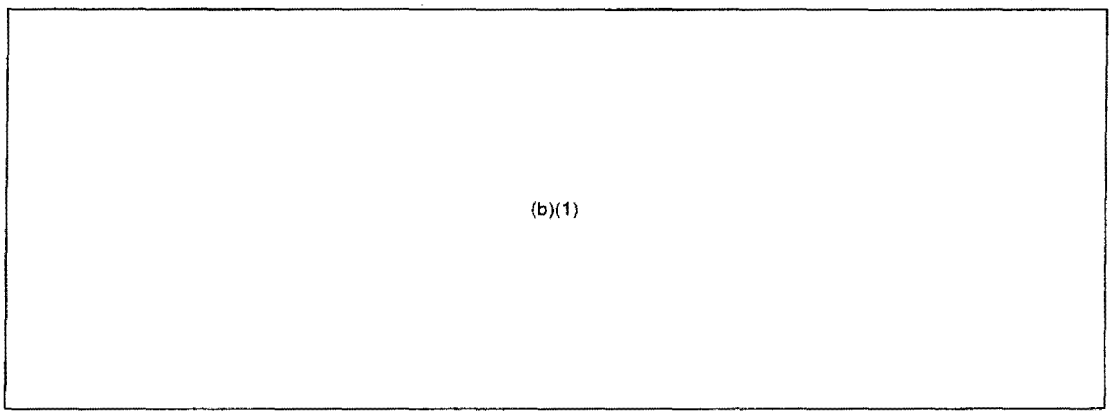
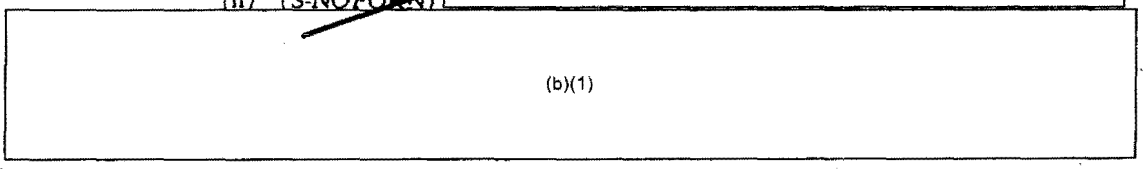
(CONFIDENTIAL)

Figure 2-27. KOTLIN Class DD deploying black smoke, 1975 (C).



(h) (S-NOFORN) (b)(1)



NOT RELEASABLE TO FOREIGN NATIONALS

(2) (C) Naval Screening Capability—European Communist Countries.

(b)(1)

e. (S-NOFORN) Limitations of Screening Operations.

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(b)(1)

(2) (U) High humidity in the atmosphere assists in the formation of some screening-agent clouds. Ideal wind speeds for screening operations are from 3 to 5 m/s. It has been reported that under ideal conditions (humidity, temperature inversion, and wind speed) some types of screening clouds may persist for 30 min. There would be periods, however, when meteorological conditions would not be favorable and the successful employment of obscurant clouds precluded.

(3) (S-NOFORN) (b)(1)

(b)(1)

f. (S-NOFORN) Summary and Conclusions.

(b)(1)

24. (C) Smoke/Aerosol Obscurant Agents Research and Development

(b)(1)

b. (U) Attention is being given to a wide assortment of plastics for this purpose, including epoxy, phenolic, polyethylene, silicone, and urethane resins. To obtain a screen from such resins, the substances are atomized by a jet of hot gases and a screen is formed by condensation in the relative cool air. The diameter of the particles varies from 1 to 100 μm, depending on the composition of the original chemical substance.[5]

K. TRENDS AND FORECASTS

25. ~~(C)~~ Trends

(b)(1)

26. ~~(C)~~ Forecasts

(b)(1)

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Section III.

FREE WORLD

A. POLICY AND DOCTRINE

1. (C-NOFORN) Policy

(b)(1)

2. (C-NOFORN) Doctrine

(b)(1)

NOT Rreleasable TO FOREIGN NATIONALS

(b)(1)

B. ORGANIZATION, TACTICS, AND TRAINING

3. (C-NOFORN) Organization

(b)(1)

4. (C-NOFORN) Tactics

(b)(1)

(b)(1)

5. (C-NOFORN) Training

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

C. STANDARD SMOKE AGENTS AND MUNITION/DISPERSION SYSTEMS

6. (C) Agents

(b)(1)

7. (C-NOFORN) Munition/Dispersion Systems

a. (C) General.

(b)(1)

b. (C) Grenades.

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(2) (U) Swedish grenade, Model FFV915. The FFV915 smoke rifle grenade,[8] which is fired from the 7.62-mm automatic rifle, is projected by a special cartridge of the rosette-crimped type. Normally fired at low angles, the grenade will produce smoke before it hits the ground at ranges greater than 250 meters. The smoke screen produced within 10 seconds after initiation is about 20 meters wide by 4 meters high under normal weather conditions. The titanium dioxide-HC agent is ignited by a black powder disc. Smoke is immediately emitted through outlet channels adjacent to the fins at the rear of the grenade, which assures smoke emission even in soft ground or snow.

(3) (U) UK L8A1 smoke grenade system. The UK L8A1 smoke system consists of the L8A1 smoke grenade and the MK 9 monobloc multibarrel smoke discharger.[9] The L8A1 grenade contains 95% RP and 5% butyl rubber within a rubber body casing; it is capable of generating a quick-forming smoke screen. The grenades have a 0.75-second delay before bursting at heights of 8 to 10 meters above the ground and at ranges of 25 to 30 meters. Twelve grenades can be fired in salvo from two MK 9 discharges to produce a smoke cloud with an initial front of about 70 meters over an arc of 110°. The smoke cloud lasts from one to three min. The MK 9 dischargers have six barrels and fire a single grenade per barrel; two can be mounted on an armored combat vehicle. The grenades are electrically fired from the barrels, with the operator having the capability to fire either a 6-grenade salvo (right or left) or a 12-grenade salvo.

(4) (C) (b)(1)

(b)(1)

(5) (U) Smoke rifle grenade, 47-mm. The STRIM 47-mm smoke rifle grenade functions upon impact to produce a dense, lasting smoke. This grenade is designed for reliable operation on any type soil and can be launched from any rifle equipped with a 22-mm-caliber device and a special blank cartridge for launch.[10] The French Army has adopted and mass produced this model in smoke, colored smoke, and incendiary rounds. Reliable functioning of all three rounds can be expected at -32° to +52°C.

(6) (U) Belgian PRB 412 smoke rifle grenade. The Belgian PRB 412 smoke rifle grenade design requires a special cartridge. The steel body, filled with HC, is attached to a boom and tail assembly that has four fins for stabilization.[10] The tail boom allows the grenade to be used with any rifle that has a 22-mm (external diameter) launcher or flash suppressor. The tail assembly is designed to carry the special cartridge that, when fired, sets off the igniter. The igniter initiates a delay element that burns for about 3 seconds to start the ignition booster. The booster in turn ignites the main charge to initiate smoke emission. White smoke is released through two channels in the base plug.

(7) (C) (b)(1)

(b)(1)

c. (C-NOFORN) Pots and Barrels.

(b)(1)

Table 3-I. West German Smoke Pots (U)

(b)(1)

(CONFIDENTIAL)

(b)(1)

Table 3-II. West German Signaling Devices (U)

(b)(1)

(CONFIDENTIAL)

(4) (C-NOFORN) (b)(1)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(3) (C) (b)(1)

(b)(1)

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Figure 3-1. Japanese smoke generator (U).

c. (U) (C) Mortar Projectiles.

(1) (C) General.

(a) (C) (b)(1)

(b)(1)

(b) (1) (b)(1)

(b)(1)

(b)(1)

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Figure 3-2. Finnish 120-mm mortar smoke projectile (Tampella) (U).

(c) (C) (b)(1)

(b)(1)

(b)(1)

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Figure 3-5. French 60-mm mortar smoke projectile, Model G1 (U).

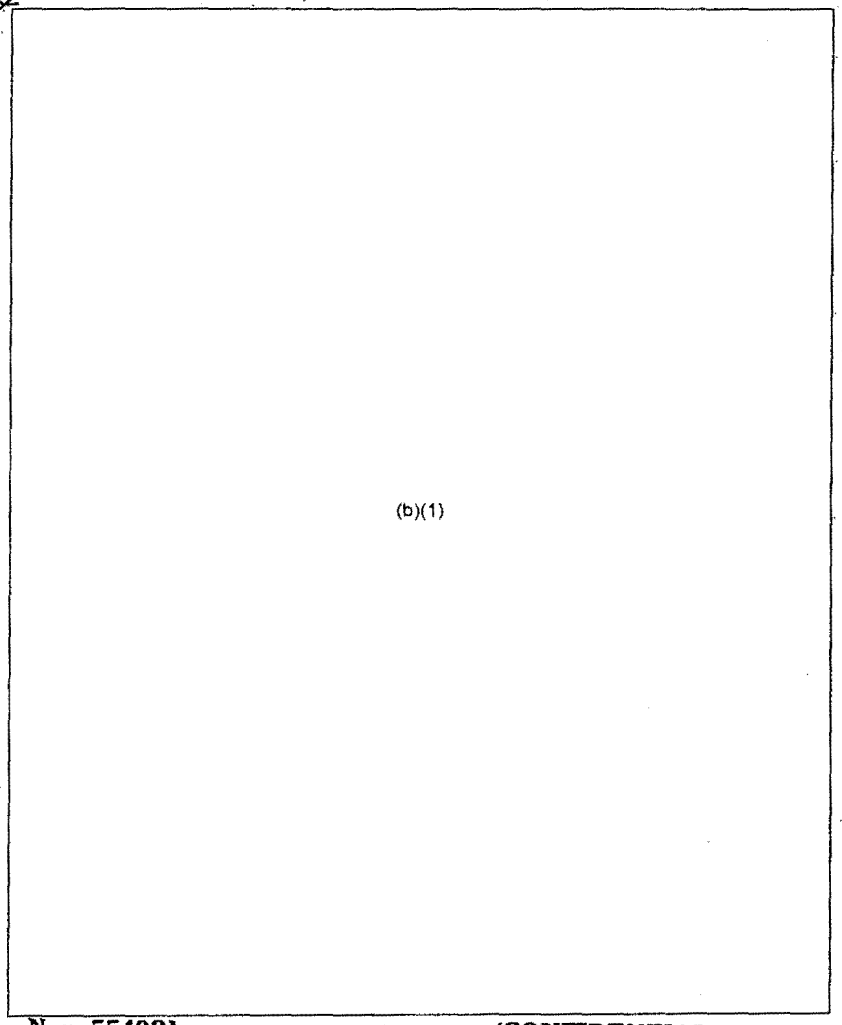

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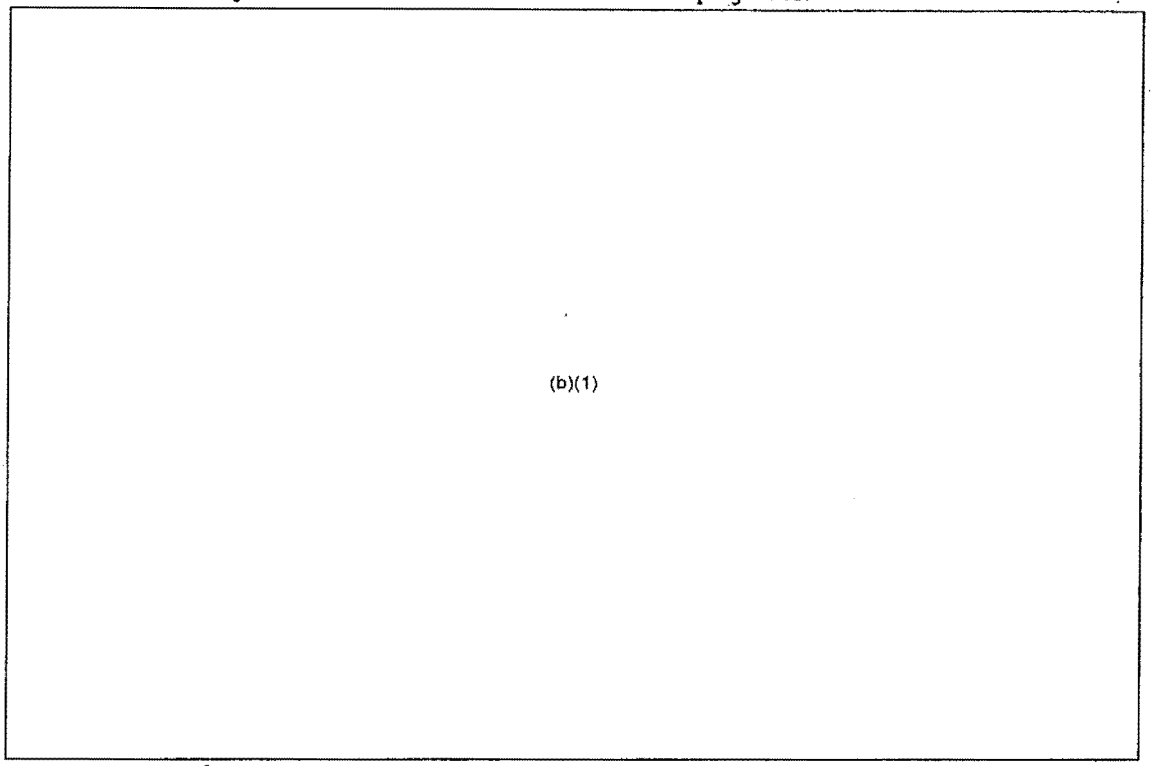
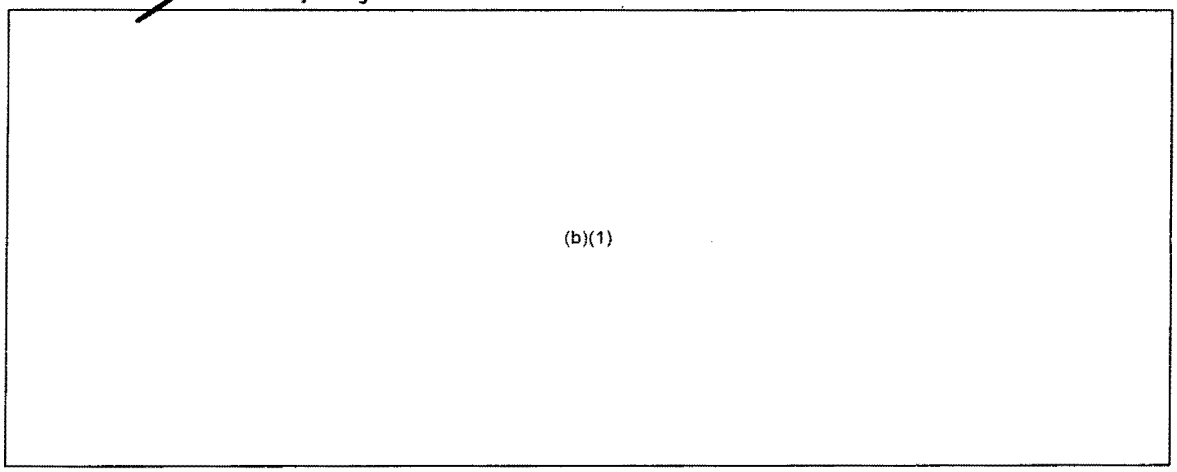
Figure 3-4. French 81-mm mortar smoke projectile, Model ML-61 (U).

(2) (C) Swedish FFV-266 120-mm smoke projectile.



f. (C) Artillery Projectiles.



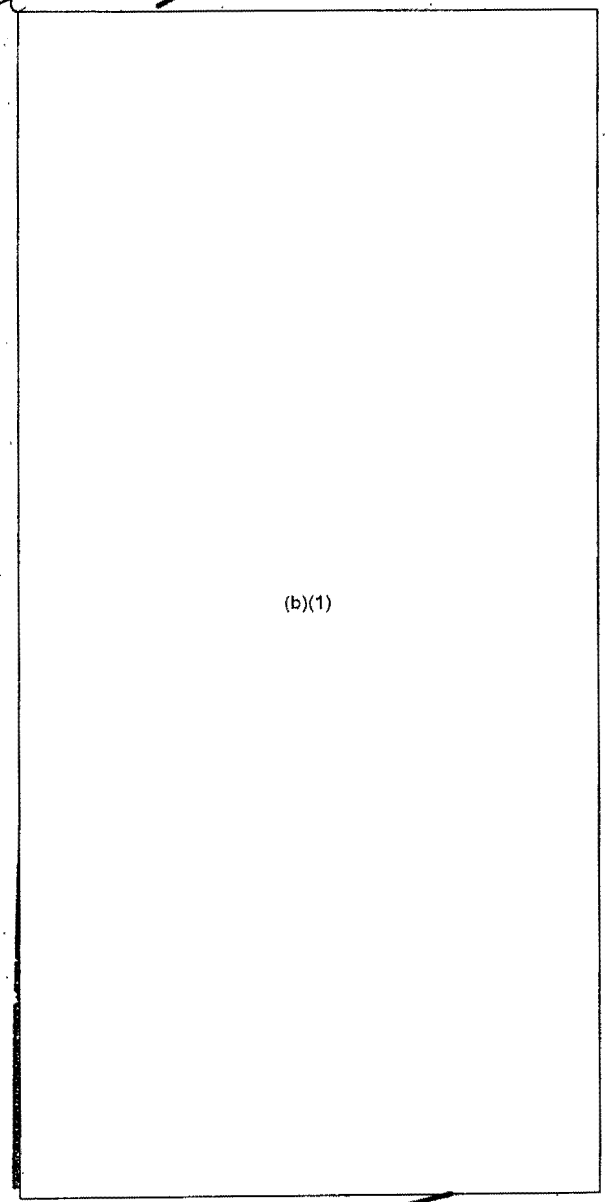


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Figure 3-5. Swedish 120-mm mortar smoke projectile, Model FFV-226 (U).

(2) (C) (b)(1)

(a) (C) (b)(1)

(b)(1)

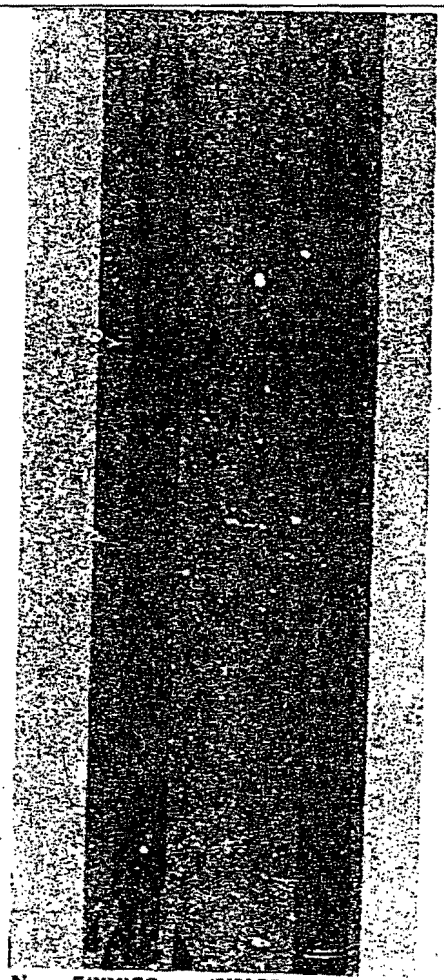

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Figure 3-6. West German 110-mm smoke-incendiary rocket (U).

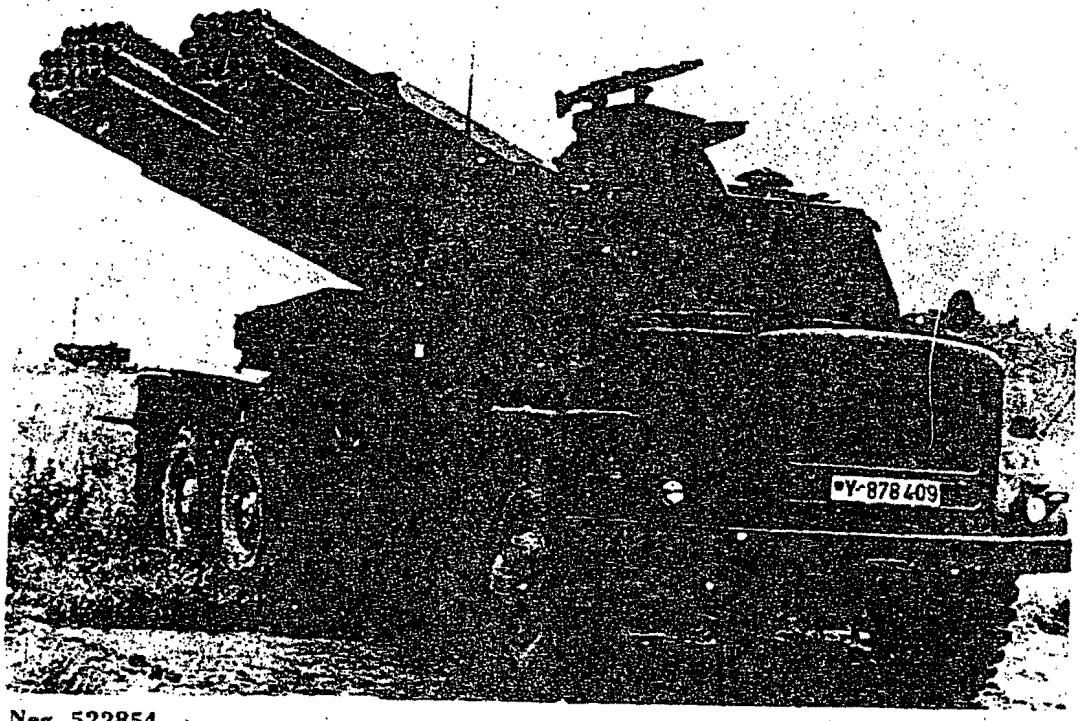

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Figure 3-7. West German 110-mm LAR system (U).

(b) (C) (b)(1)

(b)(1)

(3) (U) Swedish 105-mm smoke projectile.

(a) (U) The 105-mm smoke round, Model FFV 083, has been developed to fill Sweden's requirements for a reliable artillery smoke projectile. Each projectile releases two smoke canisters.[8] After the canisters are ejected from the body of the projectile, fin-like extensions unfold to perform a braking action during descent and to assure the proper landing of the canister. These fin-like extensions prevent rebounding and shattering when landing on hard ground and sinking into mud or soft ground, as well as assuring that the smoke-dispensing holes are not buried.

(b) (U) Each round contains 2.4 kg of smoke agent with a burning time of approximately 3 min. Titanium dioxide and HC are used as smoke-producing agents. Effective performance results at temperatures ranging from -40° to +60°C. The canisters provide a dense smoke that covers an area 125 to 150 meters by 80 meters.

(4) (U) **Swedish 155-mm smoke projectile.** The 155-mm smoke round, Model C, FFV 007, was developed along lines similar to those of the existing 105-mm smoke round, FFV 083.[8] The 155-mm smoke round now has been provided to the Swedish Army for test purposes. Like its predecessor, it releases two smoke canisters that have fin-like extensions that unfold to control descent and assure proper landing. Again the emission holes are pointed skyward and emit a dense smoke for 6 min. The smoke composition for each round consists of 6.8 kg of HC and titanium dioxide. The canisters emit a dense smoke adequate to cover an area 150 to 200 meters long and 100 meters wide. The projectile is equipped with a mechanical time fuze that normally has a setting of 5 to 80 seconds. As with the 105-mm smoke round, the most effective performance temperature ranges from -40° to +60°C.

g. ~~(C)~~ **Tank Guns, Recoilless Rifles, Rocket Launcher Warheads, and Projectiles.**

(1) ~~(C)~~ **General.**

(b)(1)

(2) (U) UK 105-mm smoke round, XM38E1. The UK 105-mm smoke round X38E1 (fig 3-8), used by Sweden in firing from the 105-mm "S" tank, employs a base-ejection projectile housing three canisters. The canisters contain a pressed smoke agent consisting of HC, zinc oxide, and calcium silicide. The smoke canisters are ignited by a black-powder expulsive charge initiated by a time fuze preset for the desired range.

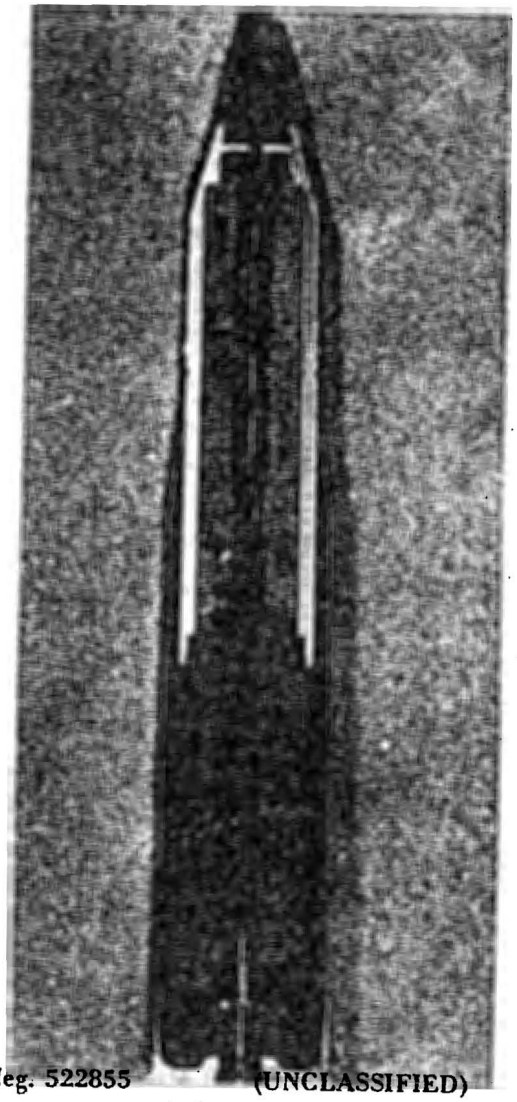

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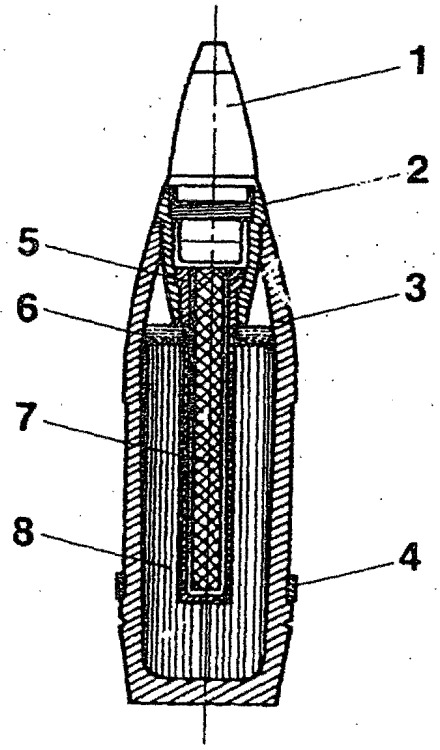
Figure 3-8. UK 105-mm smoke cartridge, Model X38E1, with time fuze No. 390 MK3 (U).

(3) (U) French 105-mm smoke projectile.

(a) (U) The French 105-mm smoke projectile (fig 3-9) can be fired from the AMX-30 105-mm tank gun. It is ballistically matched to the French 105-mm HE projectile OE 105-F-1. It has a steel body of conventional design filled with WP, a central HE burster, and a PD fuze, Model 56. In addition to incendiary and fragmentation effects, the French smoke projectile will generate smoke for 40 seconds to screen a 75-meter-wide area.



1. FUZE
2. ADAPTER
3. BODY
4. ROTATING BAND
5. SEAL
6. WATER LAYER
7. BURSTER TUBE
8. WHITE PHOSPHORUS

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(UNCLASSIFIED)

Figure 3-9. French 105-mm WP smoke projectile, Model ?, with PD fuze, Model 56 (U).

(b) (U) Technical characteristics for the 105-mm smoke projectile are as follows:

- Projectile length . . . . . 444 mm
- Projectile weight . . . . . 12.77 kg
- Filler type . . . . . WP
- Filler weight . . . . . 1.77 kg
- Muzzle velocity . . . . . 700 m/s
- Smoke duration . . . . . 40 s

(4) (U) **Swedish 84-mm smoke round, FFV 65.**

(a) (U) The Swedish 84-mm FFV 65 Ag20 is the standard smoke round for the Swedish Carl Gustav M2 recoilless rifle (fig 3-10).[15] It is intended for tactical use on the battlefield to blind direct fire weapons, enemy areas, armored fighting vehicles, and ATGMs. The projectile is filled with a composition of titanium chloride and a pulverous absorbent. Upon impact, an effective nonthermal smoke screen is instantly generated; thus, infantrymen are able to lay a smoke screen rapidly during battle. The FFV 65 smoke projectile has a range of 1300 meters and provides a smoke screen 15 meters in width. It is fitted with a PD fuze having a graze feature. Sweden currently has developed another smoke projectile, the FFV 469, similar in design to that of the FFV 65, for firing from their new antitank weapon system FFV 550. The smoke agent used in this projectile includes titanium tetrachloride, which eliminates the thermal release that might start battlefield fires.

(b) (U) Technical characteristics of the FFV 65 are as follows:

- Projectile weight . . . . . 2.2 kg
- Filler type . . . . . titanium chloride with a pulverous absorbent
- Muzzle velocity . . . . . 325 m/s
- Range . . . . . 1300 m
- Smoke screen width . . . . . 15 m

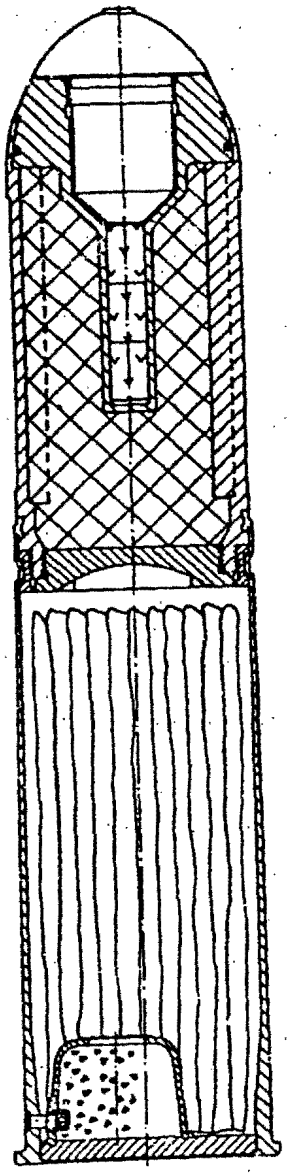

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Figure 3-10. Swedish 84-mm smoke cartridge, Model FFV-65, with PD fuze, Model ? (U).

h. (U) Smoke Grenade/Launcher Systems—Armored Vehicles.

(1) (U) General.

(a) (U) Three decades or more have passed since certain foreign free world countries concluded that on-board smoke systems enhance the combat tank's survivability and maneuver flexibility. In 1943, the Germans used a smoke projector system on some of their "Panzer" 75-mm gun tanks. In 1946, the British mounted smoke-grenade launchers on their Centurion Mark 2 tank (20-pounder gun) and in 1949, on the FV-201, the predecessor of their Conqueror heavy tank (120-mm gun). The 1951 model of the French AMX-13 light tank (75-mm gun) was equipped with similar devices. France, the United Kingdom, and West Germany have consistently used smoke-grenade/launcher systems on tanks and other armored vehicles. The HS-30 APC developed by the Swiss for, and with the cooperation of, West Germany, and adopted by the latter in 1958-59, was similarly equipped. In the early sixties other free world countries followed suit, and today all foreign free world tanks and most lightweight armored fighting vehicles, as well as some support vehicles, mount smoke-grenade/launcher systems.

(b) (U) Other on-board means of generating smoke have been developed and tested—e.g., using the vehicle engine exhaust system—but the foreign free world armies apparently agree that the grenade/launcher system is more compatible with their tactics, and that it is more effective when advancing to make contact with the enemy and when operating in a mobile defense situation. Also, grenade/launcher systems are readily adaptable to all types of armored vehicles. A cluster of two or more launcher tubes is mounted on each side of the turret of all foreign free world tanks (on the Swedish turretless "S" tank the launcher tubes are located on the commander's rotatable cupola) in service today and on experimental tanks and prototypes currently under development. The latter include the West German Leopard II tank prototypes and the British experimental Chobham tank (improved MK 5 Chieftain). Many of the lightweight armored vehicles carry these devices on the forward or rearward part of the hull, but some turreted types carry turret-mounted launcher tubes.

(c) (U) The smoke projectiles (grenades) and projectors (launchers) developed by several foreign free world countries provide a rapid means of shielding the vehicle and personnel during an evasive maneuver in an otherwise untenable situation (e.g., a single tank encounters a prepared enemy defensive position or receives surprise fire from hostile antitank weapons). The smoke screen also provides some protection to personnel when they are mounting or dismounting their vehicle, and assists in the evacuation of wounded crew members from a disabled tank. It can be used to advantage by maintenance and recovery crews when a disabled tank is retrieved or when a hasty repair could restore a tank's mobility during an engagement.

(d) (U) The smoke-grenade/launcher system is simple in concept, construction, and operation. The launcher consists of the tube assembly, mounted on the exterior of the vehicle, and the firing mechanism or control unit, which is mounted inside where it is operated by the gunner or commander. The grenade or smoke shell consists of the fuse, body, and fin assembly. Specific systems developed by foreign free world countries are described and illustrated in the remainder of this paragraph.

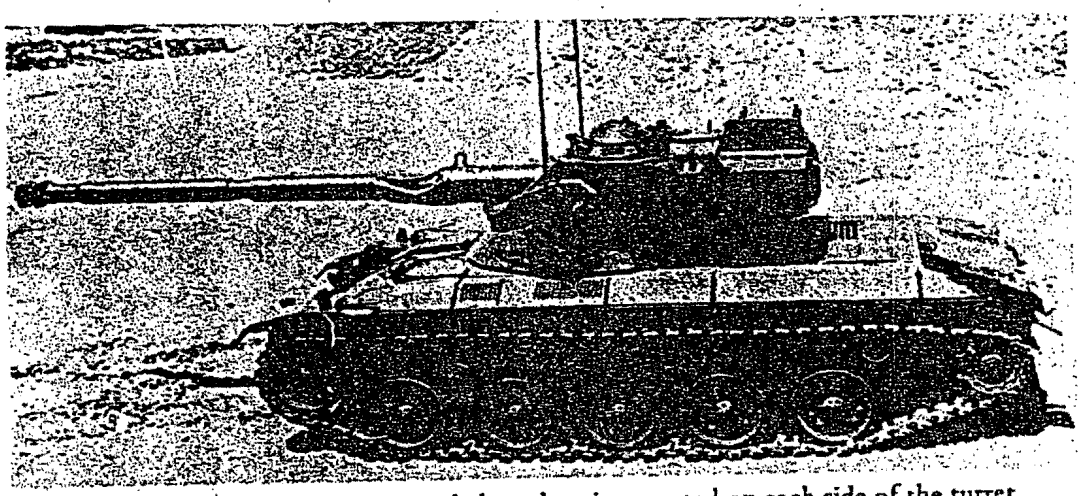
(2) ~~(C)~~ U Austria.

(a) ~~(C)~~ U General.

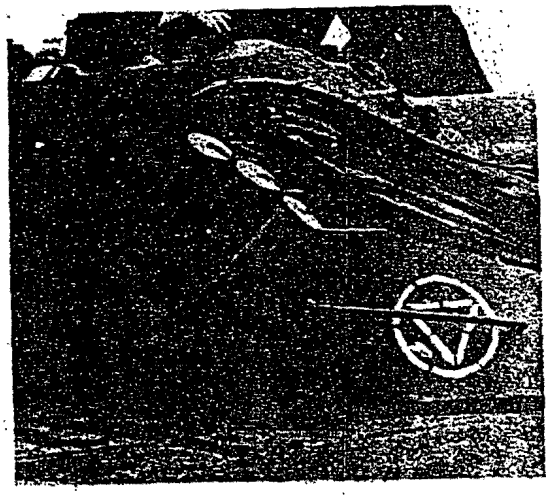
1. (U) The Austrians acquired experience with on-vehicle smoke-discharging equipment while training with French AMX-13 light tanks, which carry two smoke-grenade launcher tubes on each side of the turret. The four units can only be fired simultaneously, which the Austrians considered unsatisfactory. They developed and tested their own equipment, using clusters of two and three launcher tubes in different firing-angle arrangements. They found that, under favorable wind conditions, firing one cluster of three grenades was enough to screen effectively the change of position made by the test vehicle. In one test the three grenades hit in a fan-shaped pattern 40 to 50 meters distant from the turret and reportedly developed an effective smoke screen within 10 seconds. Under typical conditions, however, the Austrians anticipate that it will take approximately 30 seconds to build up an effective screen.[16]

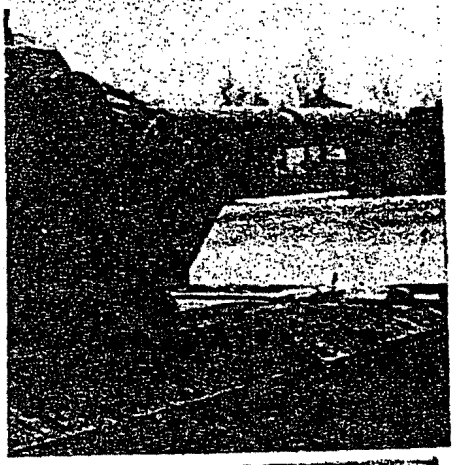
2. ~~(C)~~ (b)(1)

(b)(1)



A cluster of three smoke grenade launchers is mounted on each side of the turret.





Different mountings—two grenades (left) and three grenades (right).

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Figure 3-11. Smoke-grenade launchers on the Austrian Army's 105-mm assault gun, Panzerjäger "K" ("Kurassier") (U).

(b) ~~(C)~~ Assault gun, 105-mm, Panzerjager "K" ("Kurassier").

(b)(1)

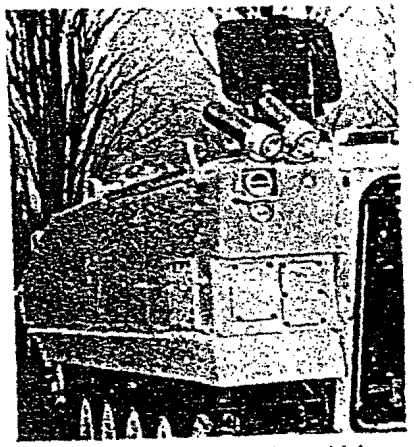
3. (U) In night tests the Austrians found that a thin smoke layer is enough to reduce substantially the range both of white-light and IR searchlights. They recommended loading only one or two smoke grenades per turret side for night combat. They concluded also that a smoke screen of satisfactory duration could be effectively laid against possible future light-intensifying sights.

(3) ~~(C)~~ U France.

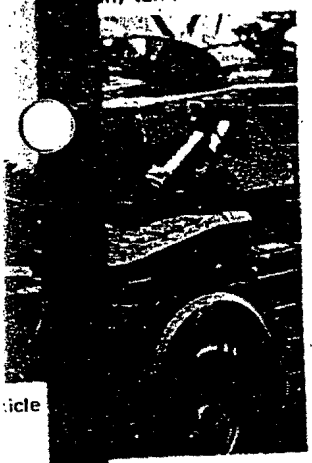
(a) (U) General. The French have been using smoke grenade launchers on their armored vehicles for more than a quarter of a century, and all French armored fighting vehicles and some armored support vehicles currently in service are equipped with them. At present, a cluster of two launch tubes is used on all of the vehicles except the AMX-30/D armored recovery vehicle, which normally mounts a single cluster of four tubes. Most of the turreted vehicles carry a two-tube cluster on each side of the turret; one exception, the turreted AMX-10P armored infantry fighting vehicle, mounts a two-tube cluster on each rear corner of the hull roof. Examples of turret- and hull-mounted launchers are shown in figure 3-12.

un) tank

Panhard M-3 APC



AMX-10P infantry fighting vehicle



rmored car

AMX-30/D armored recovery vehicle

EBR-90 armored reconnaissance vehicle

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Figure 3-12. Smoke grenade launchers on French armored vehicles (U).

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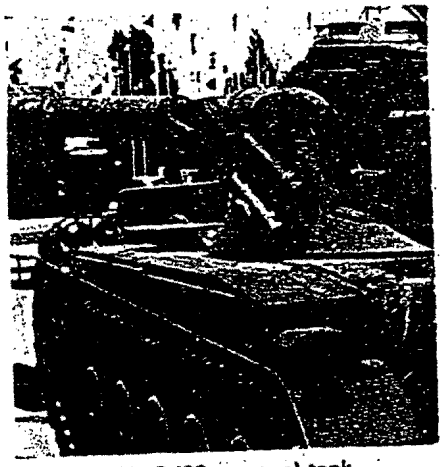
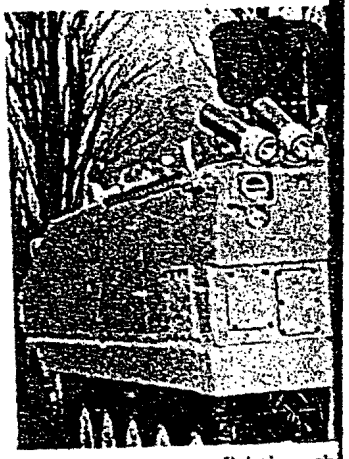
Original



AMX-13 (90-mm gun) tank

Panhard M-3 APC



AMX-10P infantry fighting veh

Panhard AML-90 armored car

AMX-30/D armored recovery vehicle

EBR-90 armored reconnaissance vehicle

Neg. 522835

Figure 3-12. Smoke grenade launchers on French armored vehicles (U).

(UNCLASS

(b) (U) French AMX-13 light tank.

1. (U) The smoke-grenade/launcher system developed for the AMX-13 tank consists of a firing/control unit mounted inside the turret within easy reach of the tank commander: the launch tubes mounted externally on each side of the turret; and the smoke grenades, which are externally loaded.[19]

a. (U) The launch tube is 318 mm long and has inside and outside diameters of 79.4 and 92.1 mm, respectively. An electrical contact point for firing the grenade is located 47.6 mm from the tube base. The tube assembly includes a base-closing cap with an expanding spring, and a top closing cap attached to the side of the tube by a chain. An electrical shielded cable connects the grenade to the firing unit (fig 3-13 and 3-14).

b. (U) The smoke grenade is 286 mm long and weighs about 4.3 kg. Approximately 37% of the weight is smoke agent.

c. (U) The firing-unit/control box is fitted to the left side of the turret interior. It consists of a thin steel housing with a sealed front cover fitted inside with a wiring diagram. The electrical circuit is activated by pushing a button on the right side of the box. A safety device prevents accidental firing. The controls for the right and left launchers are located on top of the unit.

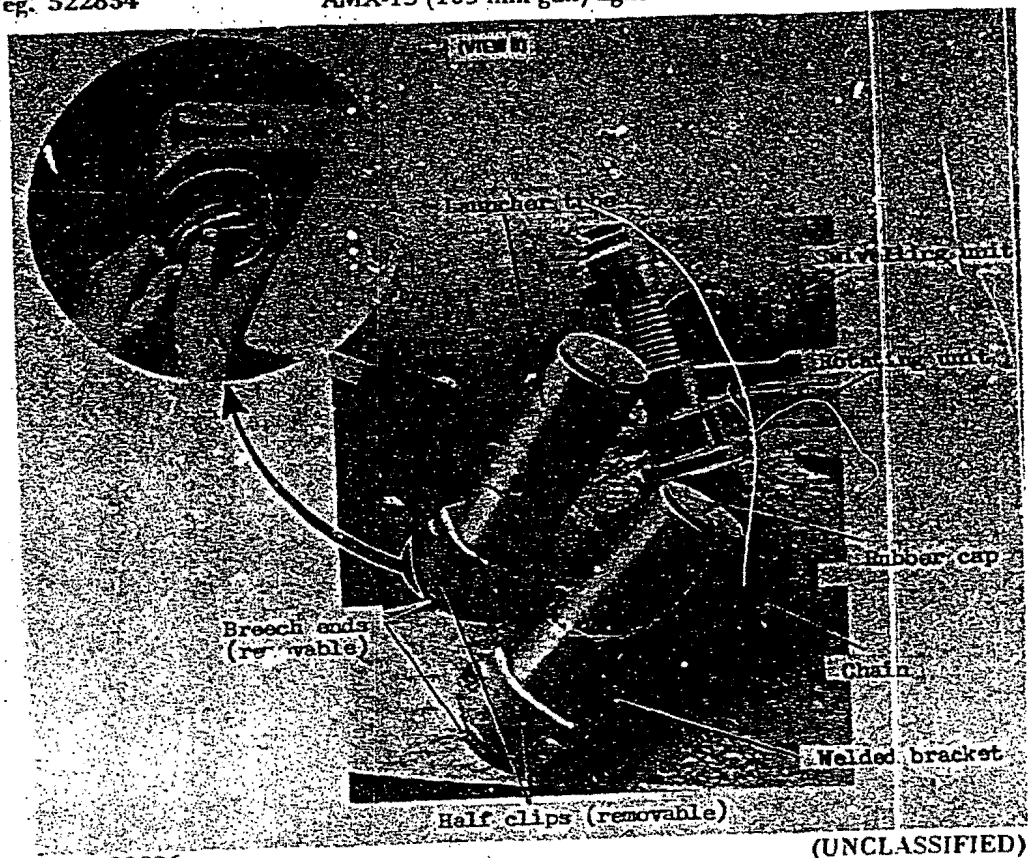
2. (U) Tests of the AMX-13 tank's grenade/launcher system were conducted with the following results:[20]

a. (U) With the launch tube elevated to 60°, the grenades were fired to ranges between 14 and 21 meters. Flight time ranged from 1.92 to 2.83 seconds, muzzle velocities from 7.6 to 9.7 m/s.

b. (U) With the launch tube elevated to 45°, the average range of the grenades was approximately 20 meters. Flight times ranged from 1.67 to 2.67 seconds, and muzzle velocities were between 8.2 and 11.3 m/s. Time from launch to intense burning of smoke ranged from 1.14 to 3.75 seconds.

c. (U) The grenades developed effective smoke screens that lasted longer than 2 min in ground winds up to 22.4 km/h.

Neg. 522834 AMX-13 (105-mm gun) light tank (UNCLASSIFIED)



Neg. 522026 (UNCLASSIFIED)

Figure 3-13. French smoke-grenade launcher tubes on the AMX-13 tank (U).

Original

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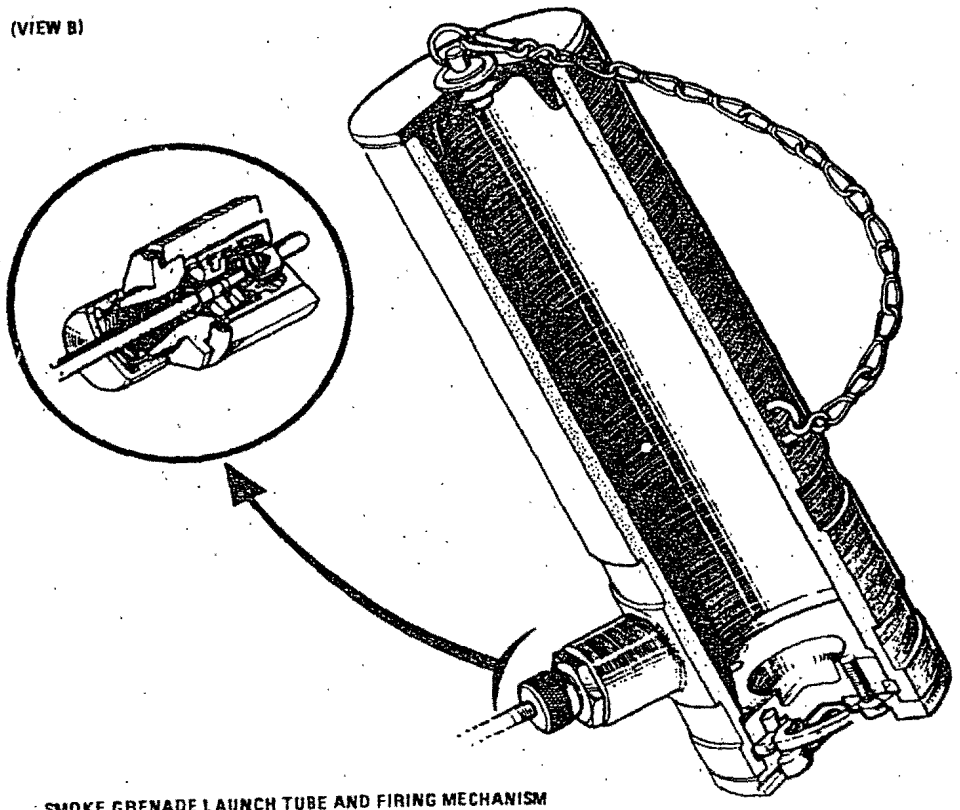
Neg. 522028

(UNCLASSIFIED)

(VIEW B)



SMOKE GRENADE LAUNCH TUBE AND FIRING MECHANISM

Neg. 522027

(UNCLASSIFIED)

Figure 3-14. Components of the French smoke-grenade/launcher system developed for the AMX-13 light tank (U).

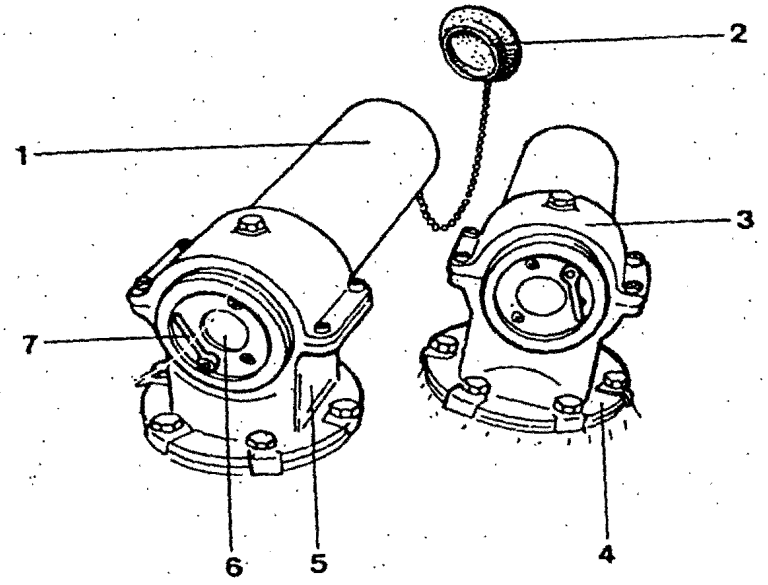
(c) (C) French AMX-30 (105-mm gun) tank.

(b)(1)

Neg. 512743

(UNCLASSIFIED)

Figure 3-15. French smoke-grenade/launcher system on the AMX-30 (105-mm gun) tank (U).

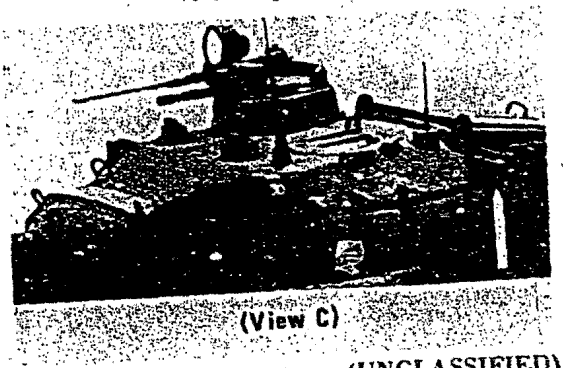


(View B)

Neg. 522838

(UNCLASSIFIED)

1. Tube
2. Rubber plug
3. Support cover
4. Turret
5. Bolted support
6. Movable breech
7. Bolting lever



(View C)

Neg. 522837

(UNCLASSIFIED)

Figure 3-15. French smoke-grenade/launcher system on the AMX-30 (105-mm gun) tank (U). (Continued)

(4) (U) West Germany.

(a) (U) **General.** The West Germans consider the smoke grenade launching system a close combat weapon, primarily for use as a defensive device against close-range attacking forces. They have mounted it as special equipment on all armored fighting vehicles and on some armored support vehicles.[23] Although various types of mounting arrangements are installed on the vehicles, the latter appear to use the same grenade and launcher equipment. Thus equipped, the vehicles can provide a smoke screen behind which troop elements as well as vehicles can be repositioned; damaged vehicles can be towed away or minor repairs can be made; target opportunities to the enemy can be reduced; and wounded personnel can be evacuated.[24]

(b) (U) **Leopard I tank series and other armored vehicles.**

1. (U) The 76-mm smoke grenade launcher system currently used on the West German Army's 105-mm gun main battle tank, Leopard I, uses two clusters of four launch tubes, one cluster on each side of the turret in a fan-shaped arrangement.[35] (The M-48 tanks and Leopard II prototypes are similarly equipped, and the austere version of the Leopard II being tested by the West German Army mounts eight launch tubes on each side of the turret. Mounting arrangements for these and other West German vehicles are shown in figure 3-16, 3-17, and 3-18).

2. (U) Like other foreign systems, the Leopard I system is electrically fired by means of controls on the firing unit inside the turret.[23] An important advantage of the German system over the French-developed system is the ability of the former to fire the grenades singly at short intervals. In addition, each cluster of four grenades can be fired as a unit. The grenade can also be thrown by hand should the combat situation so require.

3. (U) In tests, the Buck-developed grenade (HC) has produced within 3 seconds after launch an effective smoke screen of 3 min duration 40 to 60 meters distant from the tank (launch vehicle).[24] The dimensions of the smoke screen depend, of course, on the number of grenades fired.

Original

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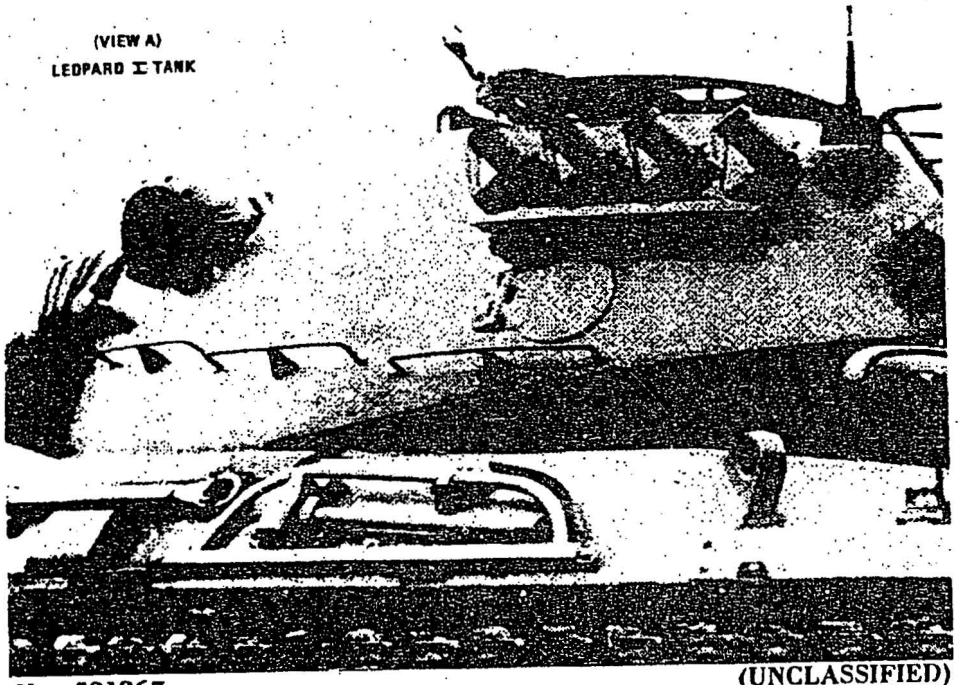
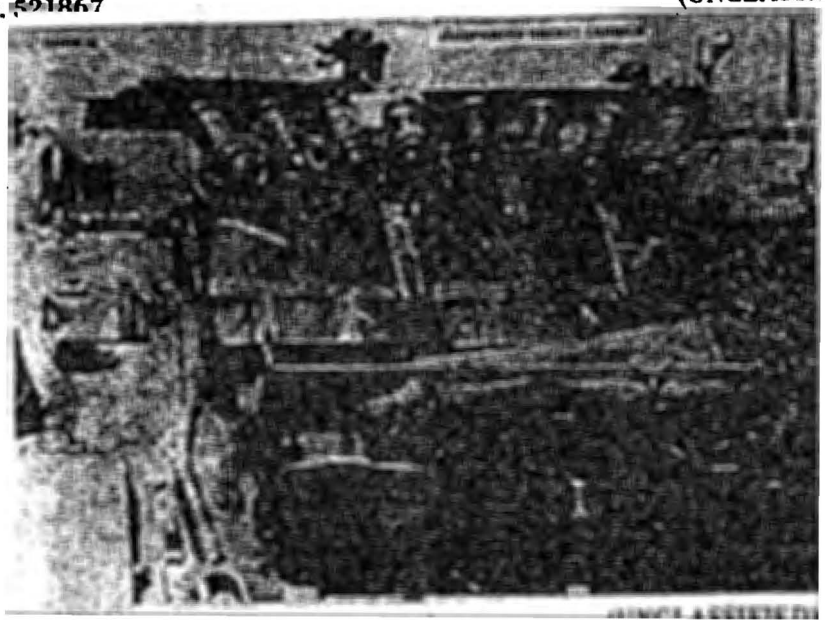
(VIEW A)
LEOPARD 1 TANK

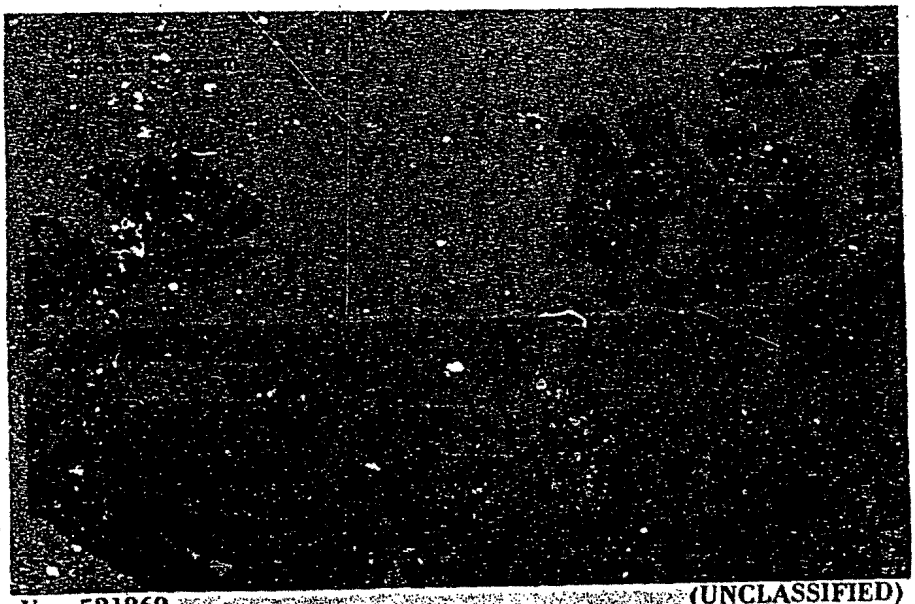


Neg. 521867 (UNCLASSIFIED)



Neg. 521868 (UNCLASSIFIED)

Figure 3-16. Smoke-grenade launchers on West German armored vehicles (U).



Neg. 521869 (UNCLASSIFIED)

Neg. 521870 (UNCLASSIFIED)

Figure 3-16. Smoke-grenade launchers on West German armored vehicles (U). (Continued)

Original

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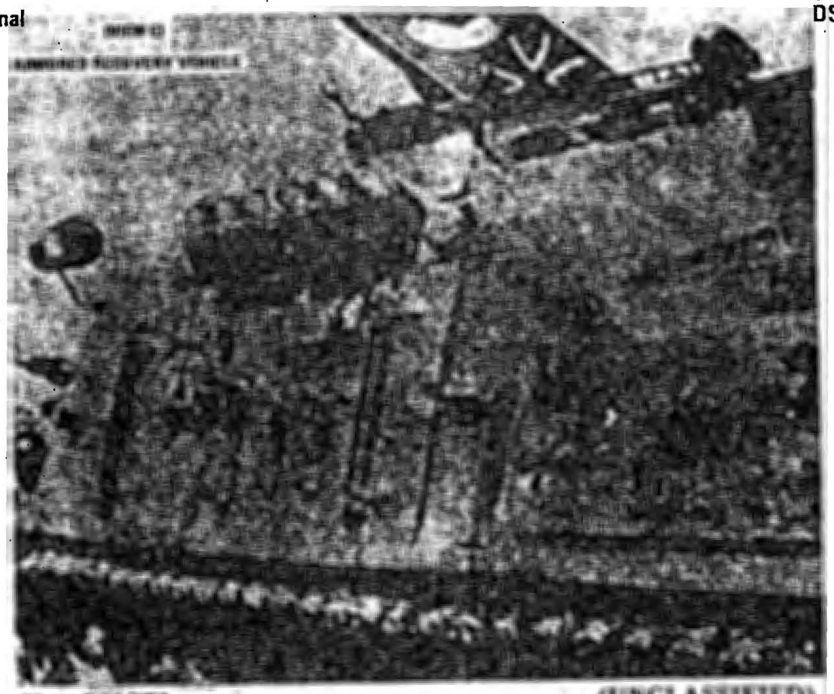


Neg. 521871 (UNCLASSIFIED)

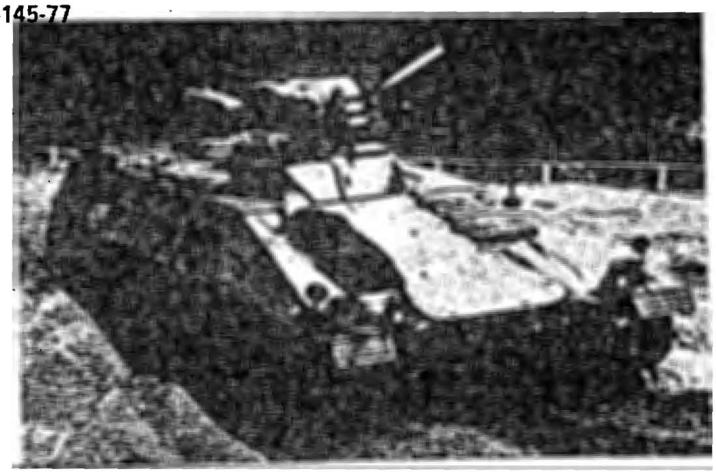
Neg. 521872

Figure 3-16. Smoke-grenade launchers on West German armored vehicles (U). (Continued)

DST-1620S-145-77

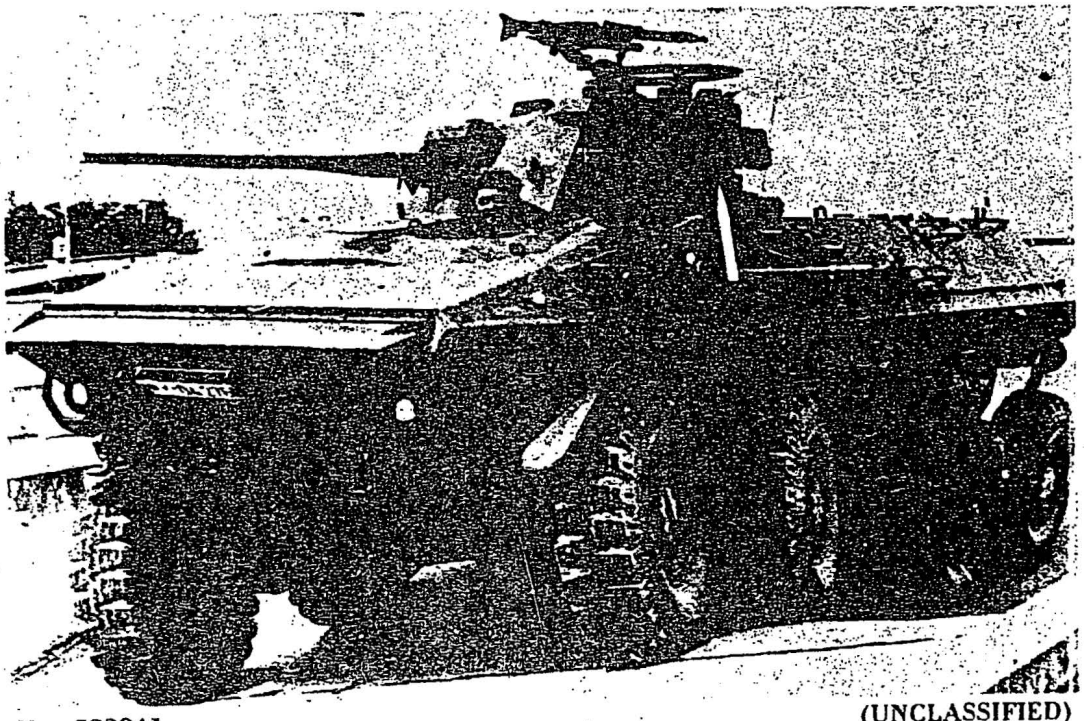
Original

Launcher tubes



Neg. 522840 (UNCLASSIFIED)

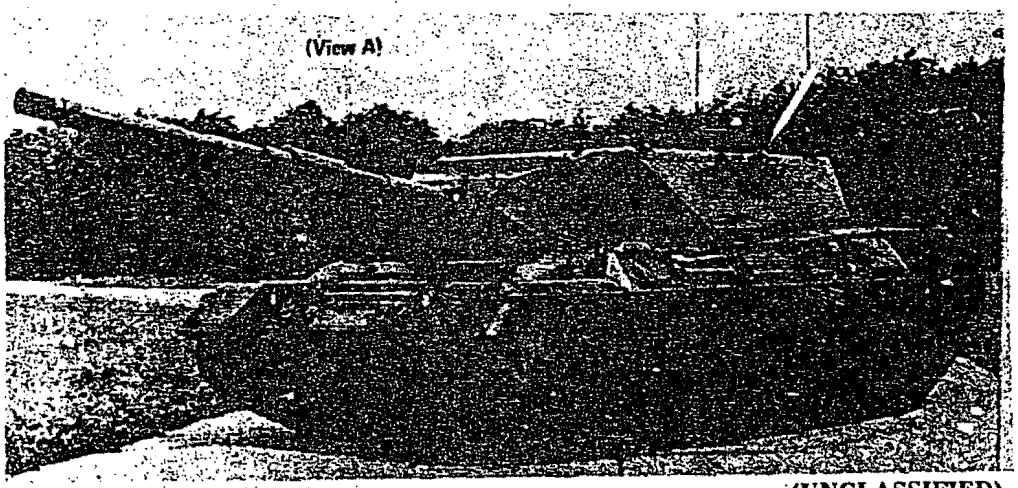
(View A)



Neg. 522841 (UNCLASSIFIED)

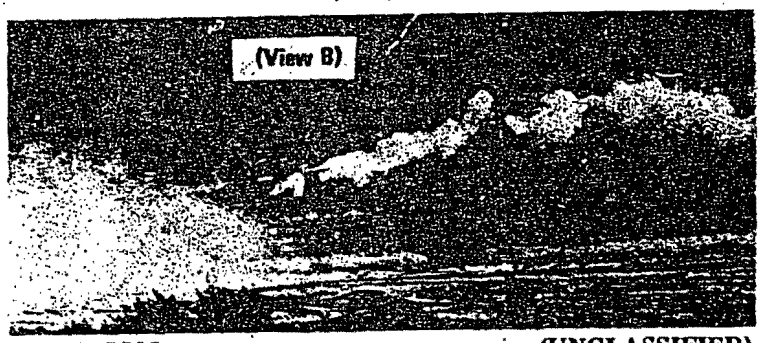
(View B)

Figure 3-17. Smoke-grenade launchers on the West German Marder MICV (top) and Luchs reconnaissance vehicle (U).



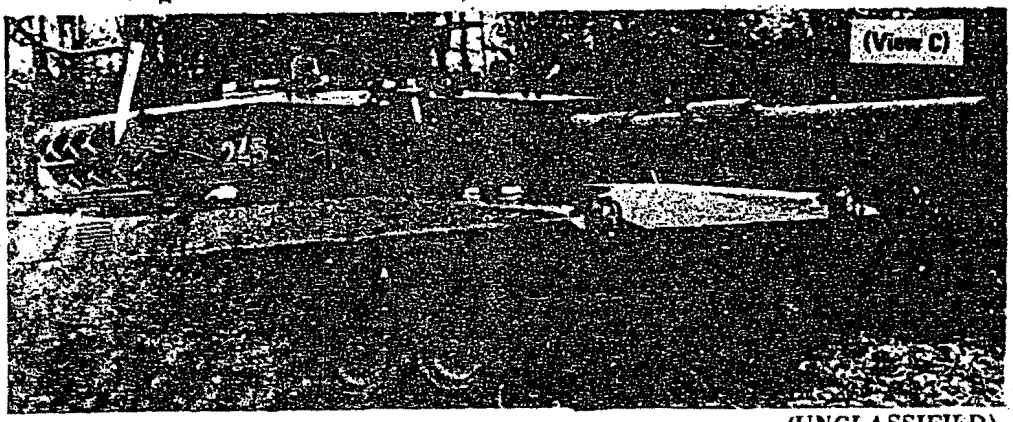
Neg. 521487 (UNCLASSIFIED)

Leopard IA4 tank



Smoke is used to screen the maneuvering of Leopard I tanks during a field exercise.

Neg. 522839 (UNCLASSIFIED)



Neg. 522842 (UNCLASSIFIED)

Leopard II (AV) prototype

Figure 3-18. Smoke-grenade/launcher system on West German tanks (U).

4. (U) The smoke grenade used by West German armored vehicles is a thin-walled metallic cylinder consisting of several components (fig 3-19). It is 176 mm long and 76.2 mm in diameter,[24] weighs 1200 grams, and contains 900 grams of chemicals, principally HC. It is of simple design and construction, safe to handle, and moisture- and shock-proof. It is operable, and can be stored or shipped within an ambient temperature range of -40° to +50°C. The smoke charge burns completely even under rain and snow conditions.

Grenade developed and produced by Buck KG of of West Germany

Neg. 521866 (UNCLASSIFIED)

Figure 3-19. West German smoke grenade developed for use on armored vehicles (U).

Original

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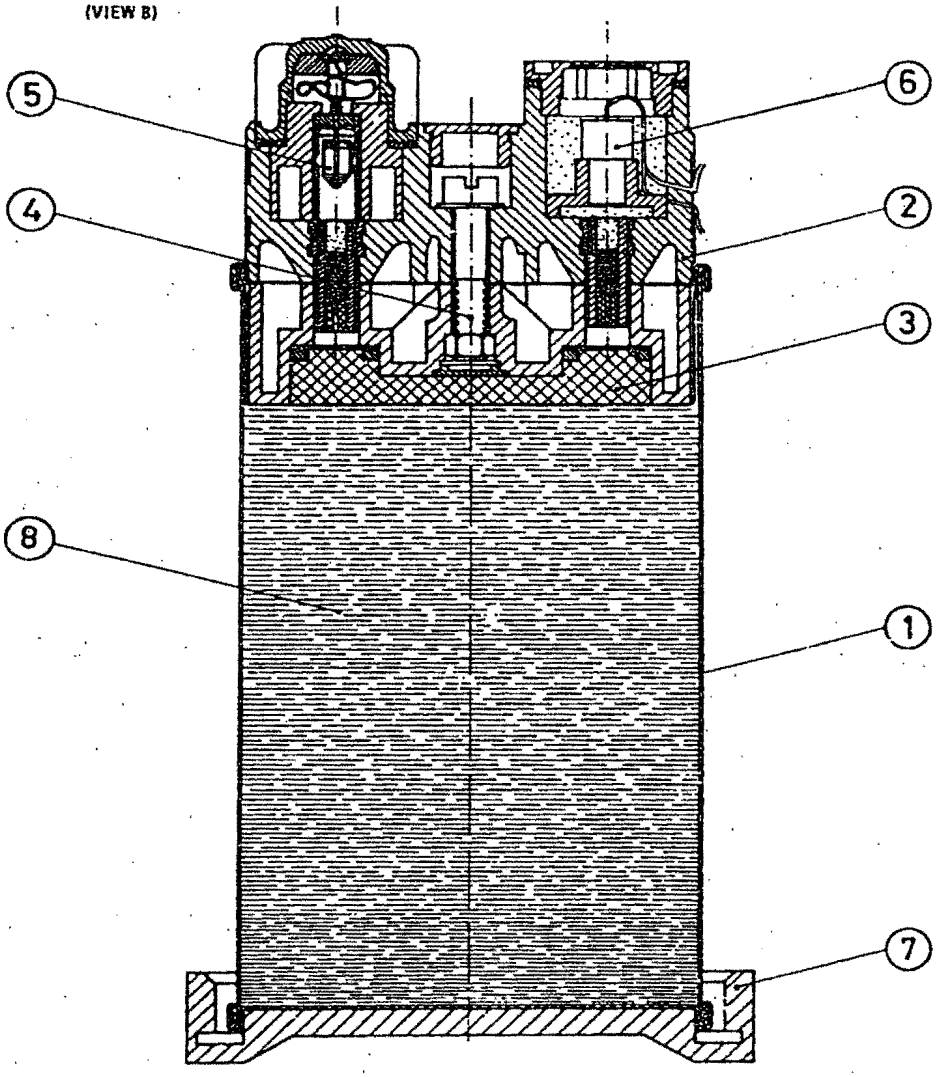

Neg. 521879

(UNCLASSIFIED)

1. Metal container (tube)
2. Contact head
3. Ignition chamber with charge
4. Cylinder head bolt
5. Mechanical fuze
6. Electrical fuze
7. Protective rubber cap
8. Smoke-producing chemicals

Figure 3-19. West German smoke grenade developed for use on armored vehicles (U). (Continued)

5. (U) The control panel and other components of the armored vehicle smoke-grenade/launcher system are shown in figure 3-20.[24]

a. (U) Each single launch tube is secured to the vehicle by a carrier mounting. The precision-made steel launch tubes are bolted to the carrier boxes in exactly defined angular positions intended to achieve maximum smoke screen width. Ignition wires are channeled so as to avoid damage from small-arms fire and shell fragments.

b. (U) The launch-tube carrier, consisting of an upper and a lower part, holds the launch tube like a clamp. Ignition current is fed from inside the vehicle through the carrier mounting into the lower part of the launch tube carrier. There the ignition cable eyes are connected to the contact inserts of the launch tube. Rubber gaskets provide watertight sealing from the tube to the tube supports and to the launcher mounting.

Neg. 521873 (UNCLASSIFIED)

(View A - Carrier mounting assembly)

Figure 3-20. Components of the West German (Wegman-Buck) smoke-grenade/launcher system for armored vehicles (U).

Original

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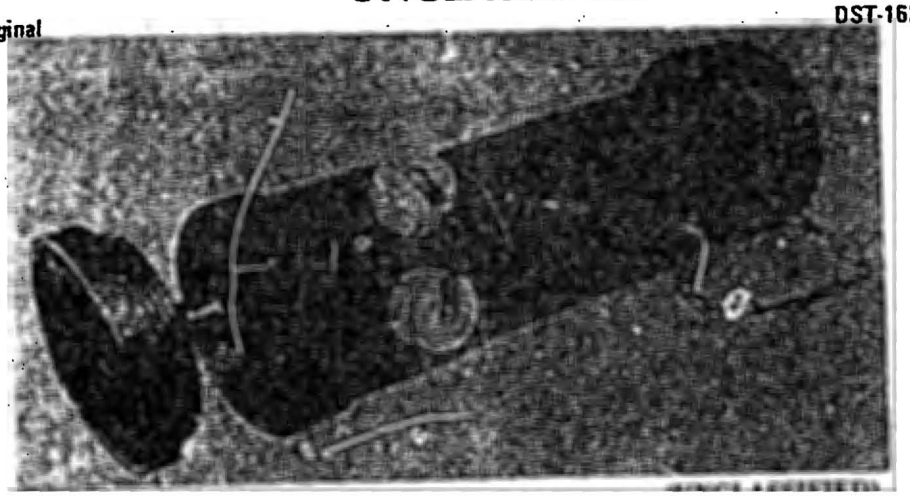


Neg. 521874

(UNCLASSIFIED)

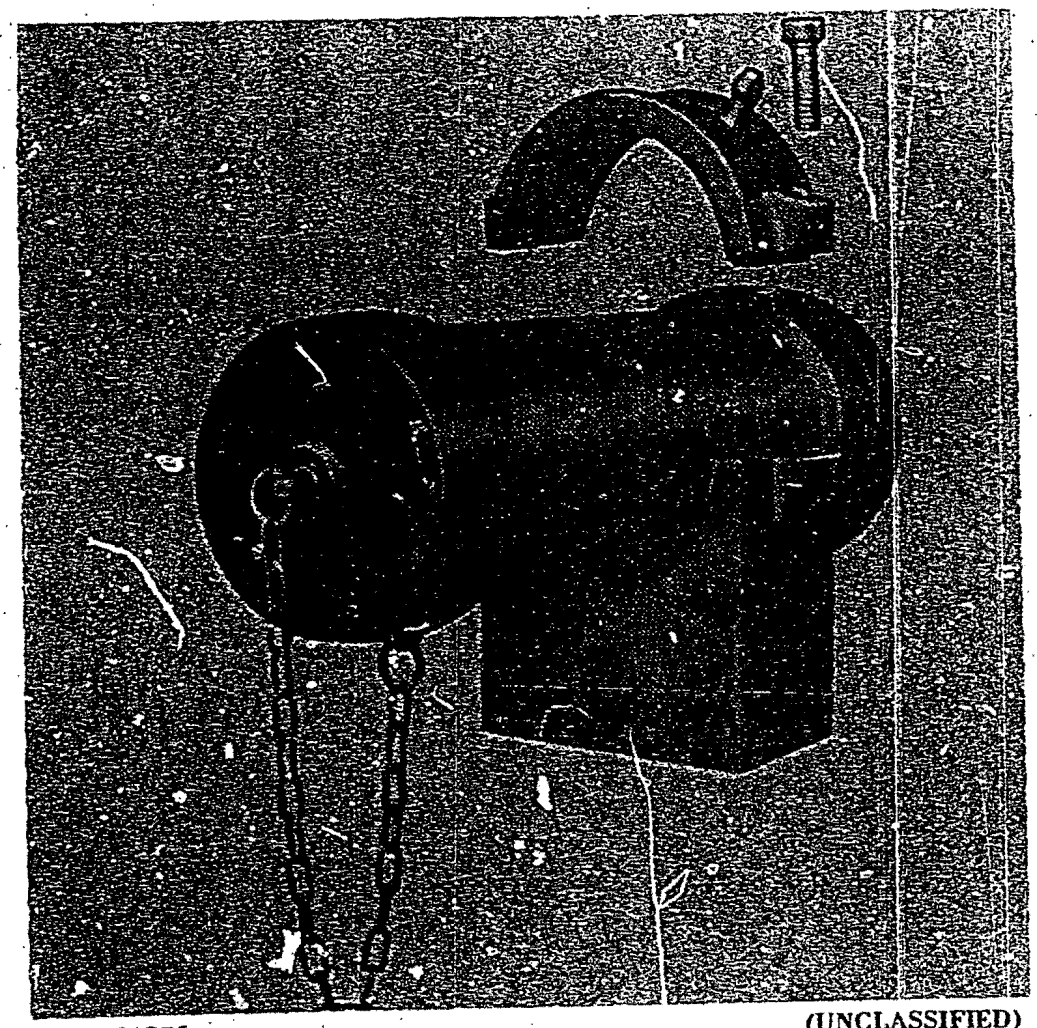
(View B - Smoke grenade launcher)

Neg. 521875

(UNCLASSIFIED)

(View C - Interchangeable, quick-release contact inserts)

Figure 3-20. Components of the West German (Wegman-Buck) smoke-grenade/launcher system for armored vehicles (U). (Continued)



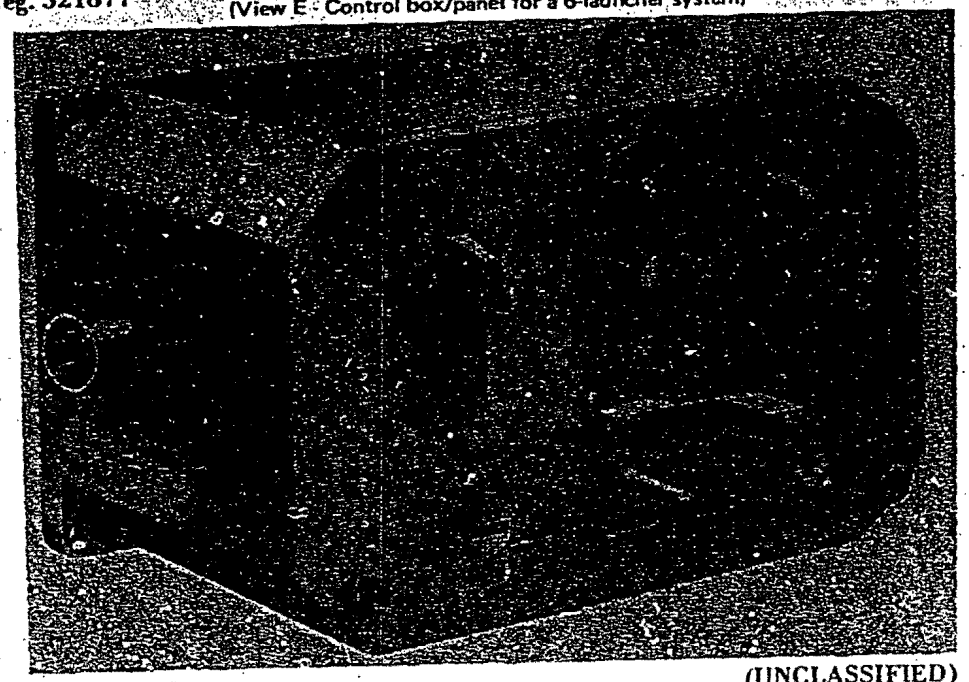
Neg. 521876

(UNCLASSIFIED)

(View D - Launcher tube carrier)

Figure 3-20. Components of the West German (Wegman-Buck) smoke-grenade/launcher system for armored vehicles (U). (Continued)

Neg. 521877 (View E - Control box/panel for a 6-launcher system) (UNCLASSIFIED)

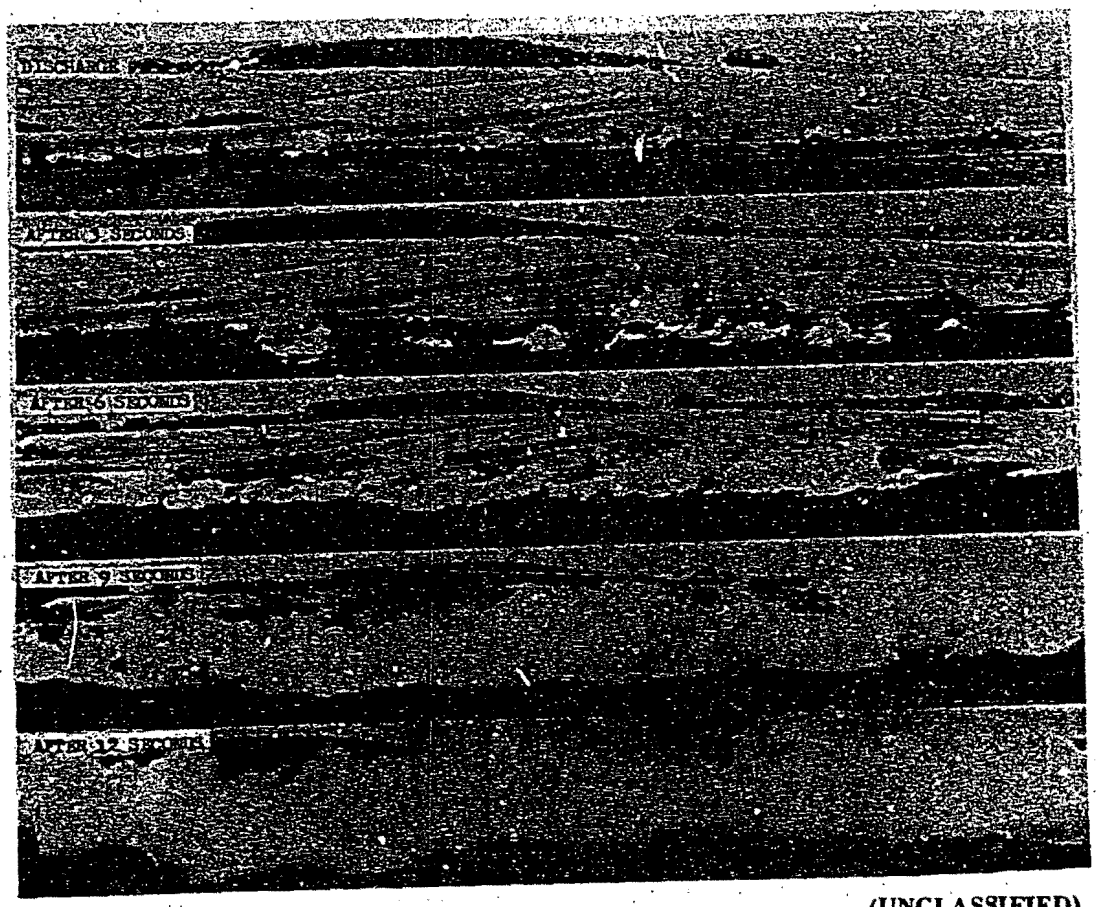


Neg. 521878 (UNCLASSIFIED)

(View F - Control box/panel for a 12-launcher system)

Figure 3-20. Components of the West German (Wegmann-Buck) smoke-grenade/launcher system for armored vehicles (U). (Continued)

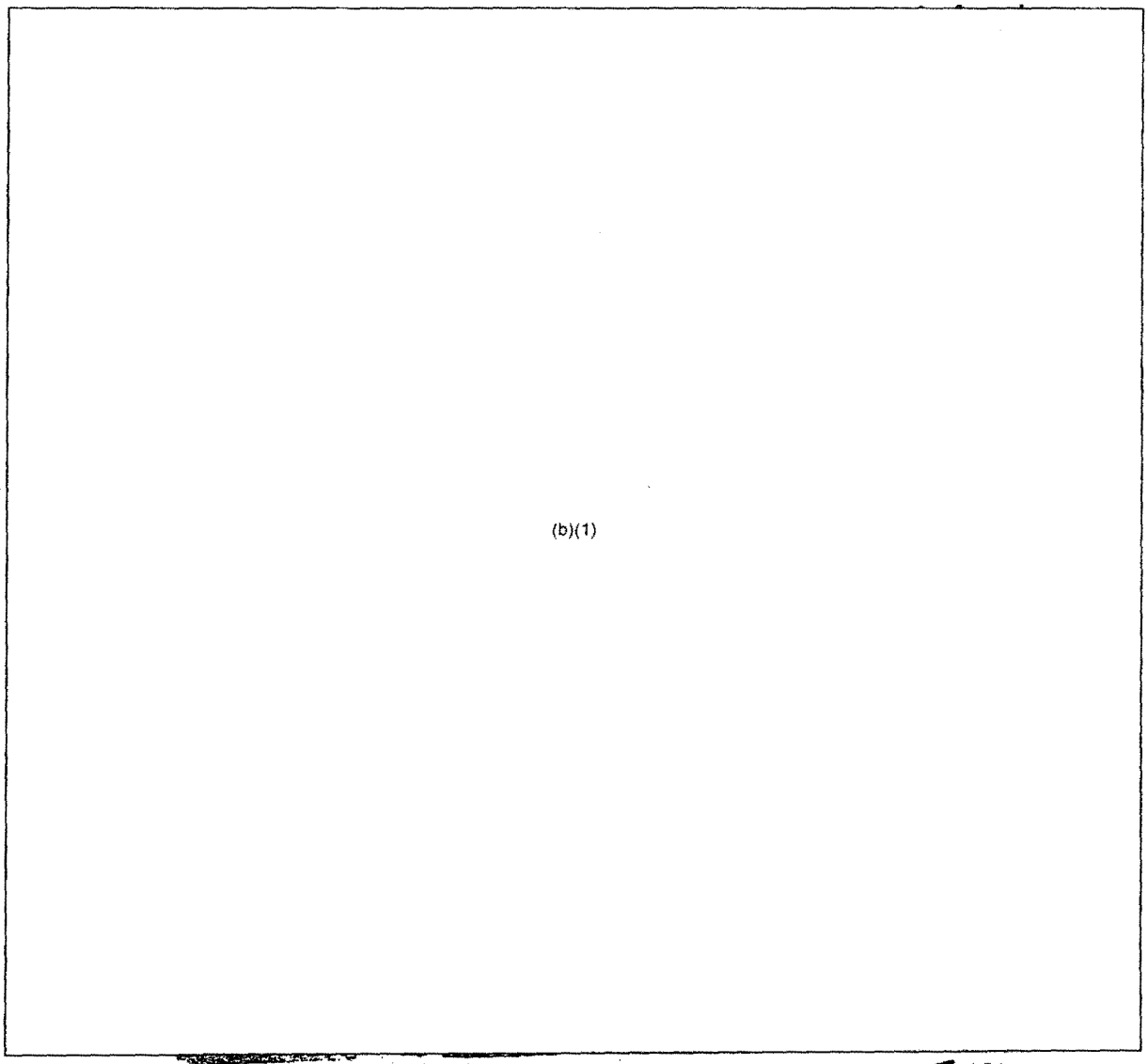
6. (U) Results achieved during a demonstration of the system discussed above are illustrated in figure 3-21.



Neg. 521883 (UNCLASSIFIED)

Figure 3-21. Demonstration of the West German (Wegman-Buck) armored-vehicle-mounted smoke-grenade/launcher system (U).

(c) (C) Leopard II tank prototype.



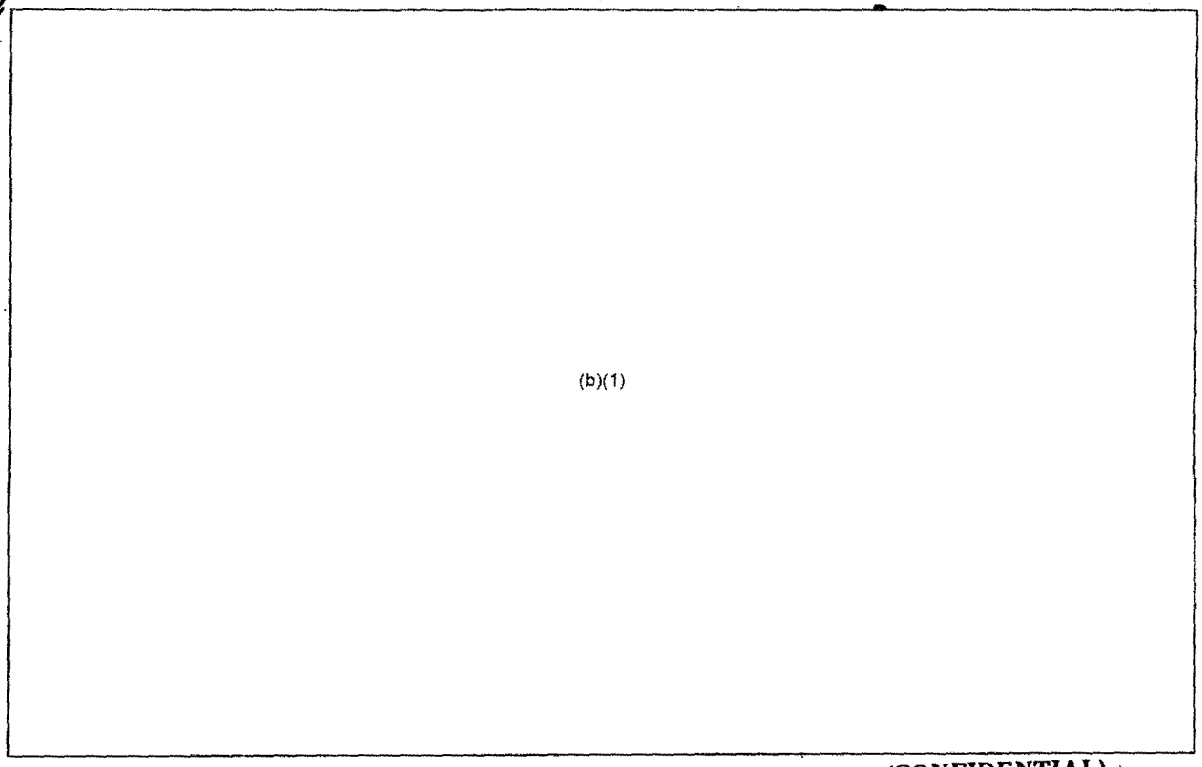
Neg. 554989

(View A - Grenade launching system)

(CONFIDENTIAL)

1. Launch tube
2. Connecting rod
3. Folding cover
4. Coverplate
5. Deflector (adjustable)

Figure 3-22. Smoke-grenade/launcher system designed for the Leopard II tank prototype (U).



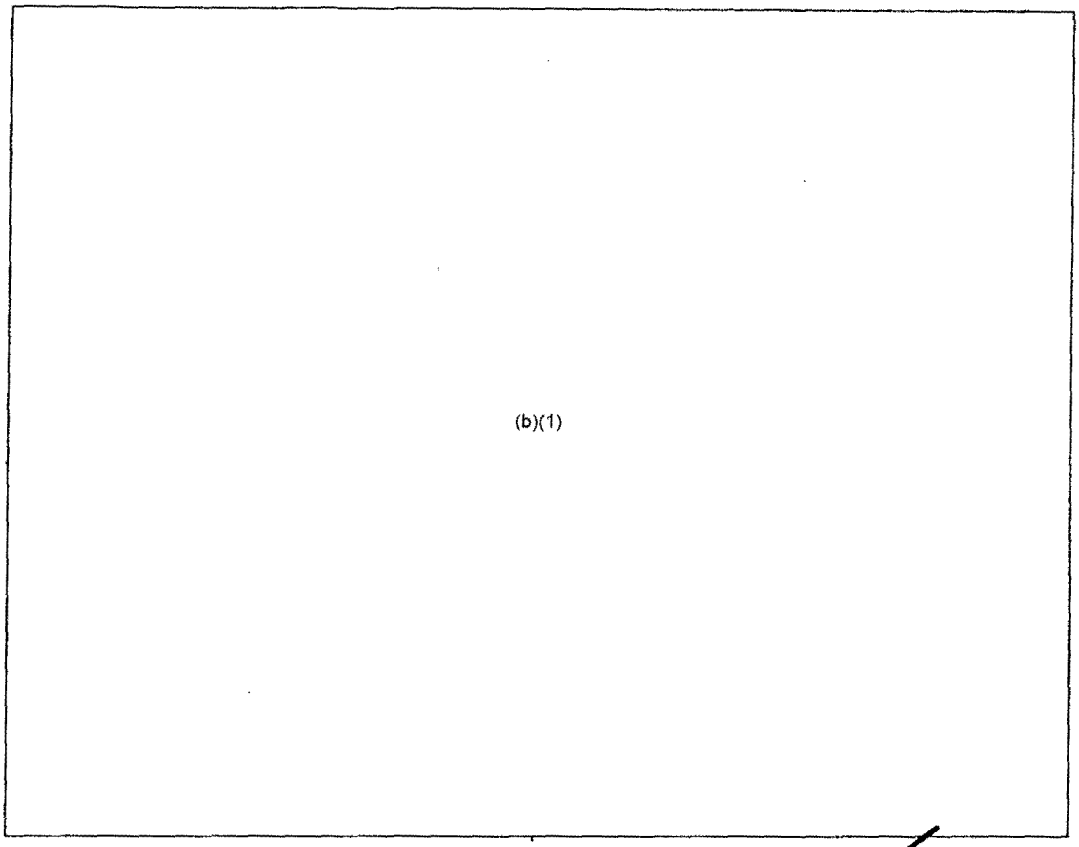
(CONFIDENTIAL)

Neg. 554990

(View B - Sectional view of the grenade launching system)

1. Front breech
2. Launch tube
3. Launch tube support
4. Rear breech
5. Mounting
6. Support ring
7. Traversing lock
8. Ball-bearing race
9. Lock (folding cover)
10. Slipring
11. Coverplate
12. Deflector (adjustable)
13. Folding cover
14. Connecting rods

Figure 3-22. Smoke-grenade/launcher system designed for the Leopard II tank prototype (U). (Continued)



Neg. 554991

(CONFIDENTIAL)

(View C - Diagram of the grenade/launcher system as viewed from inside the turret of a Leopard II tank prototype.)

1. Locking handle
2. Firing button
3. Microswitch
4. Pin
5. Pointer
6. Laying scale
7. Lock
8. Coverplate
9. Bearing (folding cover)
10. Tooth segment

Figure 3-22. Smoke-grenade/launcher system designed for the Leopard II tank prototype (U) (Continued).

NOT RELEASABLE TO FOREIGN NATIONALS

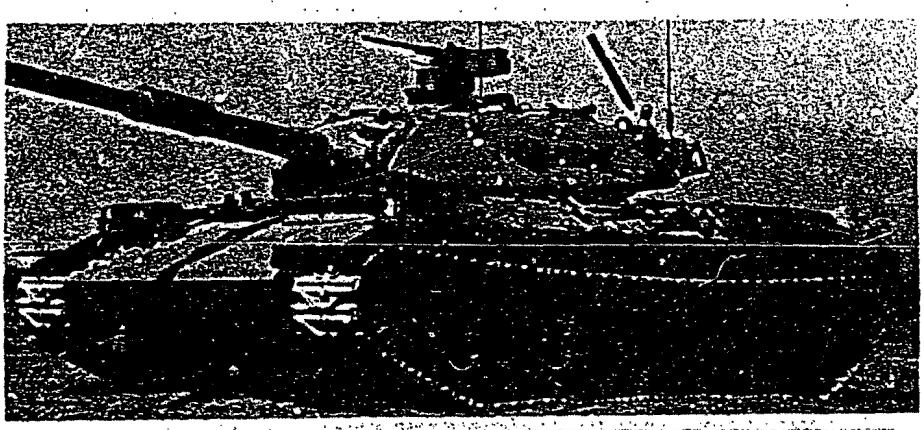
(5) (C-NOFORN) Japan.

(b)(1)

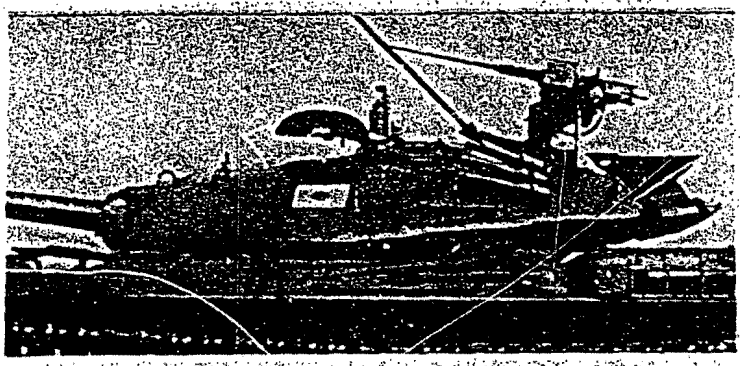
(b) (C-NOFORN) Japanese Type 74 tank and Type 73 armored personnel carrier.

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

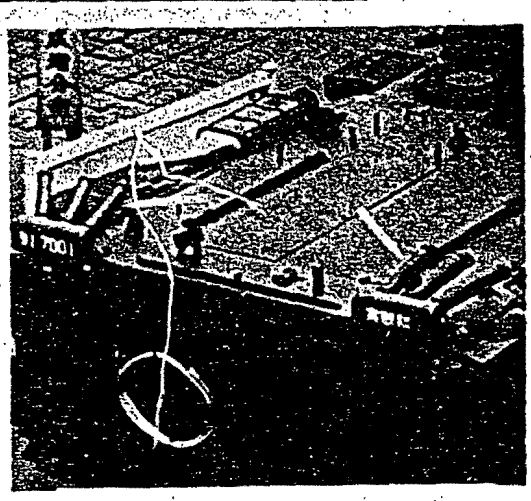


Type 74
(105-mm gun)
Tank



Type 74
tank turret

Type 73 APC prototype (Komatsu)



Type 73 APC prototype (Mitsubishi)

Neg. 522858

(UNCLASSIFIED)

Figure 3-23. Smoke-grenade launching systems on Japanese armored vehicles (U).

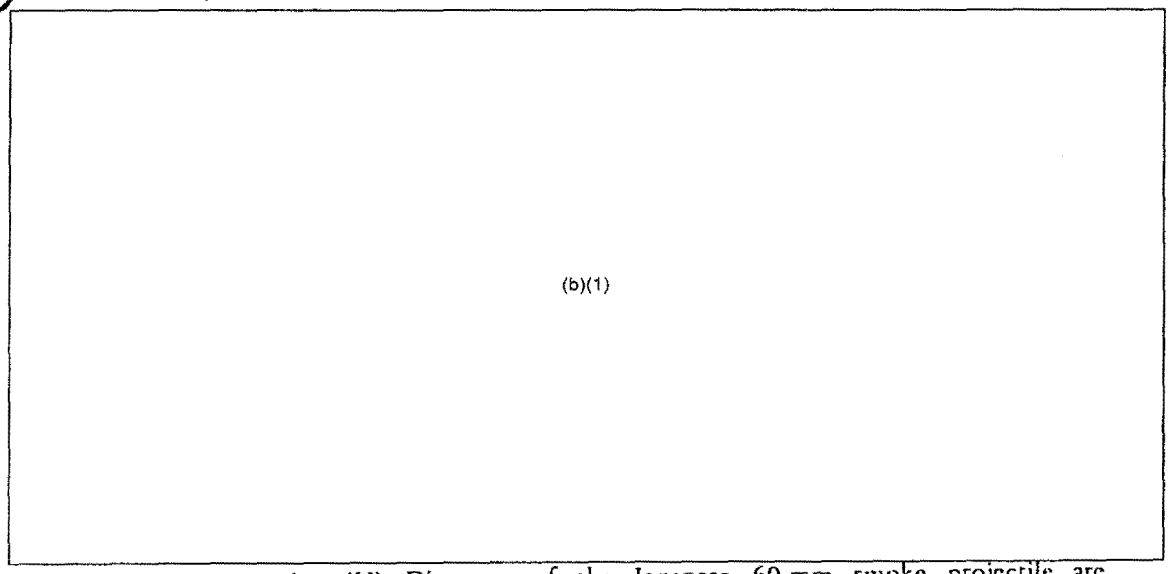
NOT RELEASABLE TO FOREIGN NATIONALS

DST-1620S-145-77

CONFIDENTIAL

(b)(1)

(b)(1)



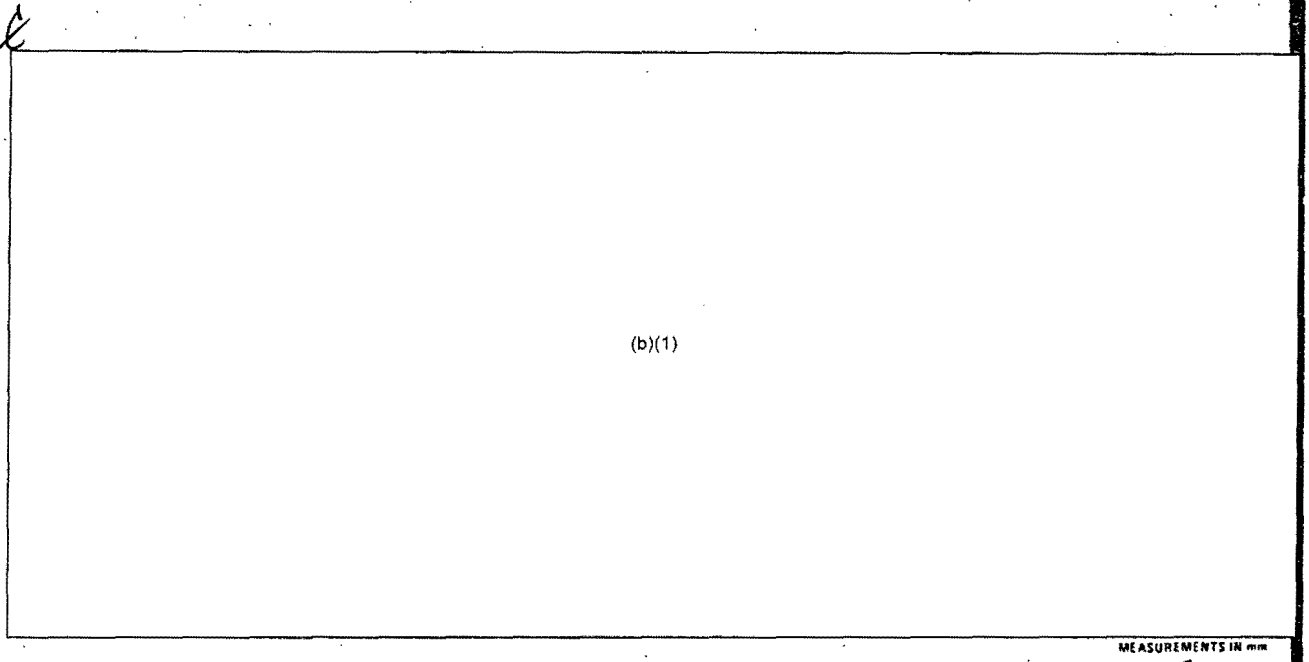
4. (U) Diagrams of the Japanese 60-mm smoke projectile are provided in figures 3-25 and 3-26.[30 31]

(6) (U) Sweden.

(a) (U) General. For more than a decade Swedish armored vehicle experts have included smoke-grenade/launcher systems in their designs. The Swedish Army's main battle tank—the 105-mm gun "S" tank—and armored recovery vehicle are two examples of such application (fig 3-27).[32]

(b) (U) Swedish "S" tank.

1. (U) Since the "S" tank is turretless, Sweden's designers put the tank's smoke-grenade launchers on the observation cupola located in the roof above the commander's position. Four launch tubes are mounted on each side of the cupola (fig 3-27),[32] which is is seated on ball bearings and equipped with a ring gear. The cupola can be traversed electrohydraulically and manually; a gyro is used to stabilize it in traverse so that, regardless of how the tank turns, ground sighting can be maintained automatically. The commander can set the cupola in a certain position and lock it; from the locked position it can be traversed mechanically 200° in either direction.



Neg. 554968

Figure 3-25. Japanese 60-mm smoke projectile (C-NOFORN).

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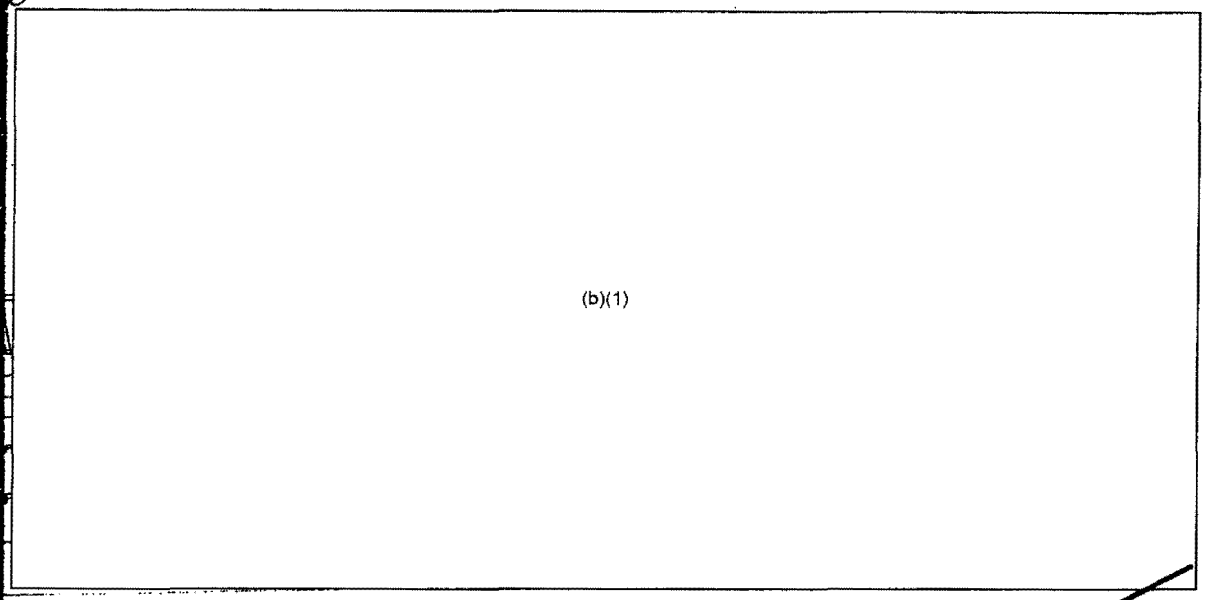

MEASUREMENTS IN mm

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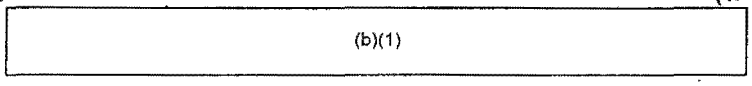

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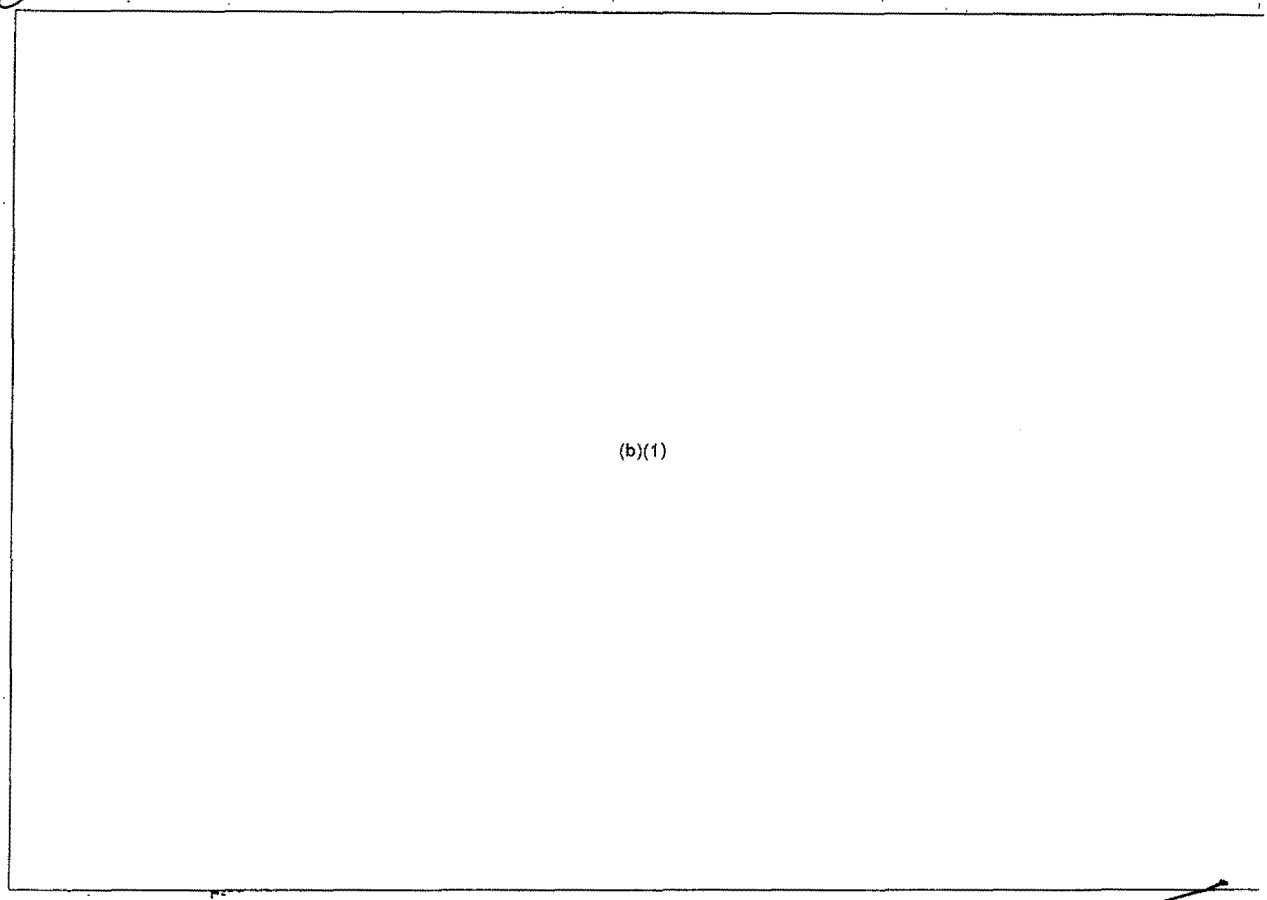

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Figure 3-26. PD fuze for Japanese 60-mm smoke projectile (C-NOFORN).

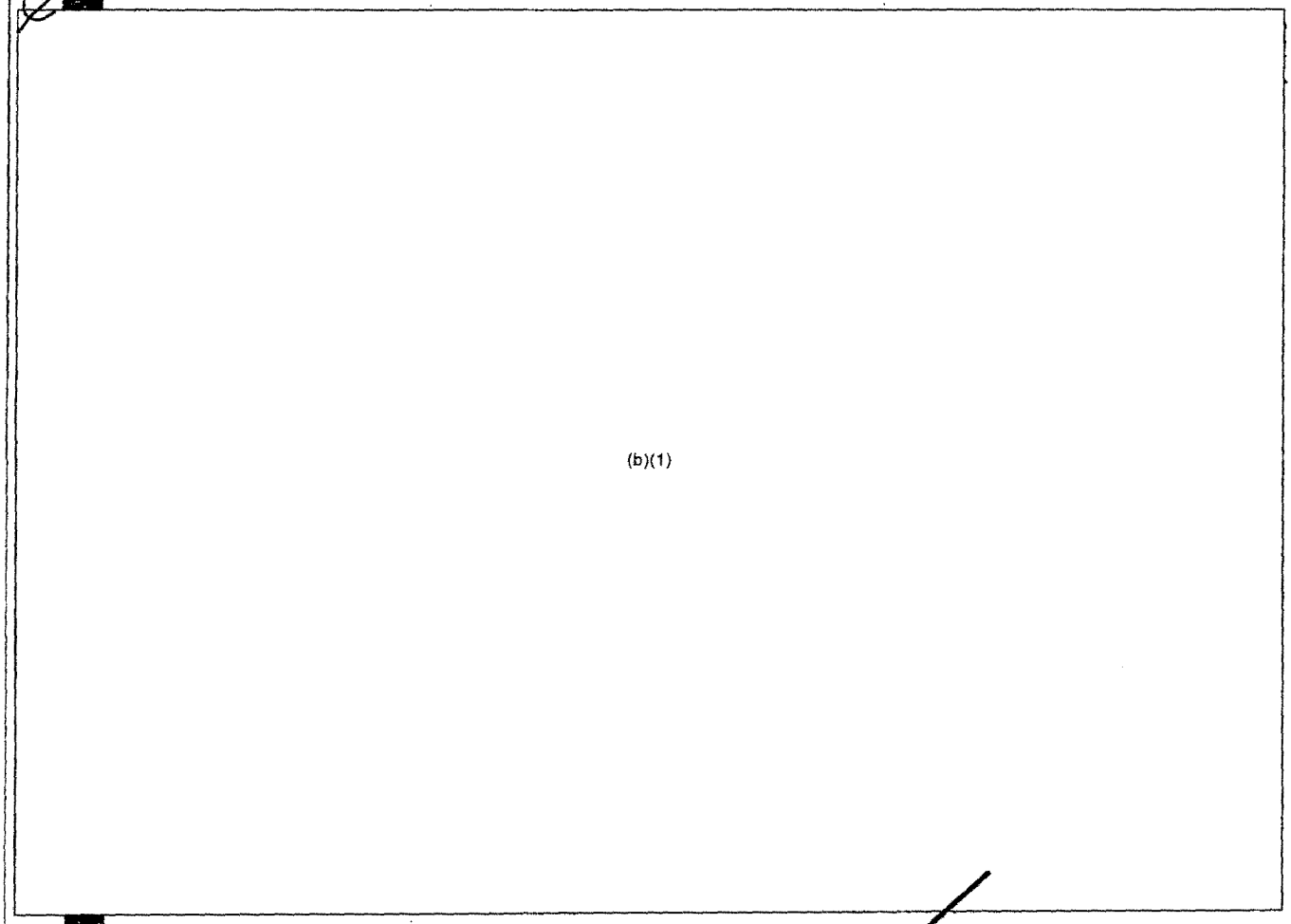
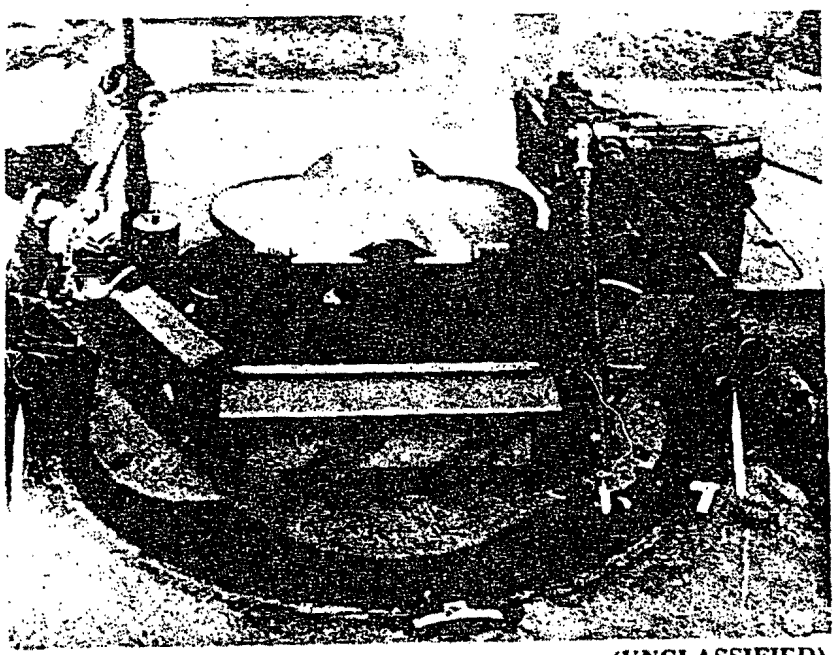


Figure 3-26. PD fuze for Japanese 60-mm smoke projectile (C-NOFORN).



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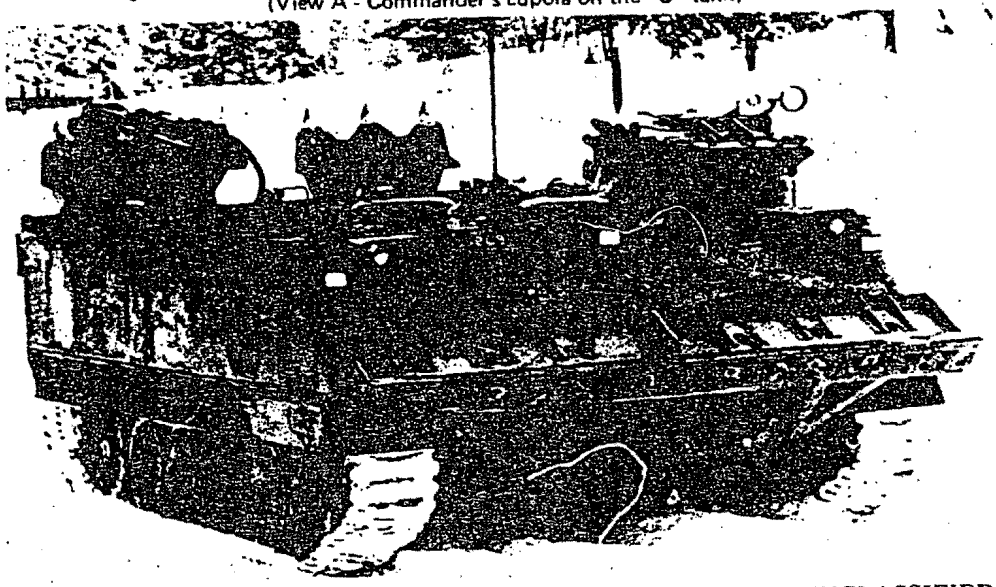
(View A - Commander's cupola on the "S" tank)



Neg. 517570 (UNCLASSIFIED)

(View B - Armored recovery vehicle)

Figure 3-27. Smoke-grenade/launcher system on Swedish armored vehicles (U).

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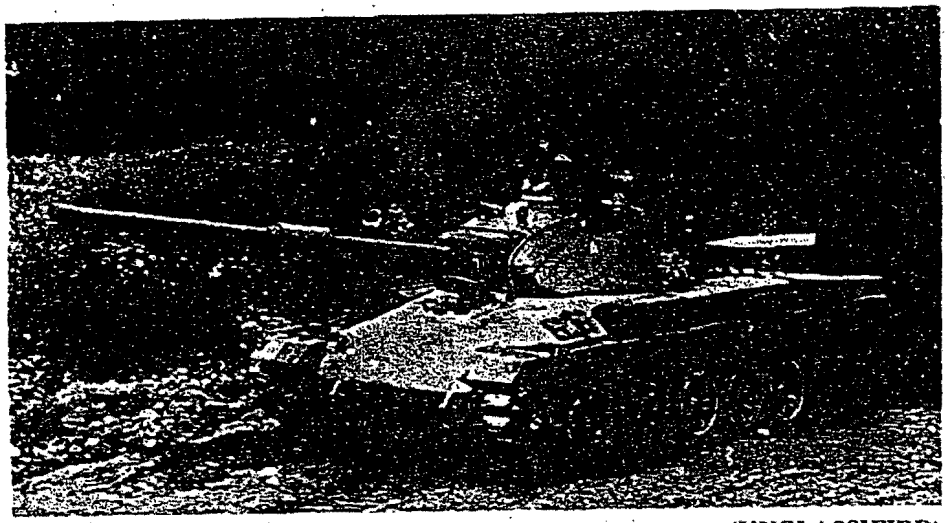
2. (U) The smoke-grenade launchers provide a smoke screen about 35 meters from the launch vehicle.[32] The launch tubes are directed in such a manner that when four grenades are fired—two are fired from each side simultaneously—they effectively cover a 90° arc. The design of the observation cupola makes it possible to redirect the launchers rapidly. Firing is controlled by the tank commander using the control panel of the observation cupola. To operate the system, the commander sets the smoke launcher toggle switch in the "on" position and depresses the firing button, which fires the first four grenades. He presses the button a second time to fire the remaining four grenades.

(7) (C) Switzerland.

(b)(1)

(b) (C) Swiss tank-mounted 80-mm smoke grenade 51.

(b)(1)



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(View A - PZ-68 tank)

Figure 3-28. Smoke-grenade launchers on Swiss army tanks (U).

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(UNCLASSIFIED)

(View B - PZ-61 tank turret)

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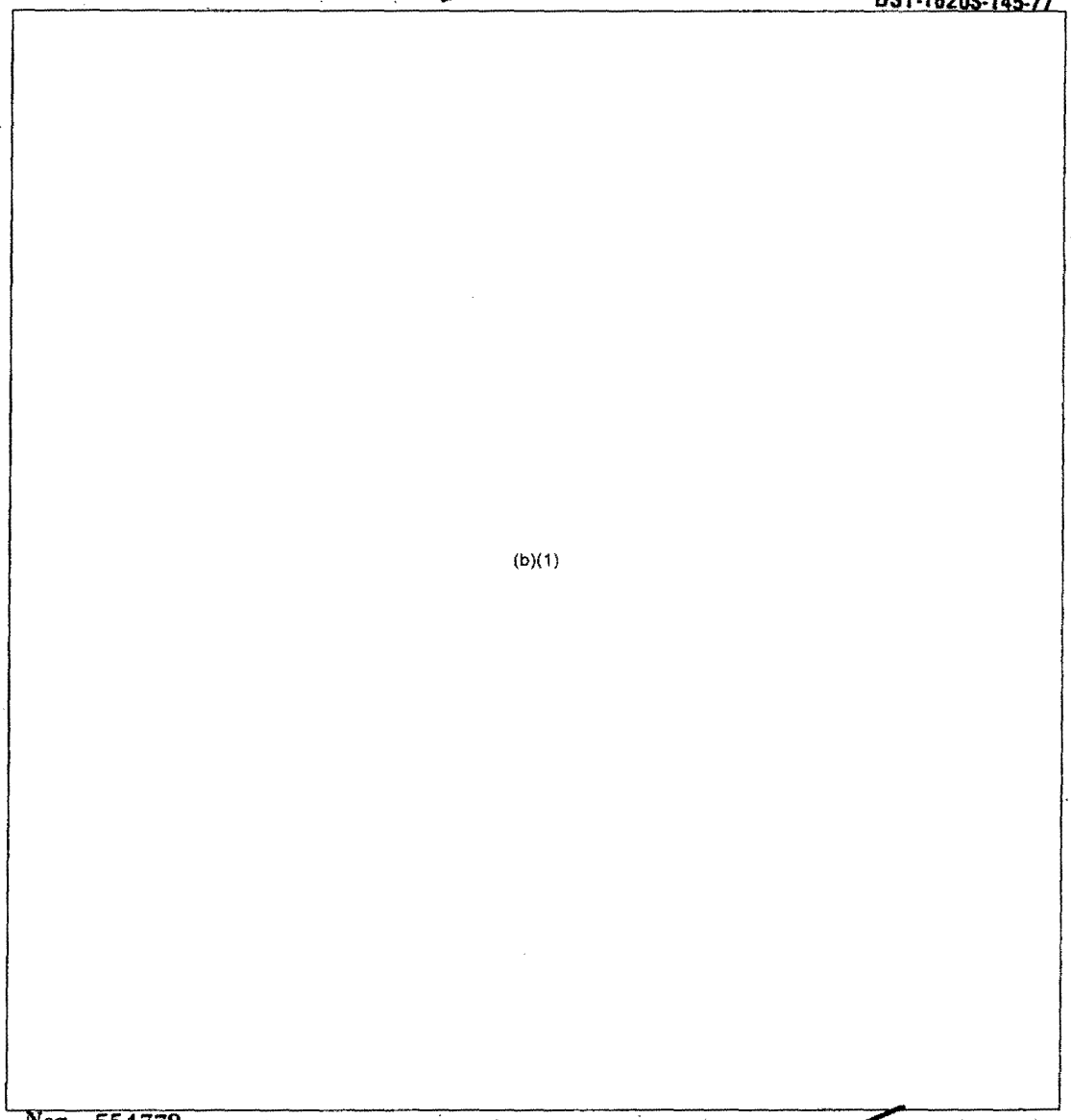
(UNCLASSIFIED)

(View C - Swiss Centurion tank during field exercise)

Figure 3-28. Smoke-grenade launchers on Swiss army tanks (U). (Continued)

(8) (✓) United Kingdom.

(b)(1)



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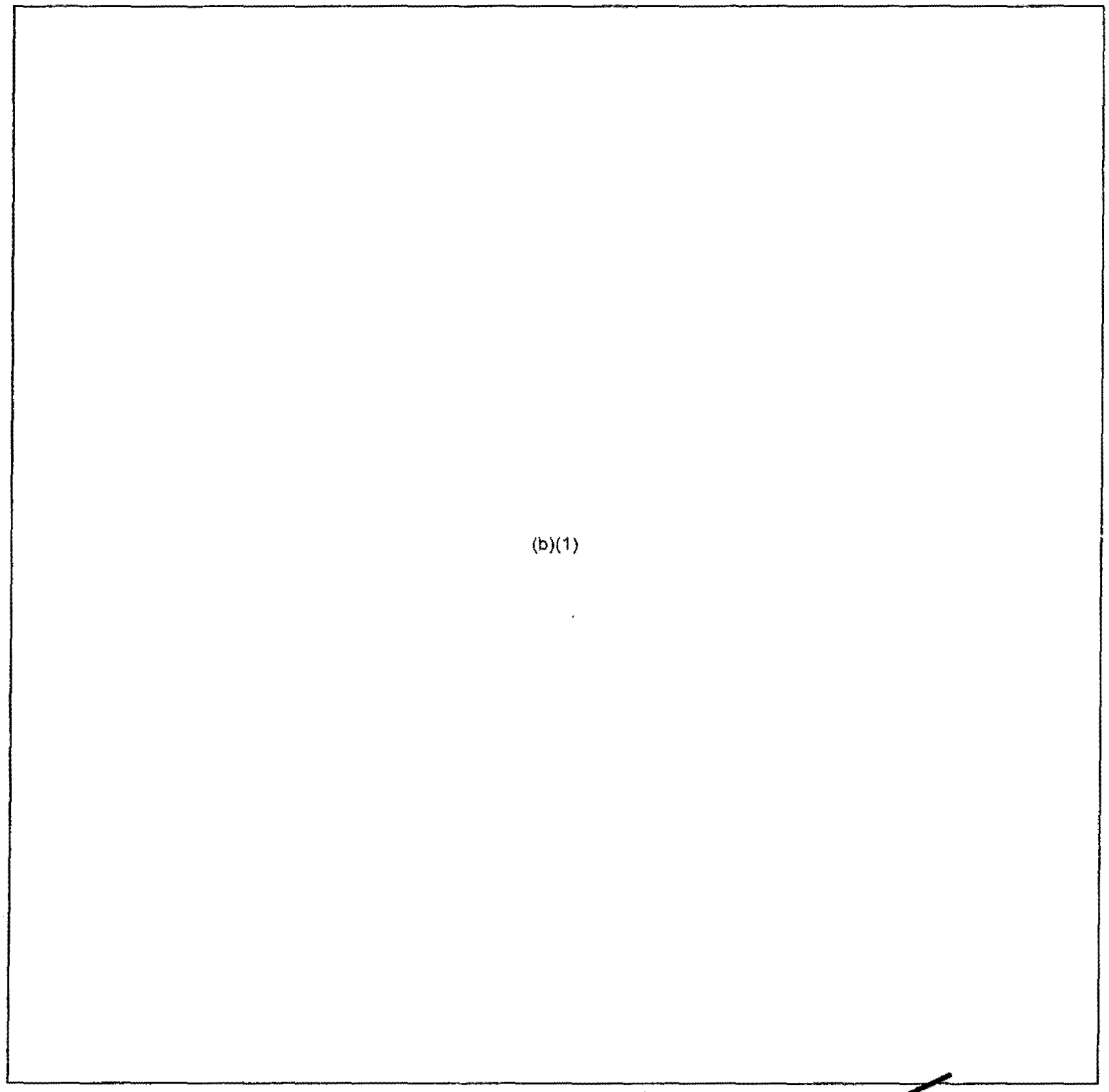
(View A - Smoke grenade discharger No. 1, MK 1)

1. Mounting
2. Contacts
3. Launch tubes (barrels)

Figure 3-29. Smoke-grenade/launcher system developed for British Centurion tanks (U).



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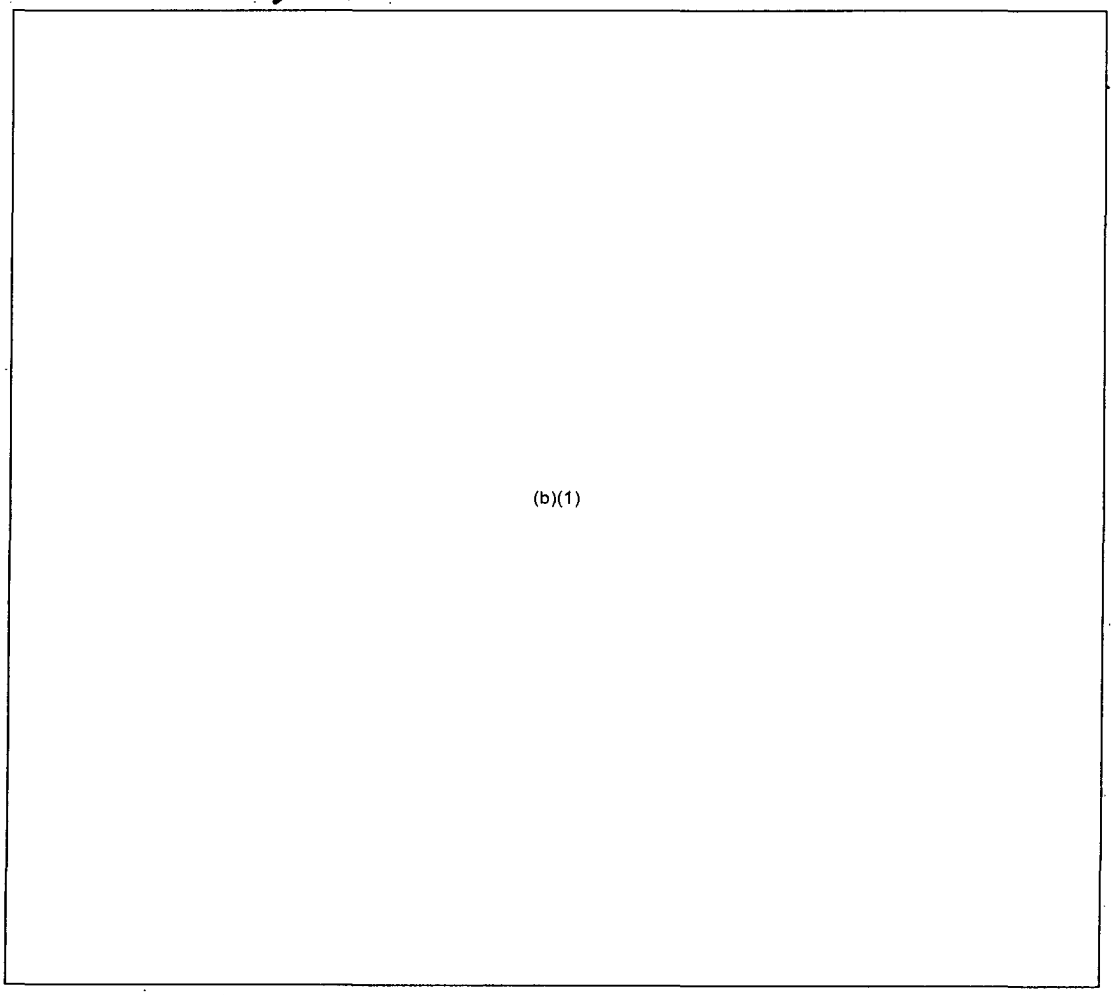
(View B - Firing-button box)

1. Resistance unit
2. Lid
3. Terminal block
4. Gasket
5. Pushbutton

Figure 3-29. Smoke-grenade/launcher system developed for British Centurion tanks (U). (Continued)

(c) ~~(C)~~ Chieftain 120-mm gun tank.



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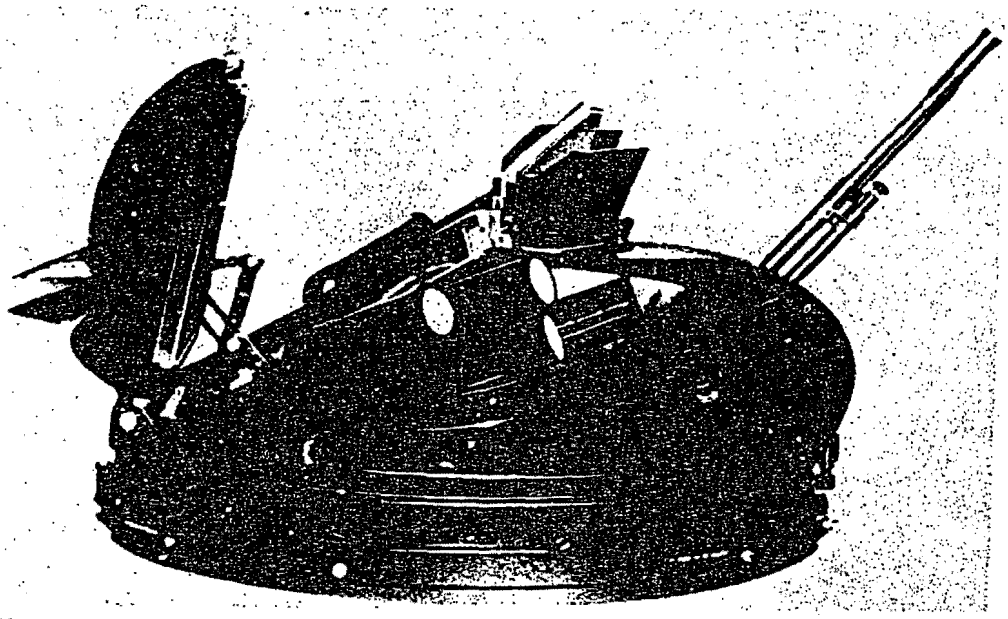
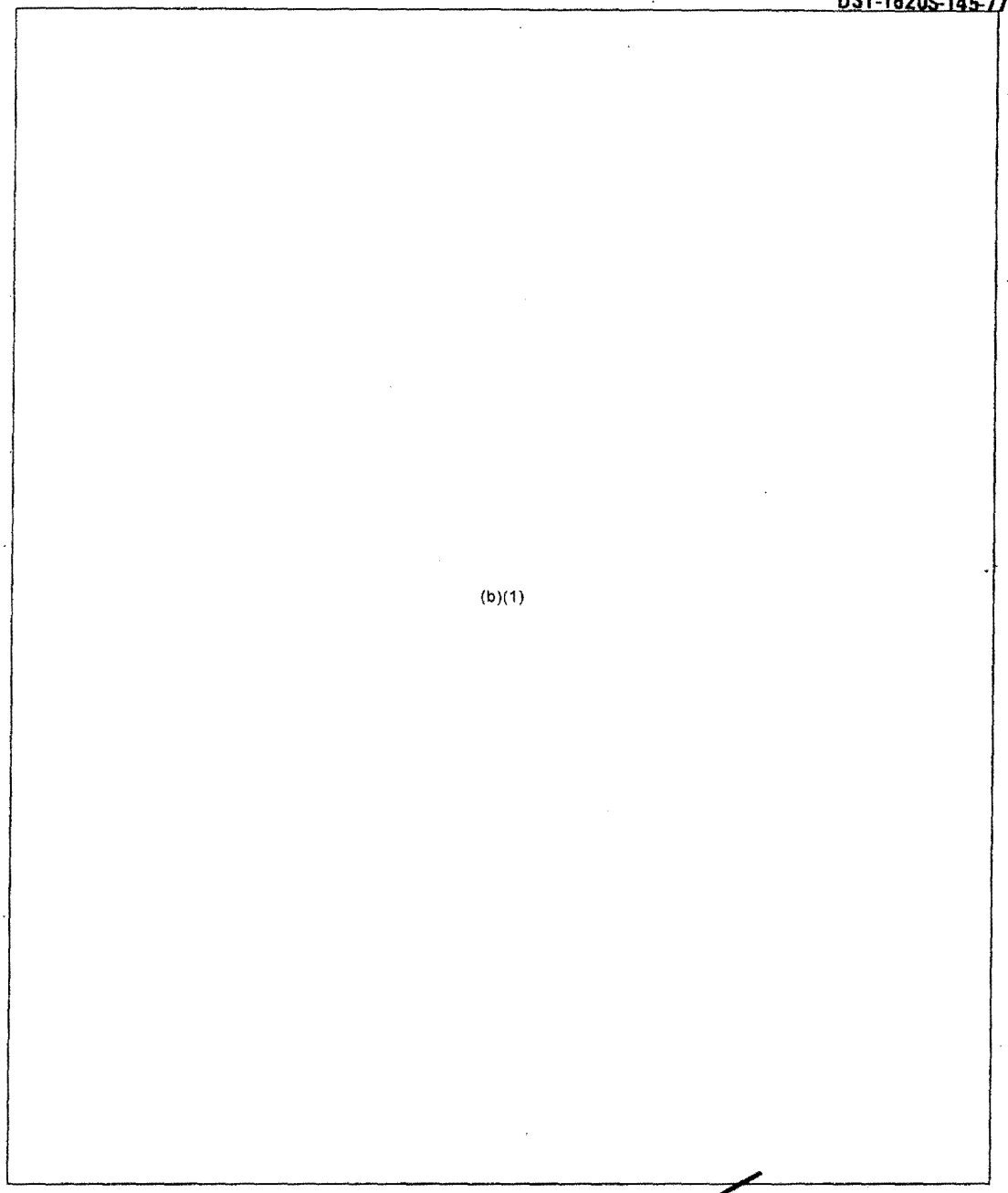
(View A - No. 9 MK 1 six-tube launch unit on Chieftain Tank turret)



Neg. 522105 (UNCLASSIFIED)

(View B - No. 12 MK 1 four-tube launch unit on a new lightweight machinegun turret No. 1 MK 1/1 designed by Peak Engineering Co., Ltd., of England)

Figure 3-30. British smoke-grenade/launcher units for armored vehicles (U).



(b)(1)

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(CONFIDENTIAL)

Figure 3-31. British L8A1 smoke grenade (U).

(9) (U) Free world light armored and recovery vehicles using smoke systems.

(a) (U) Australia. The M113A1 fire support vehicles probably use the same British smoke-grenade launchers that are mounted on the Saladin armored car and the Scorpion reconnaissance vehicle 76-mm gun turrets, which are fitted to US M113A1 APCs (Saladin—six on each side of turret; Scorpion—three on each side of gun mantlet).

(b) (U) Austria.

1. (U) Kurassier 105-mm gun antitank vehicle. This vehicle has six smoke-grenade launchers (possibly French) mounted on a French turret, three on each side of the turret.

2. (U) 4KH6FA-B Grief light recovery vehicle. This vehicle has four smoke-grenade launchers, of an unidentified type, on top of the hull.

(c) (U) Belgium. The FN4RM/62 F.A.B 4x4 armored car has 12 smoke-grenade launchers, possibly of the same type found on the British Saladin 6x6 armored cars, 6 on each side of the turret.

(d) (U) Brazil. Export models of the EE-9 Cascavel 6x6 armored car are fitted with the French H90 90-mm gun turret and have four or six smoke-grenade launchers (probably French), two or three on each rear side of the turret.

(e) (U) France.

1. (U) AMX-13D tank recovery vehicle. The AMX-13D has no launchers.

2. (U) AMX-VCG combat engineer vehicle. This vehicle has three smoke-grenade launchers, one on the right and two on the left side of the hull.

3. (U) AMX-30D tank recovery vehicle. The AMX-30D has eight smoke-grenade launchers, four on each front side of the hull.

4. (U) EBR 8x8 armored car. This vehicle has four smoke-grenade launchers, two on each side of the turret.

5. (U) AML H60 4x4 armored car. The AML H60 has no launchers.

6. (U) AML H90 4x4 armored car. This car has six smoke-grenade launchers, three on each rear side of the turret.

7. (U) AMX-VCI tracked mechanized infantry combat vehicle. The AMX-VCI has no launchers.

8. (U) AMX-10P tracked amphibious mechanized infantry combat vehicle. This vehicle has four smoke-grenade launchers, two on each rear corner of the hull.

9. (U) AML M3 4x4 amphibious armored personnel carrier (export only). The AML M3 carries four smoke-grenade launchers, two on each side of the hull.

10. (U) VXB-170 4x4 armored personnel carrier. This APC has four smoke-grenade launchers, two on each side of the hull.

11. (U) Saviem VAB 4x4 or 6x6 armored personnel carrier. There are no launchers visible on prototypes of this vehicle.

12. (U) AMX-10RC 6x6 armored reconnaissance vehicle. This vehicle has four smoke-grenade launchers, two on each rear corner of the turret.

(f) (U) West Germany.

1. (U) Standard (Leopard) armored recovery vehicle. The Leopard has six smoke-grenade launchers on the left side of the hull.

2. (U) Leopard combat engineer vehicle. These vehicles have six smoke-grenade launchers on the left side of the hull.

3. (U) UR-416 4x4 armored personnel carrier. The UR-416 has six smoke-grenade launchers (optional), three on each side of the turret.

4. (U) SW II 4x4 armored car. These cars have six to eight smoke-grenade launchers, three or four on each side of the turret.

5. (U) SPZ 12-3 (HS-30) tracked mechanized infantry combat vehicle. These vehicles have no launchers.

6. (U) Marder tracked mechanized infantry combat vehicle. Marders have six smoke-grenade launchers, two rows of three each on the left side of the gun mantlet.

7. (U) Luchs 8x8 armored reconnaissance vehicle. The Luchs carry eight smoke-grenade launchers, four on each side of the turret.

8. (U) TPZ-1 6x6 amphibious armored transporter. The TPZ-1 has six smoke-grenade launchers, all on the left side of the hull.

9. (U) TPZ-2 4x4 amphibious armored transporter. The TPZ-2 may have six smoke-grenade launchers, possibly the same as those on the TPZ-1. This vehicle and all other West German vehicles listed probably have the same launchers as those used on Leopard I 105-mm gun tanks.

(g) (U) India.

1. (U) Tracked armored personnel carrier. No launchers have been observed on prototypes of these vehicles.

2. (U) Vijiyanta tank recovery vehicle. No launchers were observed on this vehicle or on British Centurion tank recovery vehicles.

(h) (U) Israel. None of the Israeli (US) half-track APCs, (US) M113 APCs, RBY MK-1 light recovery vehicles, or the various Israeli and foreign self-propelled guns, etc., mounts a smoke-grenade launcher.

(i) (U) Italy.

1. (U) M113A1 tracked armored personnel carrier. This vehicle (co-produced in Italy) has no launchers.

2. (U) M113A1 infantry armored fighting vehicle.. The M113A1 has no launchers.

3. (U) Fiat 6616A 4x4 armored recovery vehicle. This vehicle has six smoke-grenade launchers, three on each side of the turret.

(j) (U) Japan.

1. (U) Type 60 tracked armored personnel carrier. This vehicle has no launchers.

2. (U) Type 73 tracked mechanized infantry combat vehicle. Type 73's have six smoke-grenade launchers, three on each rear corner of the hull.

(k) (U) Netherlands.

1. (U) YP-408 8x6 armored personnel carrier. This vehicle has six smoke-grenade launchers, three on each front fender.

2. (U) M113A1 tracked command and recovery carrier. This vehicle has no launchers.

(l) (U) Sweden.

1. (U) PBV-301 tracked armored personnel carrier. This vehicle has three smoke-grenade launchers, three on either side of the hull.

2. (U) PBV-302 tracked mechanized infantry combat vehicle. The PBV-302 has no launchers.

(m) (U) Switzerland. None of the Swiss vehicles appears to be fitted with smoke-grenade launchers.

(n) (U) United Kingdom.

1. (U) Ferret 4x4 scout car. Ferrets have six smoke-grenade launchers, three on each fender.

2. (U) Saracen 6x6 armored personnel carrier. The Saracen has no launchers.

3. (U) Saladin 6x6 armored car. The saladin has 12 smoke-grenade launchers, 6 on each side of the turret.

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4. (U) FV 432 armored personnel carrier. This vehicle has six smoke-grenade launchers, three each on the glacis plates above the headlights.

5. (U) Scorpion 76-mm gun armored recovery vehicle. The Scorpion has six smoke-grenade launchers, three on each side of the gun.

6. (U) Scimitar 30-mm gun armored recovery vehicle. The Scimitar has eight smoke-grenade launchers, four on each side of the gun.

7. (U) Fox 4x4 armored recovery vehicle. The Fox vehicle has a 30-mm gun and 8 smoke-grenade launchers (these use the Scimitar turret), four on each side of the gun.

8. (U) Spartan tracked armored personnel carrier and variants. The Spartan has six or eight smoke-grenade launchers, two sets of three or four on each glacis plate.

(10) (U) Conclusion. The preceding information is all that is available on free world light armored vehicles. The smoke-grenade launchers on each country's light vehicles are probably the same as those fitted to its tanks. Except for late UK vehicles (Scorpion, Scimitar, Fox, and Spartan), which probably fire RP smoke grenades, the other vehicles probably use HC- or WP-filled smoke grenades.

D. FLAME FUELS AND FLAMETHROWERS

8. (C-NOFORN) Flame Fuels

(b)(1)

9. (C-NOFORN) Flamethrowers

(b)(1)

b. (C) France.

(b)(1)

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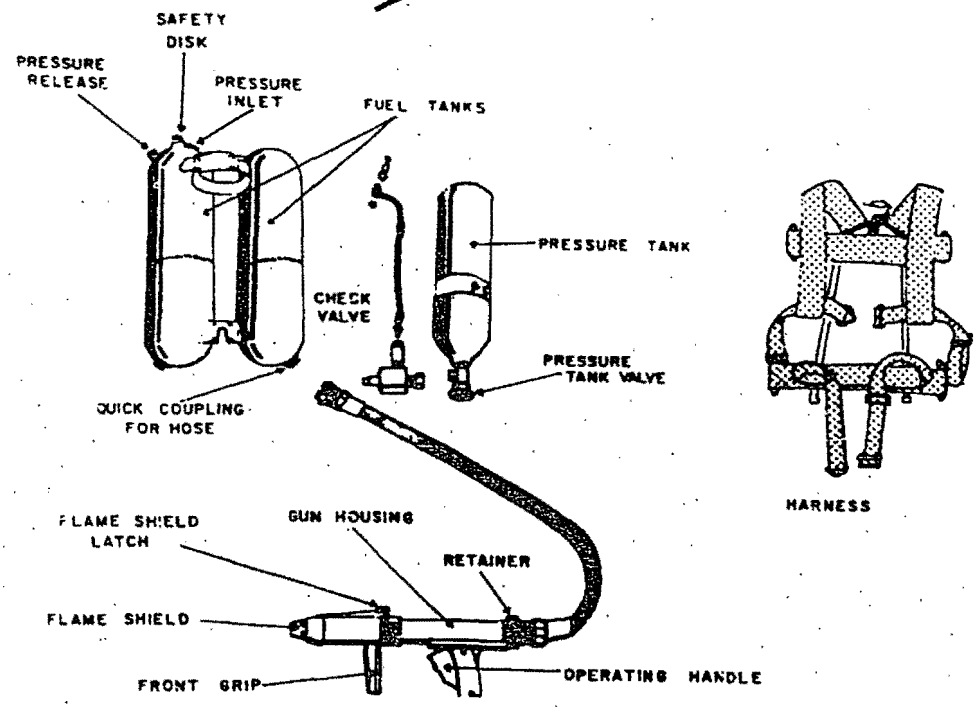

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(UNCLASSIFIED)

Figure 3-32. French Model 1954 portable flamethrower (U).

Table 3-III. Characteristics of French Portable Flamethrower (U)

(b)(1)

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e

(b)(1)

c. (C) Italy.

(b)(1)

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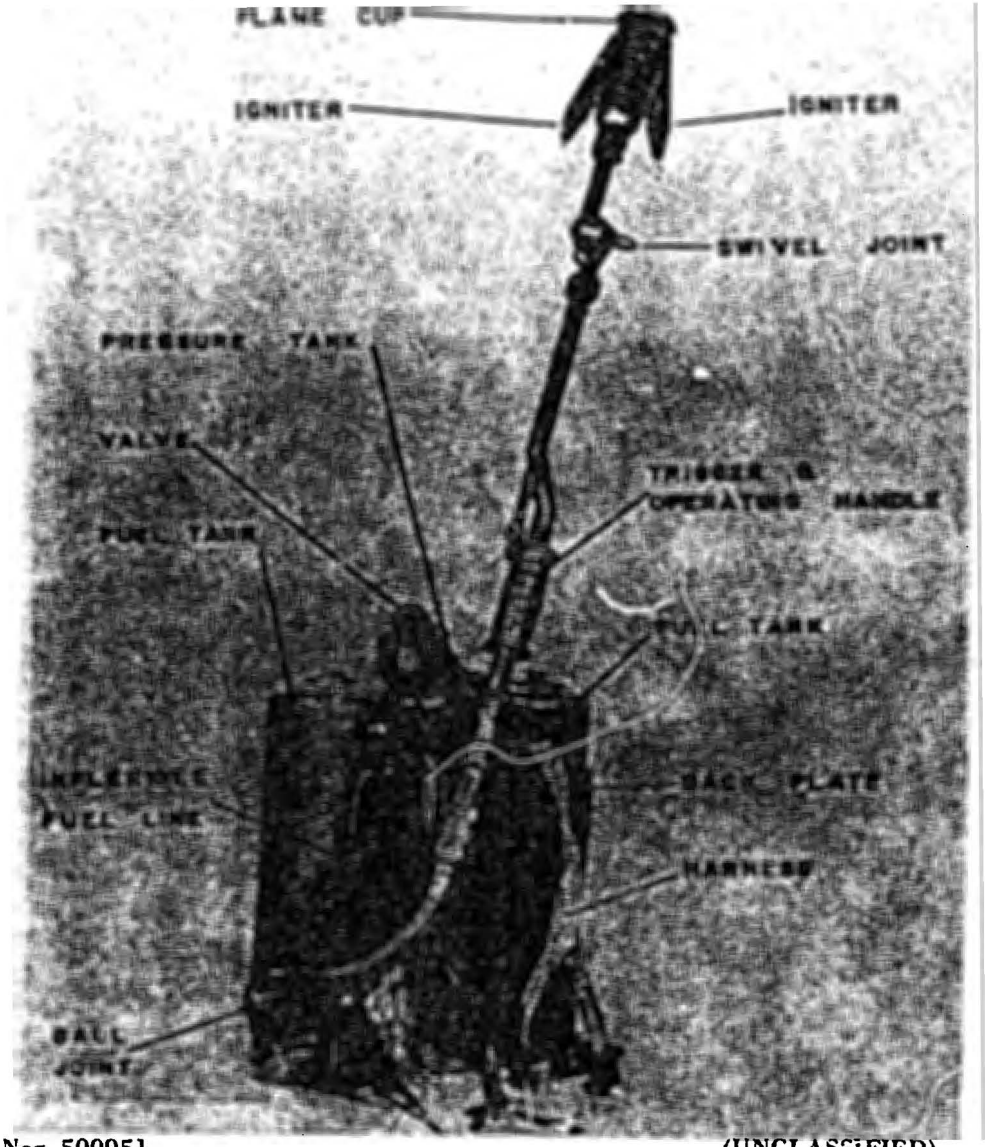

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Figure 3-33. Italian Model 55 portable flamethrower (U).

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e. (C-NOFORN) West Germany.

(b)(1)

(2) (U) Handheld flame launcher, Model DM14. The DM14 launcher is constructed of a smooth-surface cardboard tube that is reinforced in the front.[2] Near the rear are three narrow metal rings that, in addition to reinforcement, serve as hand grips. The launcher measures 35 cm in length and 3.6 cm in diameter. The total weight with fuze is 450 grams. The flame cartridge consists of 400 grams of a prepackaged phosphorus and magnesium mixture. The cartridge is held in place by a cork in each end of the tube. The propellant consists of 2 grams of black powder encased in a metal holder. A fuze inserted into the rear end of the launcher completes the assembly. The DM14 launcher is a close-combat weapon; it can be provided to the individual soldier and can be fired against personnel, buildings, and light equipment. Its maximum effective range is reported to be 80 meters.[49]

(b)(1)

(4) (U) Disposable handheld flame-grenade launcher, Model DT24A2B2, 35-mm.Buck KG, a West German munition manufacturing firm, has developed the DT24A2B2 disposable handheld flame-grenade launcher (HAFLA), which is reportedly a great improvement over the DM24A1.[11] The HAFLA has a range of 80 to 100 meters, and distributes its 240-gram RP incendiary mass over a 5x15-meter area by means of an explosive delay device. Temperatures at the conflagration point reach 1200°C. A dense nonpoisonous smoke is generated for up to 2 min. The components of the HAFLA, shown in figure 3-34, include a launching tube of pressed paper that is lined with aluminum; a plastic, folding, pistol-grip trigger mechanism containing the grenade propellant charge and a positive safety (pull ring and split pin); and a plastic-encased projectile containing the incendiary mass, the dispersion charge, and a PD time delay fuze. The launcher has an overall length of 39 cm and weighs 500 grams. The launcher is particularly useful for close-in fighting against strongpoints (bunkers, trenches, etc.), in house-to-house fighting, and against armored vehicles.

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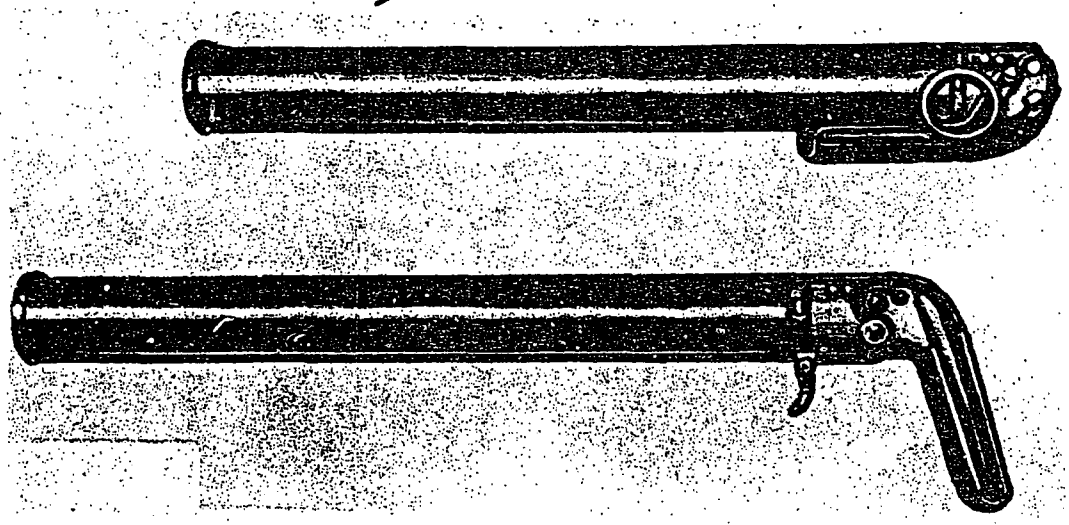

Neg. 505021 (UNCLASSIFIED)

Figure 3-34. West German Model DT24A2B2 flame-grenade launcher (U).

f. (C-NOFORN) Japan.

(b)(1)

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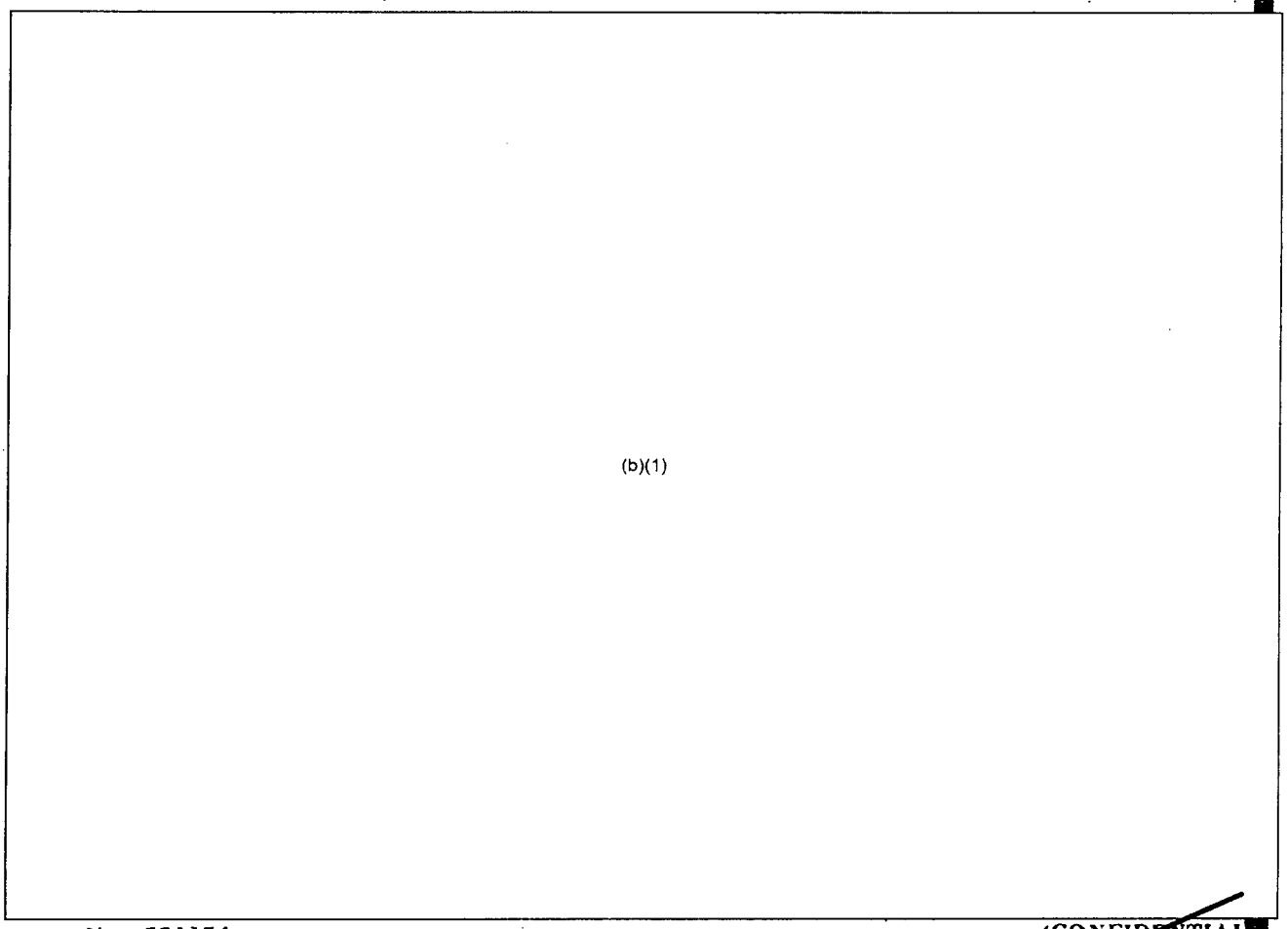

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Figure 3-35. Type 1-1 portable flamethrowers (U).

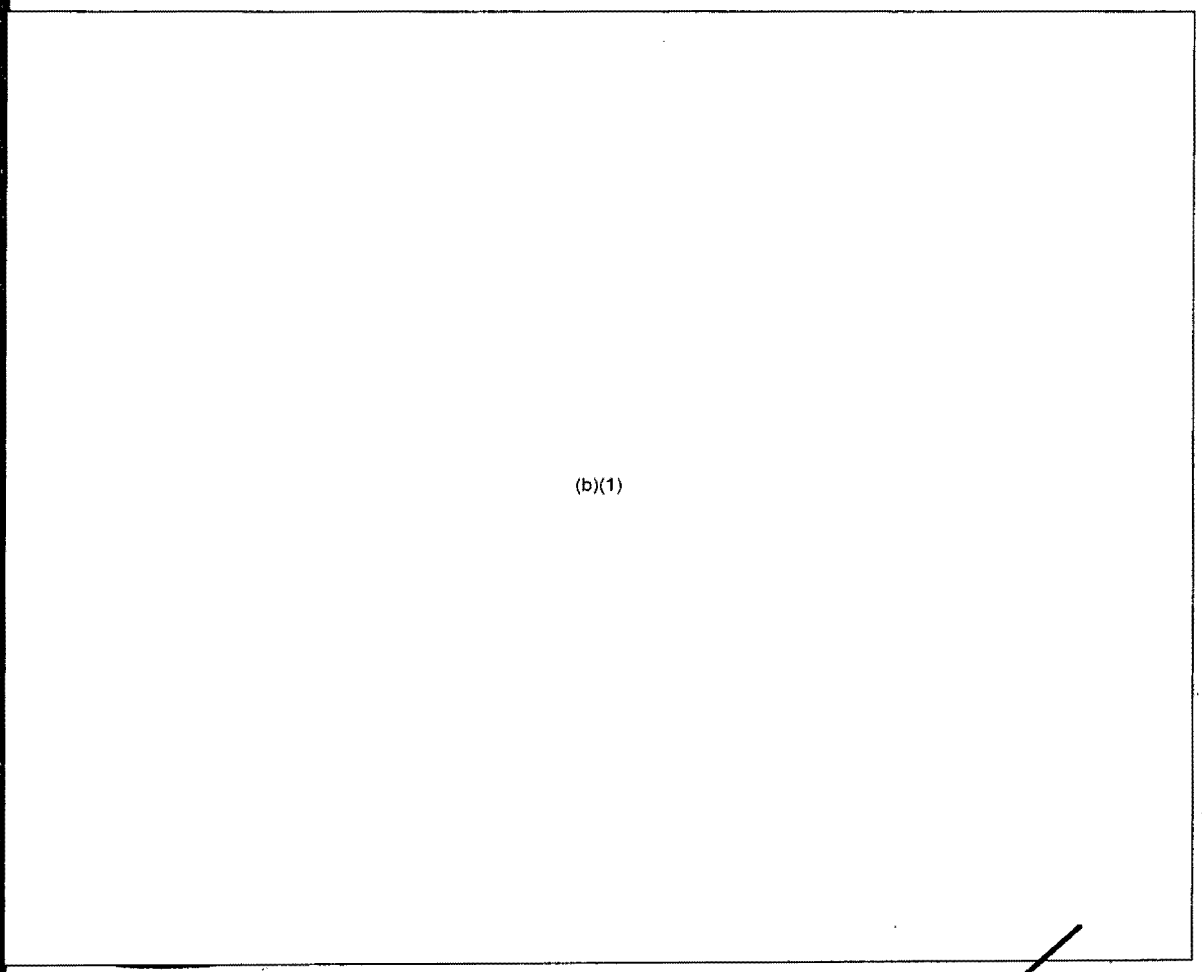

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Figure 3-35. Type 1-1 portable flamethrowers (U).

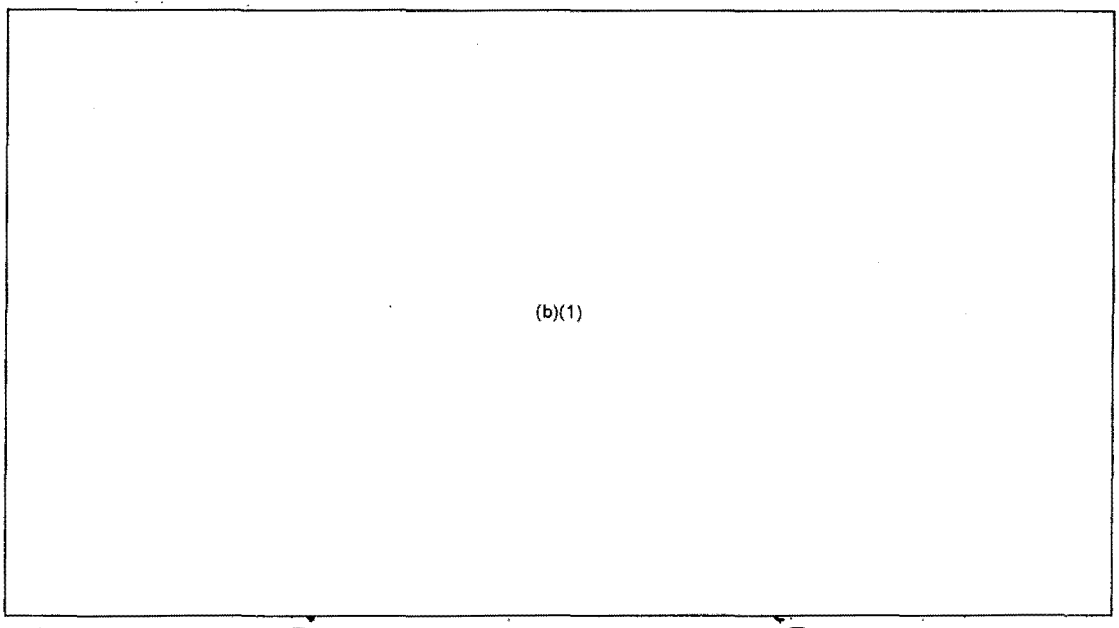

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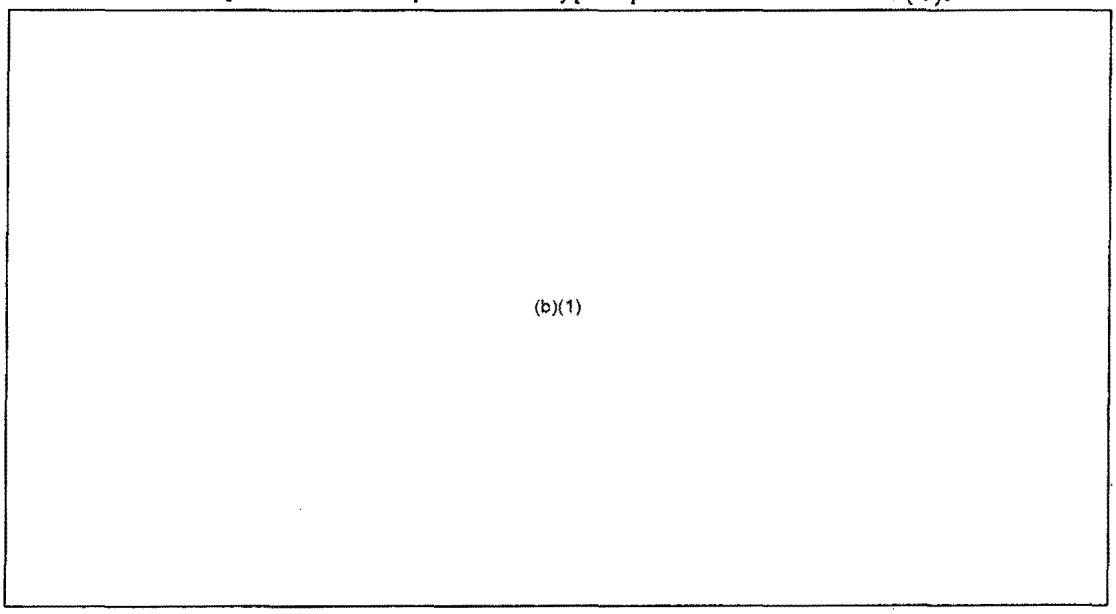
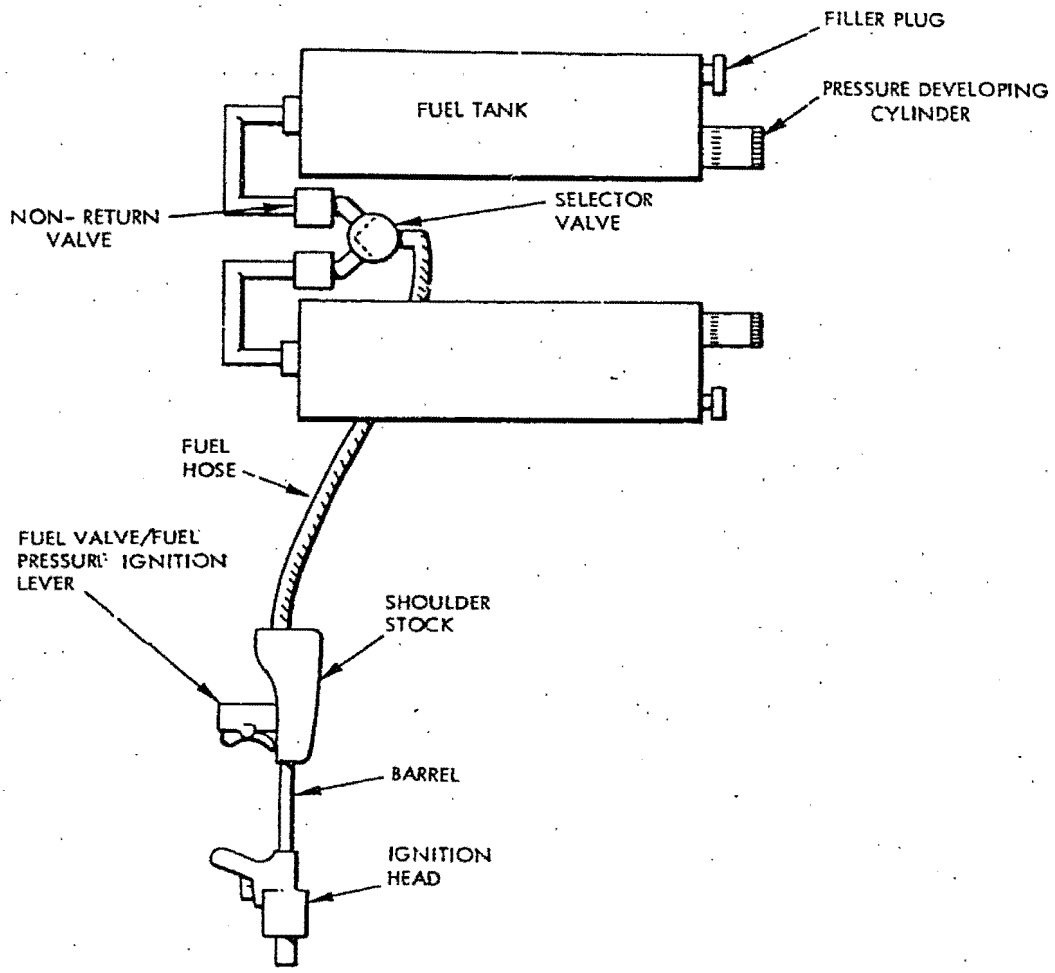
Figure 3-36. Compressor for Type 2 portable flamethrowers (U).





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(UNCLASSIFIED)

Figure 3-37. New portable flamethrower (U).

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E. INCENDIARY AGENTS AND MUNITIONS

10. (C) Agents

(b)(1)

11. (C-NOFORN) Munitions

(b)(1)

(b)(1)

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F. PRODUCTION, STORAGE, AND STOCKPILES

12. (S-NOFORN) Production

(b)(1)

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(b)(1)

(3) (U) Luchaire SA; Paris, a privately owned company, manufactures the following smoke munitions:

- A 90-mm smoke round for the AML Panhard and AMX-13 tank guns.
- The 47-mm smoke and incendiary rifle grenade, Model 60.
- The 47-mm instant smoke rifle grenade, Model F3.
- The 47-mm colored smoke rifle grenade.
- The 40-mm smoke practice rifle grenade, MK F1.

Luchaire is a large company comprising nine plants and employing 5200 persons; there are two major divisions, STRIM and Armament. It undoubtedly has the capability to produce substantial quantities of these smoke munitions.

(4) (U) Etablissements Ruggieri, Armament Department, Paris, manufactures the following smoke munitions:[11]

- Smoke hand grenade, Model 53-58, colored.
- Smoke hand grenade, Model F1, colored.
- Smoke hand grenade, Model F2, colored.

- Smoke hand grenade, Model F3, colored.
- Smoke rifle grenade, 50-mm Model F4, opaque.
- Smoke device, Model 59, white.
- Standard smoke-producing charge. Model F1, white.

All of the above munitions are mass-produced and used in the French Army. The smoke device is designed for use with armored vehicles, from which it is launched via a special tube attached to the vehicle. The F1 smoke charge is a 200-gram plastic bag filled with smoke agent; it is designed to be used with various engineering practice equipment such as mines.

(5) (U) Compagnie Francaise Thomson-Houston-Hotchkiss-Brandt, Nantes (47-13N 01-33W), a large armament, ammunition, and electronic equipment manufacturer, produces a line of mortar smoke ammunition. Its products include 120-mm, 81-mm, and 60-mm mortar rounds. The 120-mm round is soon to be in mass production; the 81-mm and 60-mm rounds are now in mass production. Both HC and titanium tetrachloride are used for fill.

(6) (U) La Societa E. Lacroix, a company that claims to be one of the largest pyrogenic manufacturers in Europe, also produces a line of smoke munitions. The company, located in Toulouse on 80 acres of land, manufactures a wide range of pyrotechnics, antipersonnel devices, and special products. Its smoke line includes the following:

- Smoke cartridge, 74-mm, Type F130.
- Impact-pinpointing cartridge, Type F75A.
- Tinted-smoke grenade, Type LXT290.
- Tinted-smoke hand grenade, Type 60.
- Yellow-smoke sea-marker.
- Night and day signal, Type 275.
- Nuclear-explosion simulator.

Production is believed to be available both for the armed forces and for export.

(b)(1)

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(b)(1)

Table 3-IV. Production of Chemical Warfare Munitions at Sociedade Portuguesa de Explosivox (U)

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(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(b)(1)

(2) (U) Standard Pyrotechnik Meissner, Speyer, produces the SPM, DM-22, and DM-1 smoke pots. This is a small company, employing only 20 people. Illuminating devices are also produced here.

(b)(1)

(5) (U) Th. Goldschmidt, AG, Essen, produces a special incendiary material used in the thermit destructor unit, which is used to destroy electronic equipment. Both of these devices are marketed by Elektro-Thermit, GmbH, Essen.

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Table 3-V. Munitions Produced by the West German Buck Company (U)

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15. (C) Therapy

a. (C) Smokes.

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b. (U) Flames and Incendiaries.

(1) (U) Burning WP, thermite, and magnesium cause deep burns when they contact the skin. The initial step in the treatment of these burns is removal of agent particles from the skin. Phosphorus burns should be immersed in or soaked immediately with water to eliminate the possibility of reignition. Bicarbonate solution should then be applied to neutralize phosphoric acid, followed by a 0.5% to 2.0% solution of copper sulfate to wash the skin. All remaining fragments should then be removed. Prolonged contact between the copper sulfate solution and the burned area must be avoided to prevent systemic copper poisoning. Burns should then be treated conventionally, with the exception that oil-base ointments should not be applied.

(2) (U) The treatment for injuries from thickened fuels such as napalm consists of immediate removal of the victim to fresh air. Artificial respiration with 100% oxygen (if possible) is suggested. A tracheotomy may be necessary if there is a respiratory obstruction. Burns of the skin should then be treated.[49]

(3) (U) Information from nonaligned countries is lacking on specific treatment for smoke, flame, and incendiary casualties.

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WARNING NOTICE
Sensitive Intelligence Sources
and Methods Involved

H. RESEARCH AND DEVELOPMENT

16. (C-NOFORN-WNINTEL) Smoke Agents

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and Methods Involved

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e. (C-NOFORN) West Germany.

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Table 3-VI. Attenuation Effects* of Smoke Agents (U)

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*% attenuation at a given time

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(5) (U) Nontoxic replacements for HC and research to develop IR screening smokes are also done at NICO-Pyrotechnik, Tritou.[55] Design requirements imposed by the MOD include effective screening in the visible, near-IR (3- to 5-μm) and medium-IR (8- to 14-μm) spectral regions. Because Rayleigh scattering is ineffective at the longer wavelengths, NICO-Pyrotechnik has developed two IR screening smokes employing black-body absorbers. Reportedly, one composition attenuates 3- to 5-μm radiation and the other attenuates in the 8- to 14-μm region. Compositions of these experimental black-body smokes are unknown. Evaluation tests are scheduled for the near future. Demonstrations of the two compounds showed dense clouds of light gray smoke that became lighter as it moved downwind. The smokes also had a strong tendency to pillar, which was attributed to the very high (1400° to 1500°C) burning temperature. A new visual screening and white signalling smoke was said to have substantial advantages over standard HC mixtures. Advantages claimed were as follows:

- The mixture contains no zinc or chlorine and therefore is considered noncorrosive and nontoxic even in high concentration.
- The mixture is incorporated into an elastomeric matrix, so shelf life expectancy is unlimited.
- The mixtures requires no first-fire to ignite.

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- The intensity of the smoke is independent of moisture.
- The burn temperature is low (600°C) and there is no appreciable ash.

Smoke produced by this mixture was brilliant white and virtually odorless. An acidity indicator showed a pH of about 6.

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17. ~~(C-NOFORN)~~ **Munition/Dispersion Systems**

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(2) (C-NOFORN) West Germany.

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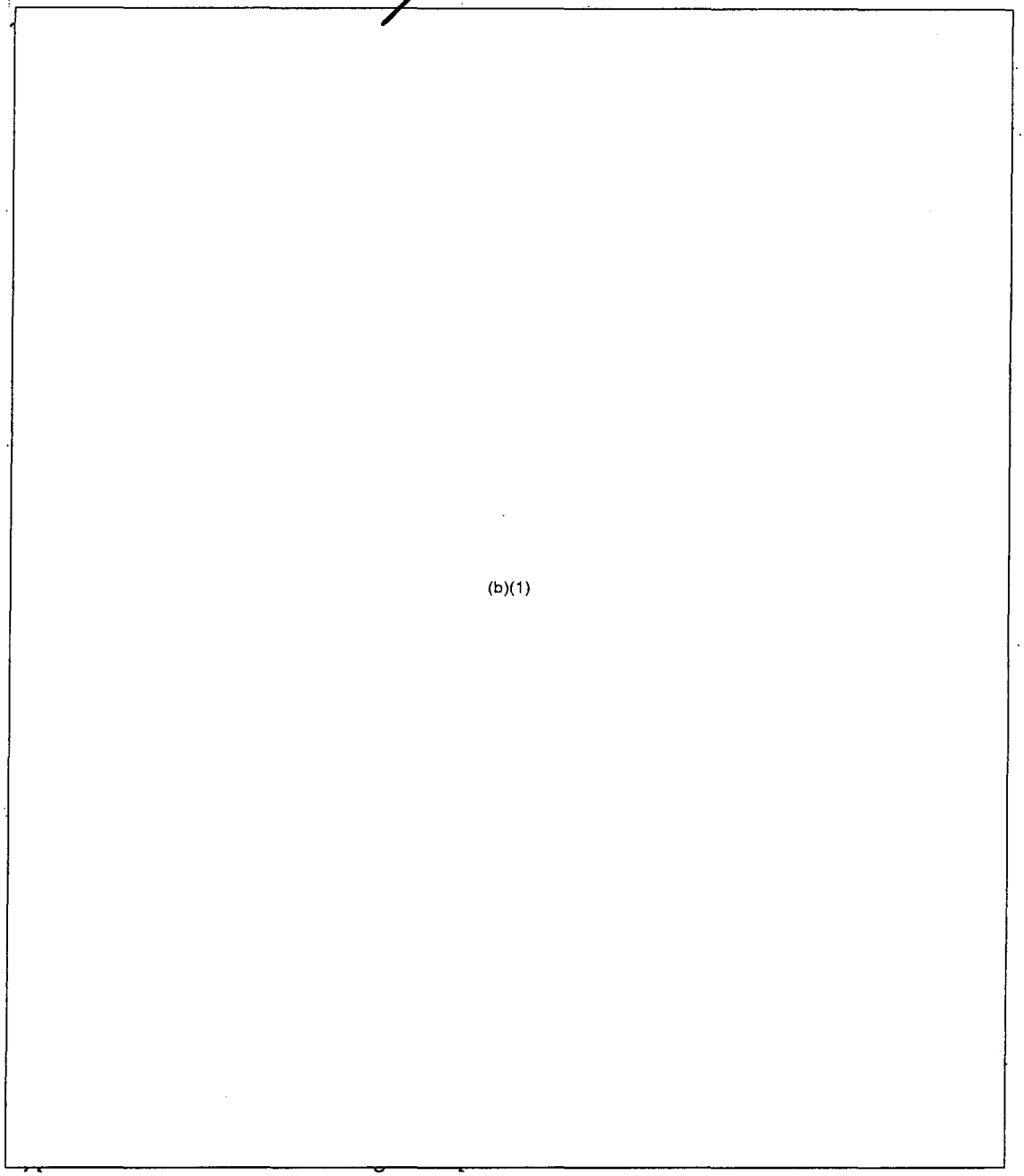

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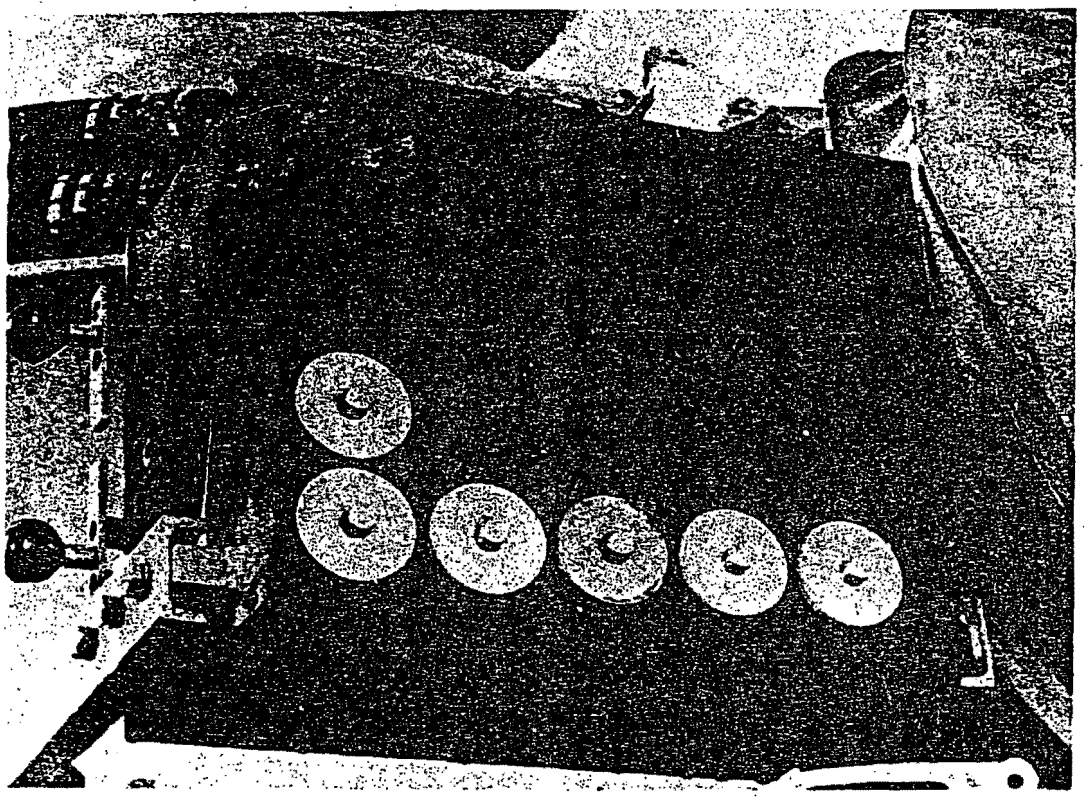

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Figure 3-38. Israeli vehicle grenade launcher (U).

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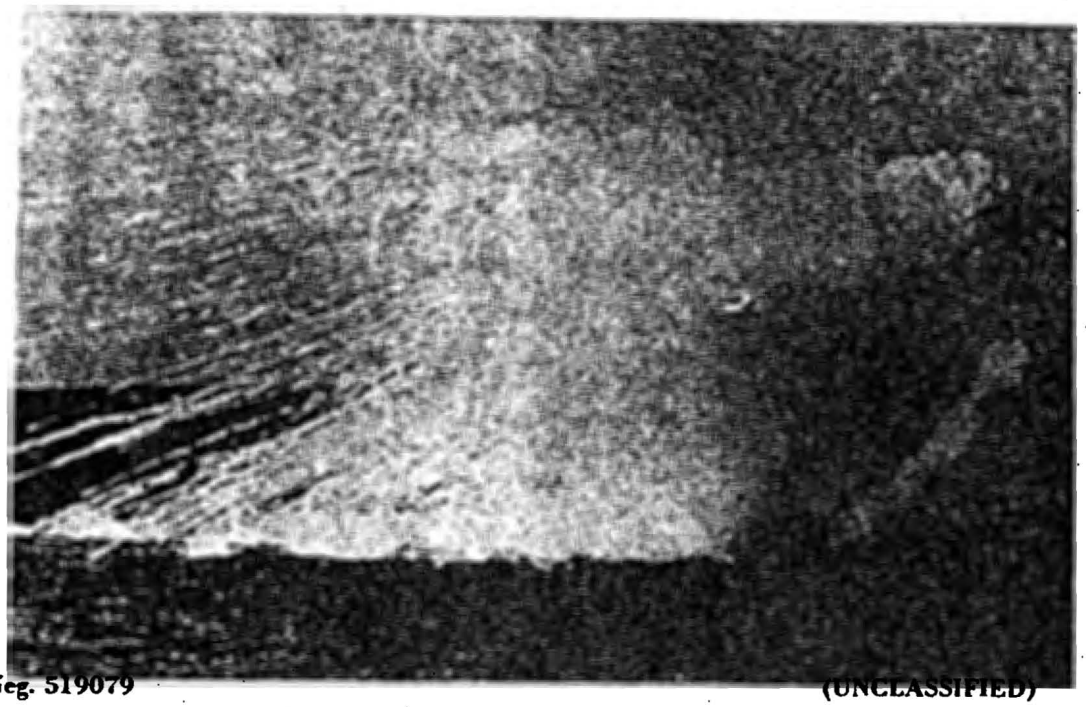

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Figure 3-39. Grenade smoke cloud at 1.1 seconds (U).

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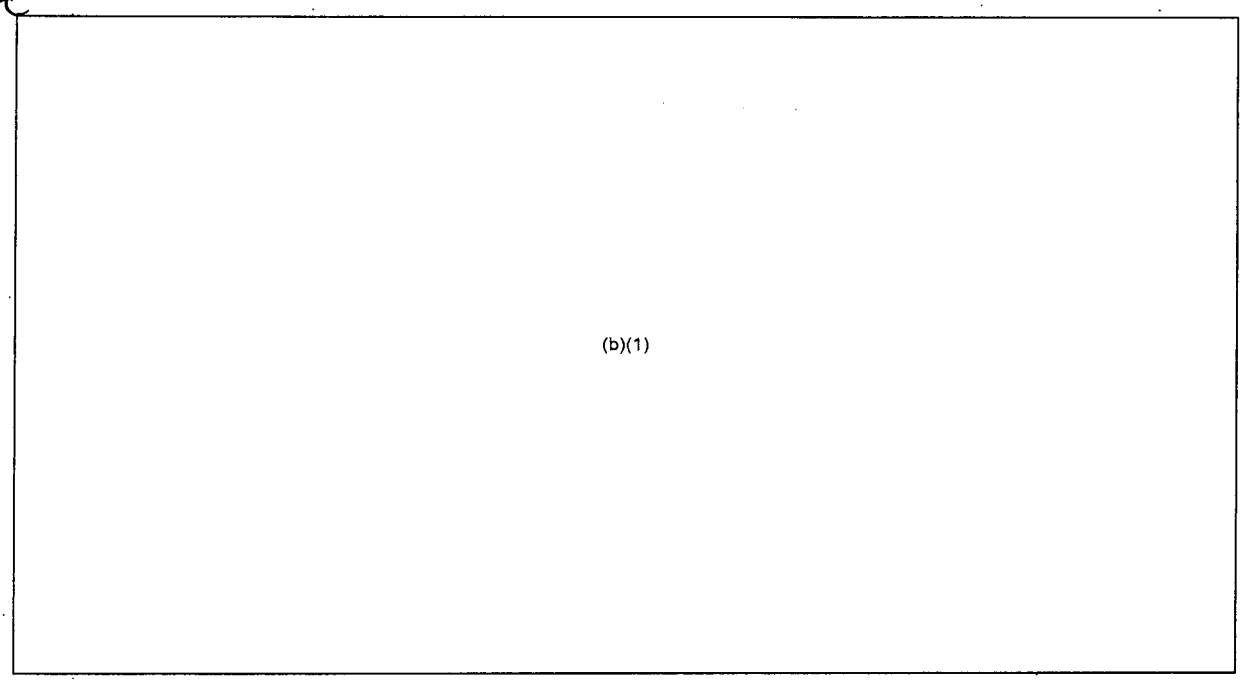

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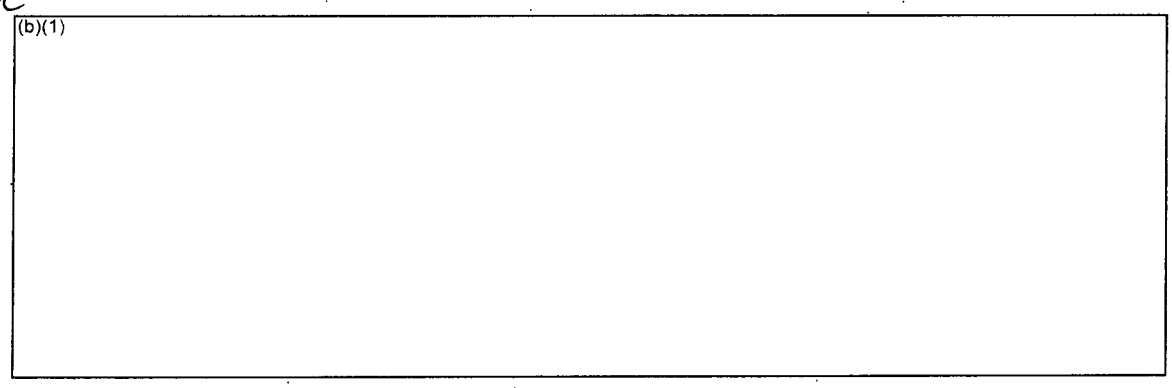
Figure 3-40. Schematic of smoke generator installed on tank engine (U).



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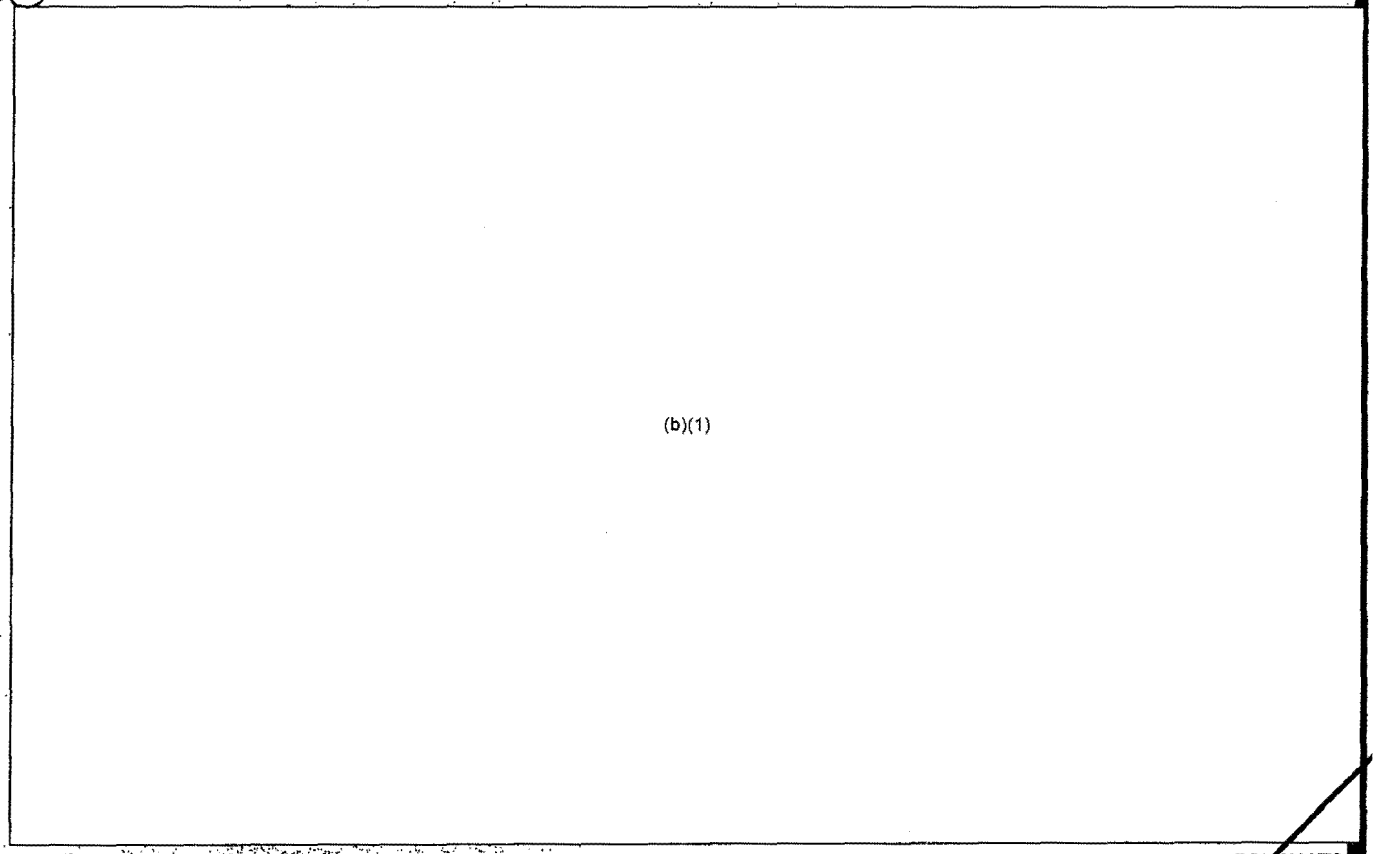

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Figure 3-41. Israeli Army smoke trailer (U).

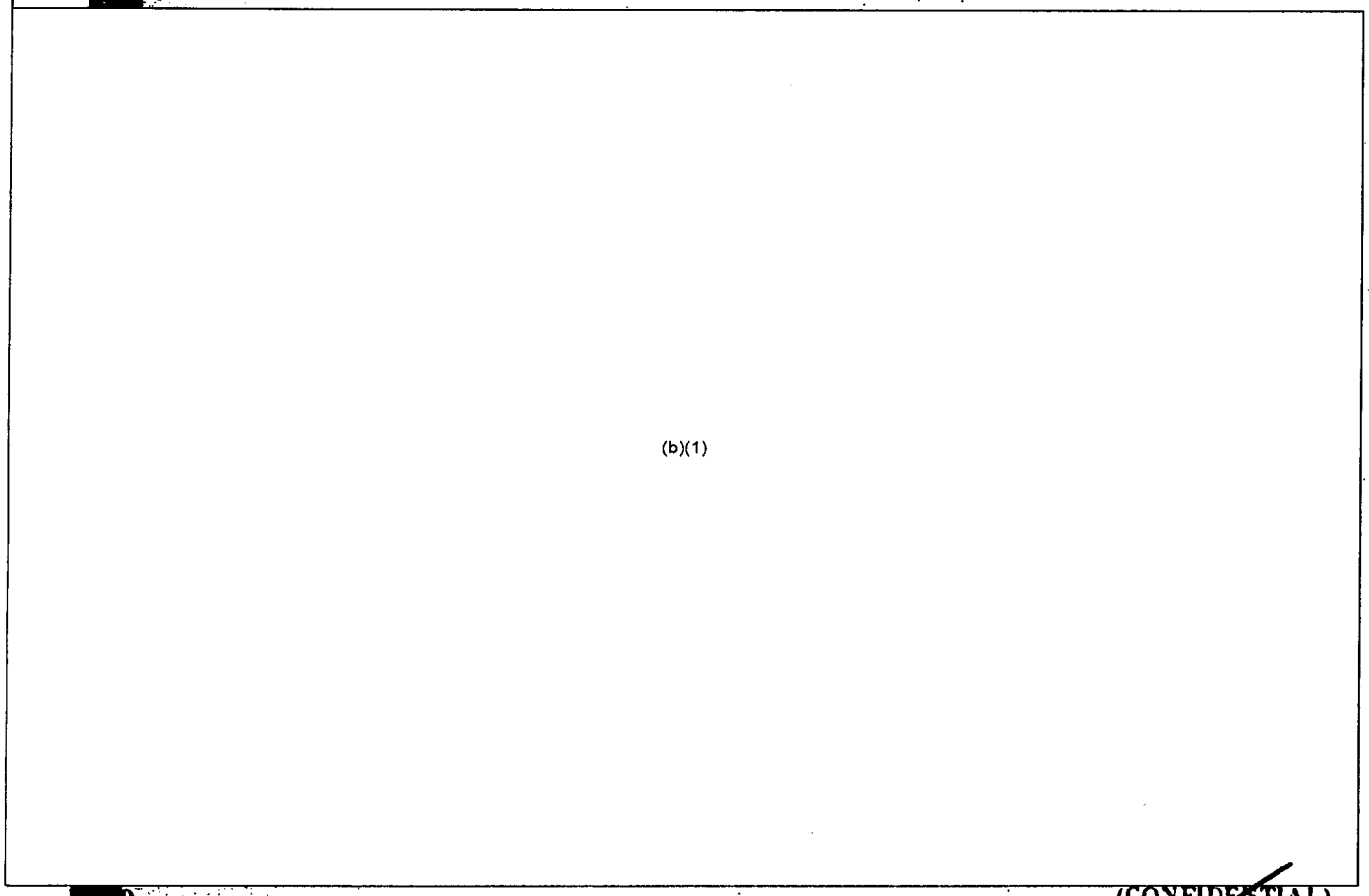

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Figure 3-41. Israeli Army smoke trailer (U).

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(4) (U) France. Reportedly, the French have constructed a new specialized smoke screen device, called the F-1, which uses a pulse jet engine.[65] The device, weighing 275 kg, uses 16 to 18 liters of gasoline and 80 to 100 liters of machine oil per hour. It is designed for installation on cars, ships, transporters, or armored vehicles. No further technical details are available.

b. (C-NOFORN) Flame and Incendiary.

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Appendix II. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued)

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I. AEROSPACE SMOKE, FLAME, AND INCENDIARY CAPABILITIES

18. (S-NOFORN) General

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19. (S-NOFORN) Standard Agents and Dispersion Systems.

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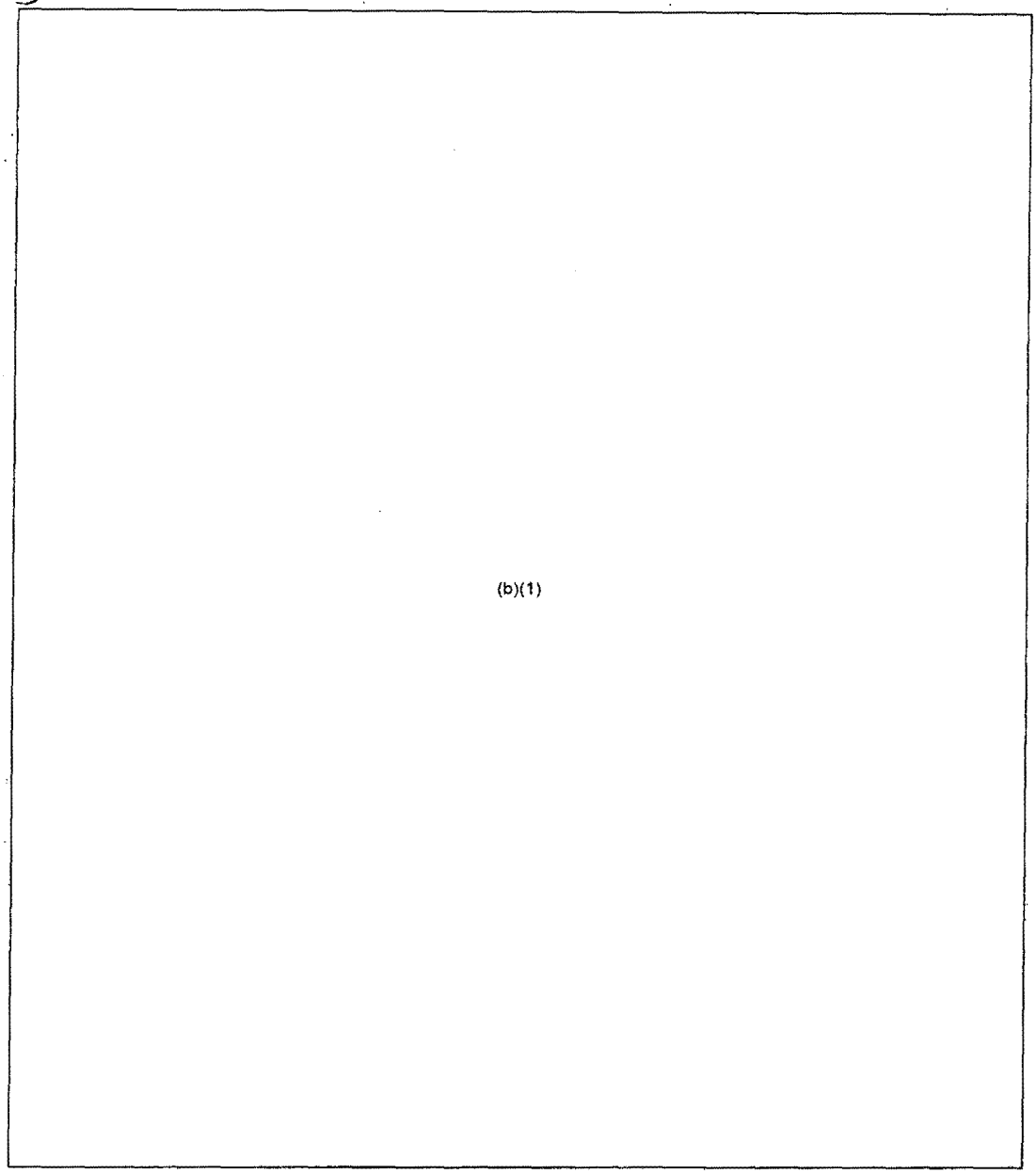

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J. TRENDS AND FORECASTS

21. (C-NOFORN) Trends

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22. (~~C-NOFORN~~) Forecasts

a. (~~C-NOFORN~~) Five-Year Projection.

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b. (~~C-NOFORN~~) Ten-Year Projection.

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Appendix I. Comparative Technical Characteristics of ECC and Free World Mortar Smoke Projectiles (U)

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1. Comparative Technical Characteristics of ECC and Free World Mortar Smoke Projectiles (U)

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Appendix I. Comparative Technical Characteristics of ECC and Free World Mortar Smoke Projectiles (U) (Continu

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...dix L Comparative Technical Characteristics of ECC and Free World Mortar Smoke Projectiles (U) (Continued)

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Appendix I. Comparative Technical Characteristics of ECC and Free World Mortar Smoke Projectiles (U) (Con

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Comparative Technical Characteristics of ECC and Free World Mortar Smoke Projectiles (U) (Continued)

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Appendix I. Comparative Technical Characteristics of ECC and Free World Mortar Smoke Projectiles (U) (Con

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ix I. Comparative Technical Characteristics of ECC and Free World Mortar Smoke Projectiles (U) (Continued)

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Appendix II. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U)

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1. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U)

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d) Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued)

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Appendix II. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued)

Nomenclature	Length (mm)	Diam (mm)	Wt (g)	Filler	Color of smoke	Range (m)	Delay a duratic
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dix II. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued)

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dix II. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued)

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Appendix II. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued

Nomenclature	Length (mm)	Diam (mm)	Wt (g)	Filler	Color of smoke	Range (m)	Dela dura
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II. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued)

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Appendix II. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued

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Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued)

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Appendix III. Technical Characteristics of Artillery Smoke Ammunition—Free World Countries (U)

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Appendix III. Technical Characteristics of Artillery Smoke Ammunition—Free World Countries (U)

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Appendix III. Technical Characteristics of Artillery Smoke Ammunition—Free World Countries (U) (Continu

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III. Technical Characteristics of Artillery Smoke Ammunition–Free World Countries (U) (Continued)

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Appendix III. Technical Characteristics of Artillery Smoke Ammunition—Free World Countries (U) (Conti

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III. Technical Characteristics of Artillery Smoke Ammunition—Free World Countries (U) (Continued)

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Appendix IV. Technical Characteristics of Smoke Ammunition for Tanks, Recoilless Guns, and Rockets—Free World Countries (U)

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Appendix IV. Technical Characteristics of Smoke Ammunition for Tanks, Recoilless Guns, and Rockets—Free World Countries (U)

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Appendix IV. Technical Characteristics of Smoke Ammunition for Tanks, Recoilless Guns and Rockets—Free World Countries (U) (Continued)

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Appendix IV. Technical Characteristics of Smoke Ammunition for Tanks, Recoilless Guns, and Rockets—Free World Countries (U) (Continued)

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LIST OF ABBREVIATIONS

ACC	Asian Communist countries
AO	aerosol obscurant
APC	armored personnel carrier
API	armor-piercing incendiary
ATGM	antitank guided missile
BICT	Bundes Institut fur Chemisch Technische
CAF	Canadian Air Force
CBR	chemical-biological-radiological
CIL	Canadian Industries, Ltd
CIW	close-in-weapon
CN	chloracetophenone
CW	chemical warfare
DTAT	Directorate of Ground Armament for Nuclear, Biological, and Chemical Services
ECC	Eurasian Communist countries
EO	electro-optical
FEBA	forward edge of battle area
FFV	Forenade Fabriksverken
FLIR	forward-looking infrared
FS	chlorosulfonic acid/sulfur trioxide mixture
GSDF	ground self-defense force
HAFLA	handheld flame-grenade launcher
HC	hexachloroethane
HD	mustard gas
HDA	highly dispersed aerosols
HE	high-explosive
IABG	Industrieanlagen-Betrieb-Gesselschaft
IR	infrared
LARS	light artillery rocket launcher
LLLTV	low-light level television
MBSD	multibarrel smoke discharger
MOD	Ministry of Defense
NATO	North Atlantic Treaty Organization
NSWP	non-Soviet Warsaw Pact
PD	point-detonating
PRC	People's Republic of China
PTUR	antitank guided rocket

R&D	research and development
RAF	Royal Air Force
RP	red phosphorus
SAF	Soviet Air Force
TDA	thermal-smoke-equipment
TID	thermal imaging device
UOF	unit of fire
WP	white phosphorus
WWI	World War I
WWII	World War II

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Description of document:	Defense Intelligence Agency report, Reference Book on Chemical Warfare Information (Worldwide), 31 January 1983
Requested date:	23-October-2008
Released date:	10-June-2013
Posted date:	13-August-2013
Source of document:	Commander US Army Intelligence & Security Command Freedom of Information/Privacy Office ATTN: IAMG-C-FOI 4552 Pike Road Fort George G. Meade, MD 20755-5995 Fax: (301) 677-2956 Email: FOIA/Privacy Office Online FOIA Request Form
Note:	This report is one of 16 reports released under Mandatory Declassification Review by the US Army Intelligence & Security Command. All of these reports may be accessed here: http://www/governmentattic.org/inscomBWCW.html

DEPARTMENT OF THE ARMY
UNITED STATES ARMY INTELLIGENCE AND SECURITY COMMAND
FREEDOM OF INFORMATION/PRIVACY OFFICE
FORT GEORGE G. MEADE, MARYLAND 20755-5995

REPLY TO
ATTENTION OF:

Freedom of Information/
Privacy Office

10 JUN 2013

This is in further response to your Freedom of Information Act (FOIA) request of October 23, 2008, and supplements our electronic message of May 12, 2010.

Coordination has been completed with another element of our command and other government agencies and records returned to this office for our review and direct response to you. We have reviewed the records and determined the records are partially releaseable to you. A copy of the records are enclosed for your use.

We have completed a mandatory declassification review in accordance with Executive Order (EO) 13526. As a result of our review information has been sanitized and 4 pages have been withheld in their entirety as the information is currently and properly classified TOP SECRET, SECRET and CONFIDENTIAL according to Sections 1.2(a)(1), 1.2(a)(2), 1.2(a)(3) and 1.4(c) of EO 13526. This information is exempt from the public disclosure provisions of the FOIA pursuant to Title 5 U.S. Code 552 (b)(1). It is not possible to reasonably segregate meaningful portions of the withheld pages for release. The records are enclosed for your use. A brief explanation of the applicable sections follows:

Section 1.2(a)(1) of EO 13526, provides that information shall be classified TOP SECRET if its unauthorized disclosure reasonably could be expected to cause exceptionally grave damage to the national security.

Section 1.2(a)(2) of EO 13526, provides that information shall be classified SECRET if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

Section 1.2(a)(3) of EO 13526, provides that information shall be classified CONFIDENTIAL if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

Section 1.4(c) of EO 13526, provides that information pertaining to intelligence activities, intelligence sources or methods, and cryptologic information shall be considered for classification protection.

In addition, information has been sanitized from the records and 4 pages have been withheld in their entirety as the release of the information would reveal sensitive intelligence methods. This information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(7)(E) of the FOIA. The significant and legitimate governmental purpose to be served by withholding is that a viable and effective intelligence investigative capability is dependent upon protection of sensitive investigative methodologies. It is not possible to reasonably segregate meaningful portions of the withheld pages for release.

The withholding of the information described above is a partial denial of your request. This denial is made on behalf of Major General Stephen G. Fogarty, the Commanding General, U.S. Army Intelligence and Security Command, who is the Initial Denial Authority for Army intelligence investigative and security records under the FOIA. You have the right to appeal this decision to the Secretary of the Army. Your appeal must be postmarked no later than 60 calendar days from the date of this letter. After the 60-day period, the case may be considered closed; however, such closure does not preclude you from filing litigation in the courts. You should state the basis of your disagreement with the response and provide justification for a reconsideration of the denial. An appeal may not serve as a request for additional or new information. An appeal may only address information denied in this response. Your appeal is to be made to this office, for forwarding, as appropriate to the Secretary of the Army, Office of the General Counsel.

Coordination has been completed and we have been informed by the Central Intelligence Agency (CIA) that information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(1) and (b)(3) of the FOIA.

The withholding of the information by the CIA constitutes a denial of your request and you have the right to appeal this decision to the Agency Release Panel within 45 days from the date of this letter. If you decide to file an appeal, it should be forwarded to this office and we will coordinate with the CIA on your behalf. Please cite CIA #F-2010-01292/Army #57F-09 assigned to your request so that it may be easily identified.

Coordination has been completed and we have been informed by the Defense Intelligence Agency (DIA) that their information is exempt from public disclosure pursuant to Title 5 U.S. Code § 552 (b)(1), (b)(2) (b)(3) and (b)(4) of the Freedom of Information Act and Executive Order (EO) 13,526 § 1.4 (c) (d) and (h). The statute invoked under Title 5 U.S. Code 552 (b)(3) is 10 U.S.C. §424, which allows for the protection of organizational and personnel information for DIA.

The withholding of the information by the DIA constitutes a partial denial of your request and you have the right to appeal this decision directly to the DIA. If you decide to file an appeal, it should be forwarded to the Director, Defense Intelligence Agency, ATTN: DAN-1A-FOIA, Washington, DC 20340-5100. Please cite MDR #0155-2010 assigned to your request so that it may be easily identified.

You have received all Army intelligence investigative records pertaining to this request.

There are no assessable FOIA fees.

If you have any questions regarding this action, feel free to contact this office at 1-866-548-5651, or email the INSCOM FOIA office at: INSCOM_FOIA_ServiceCenter@mi.army.mil and refer to case #57F-09.

Sincerely,

Brad S. Dorris
Director
Freedom of Information/Privacy Office
Investigative Records Repository

Enclosure

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31 January 1983

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Remove pages:	Insert new pages:
Front and back covers	Front and back covers
Title page	Title page
v and vi	v thru vi.1 (Reverse Blank)
xi thru xiv	xi thru xiv
---	268.1 and 268.2
353 and 354	353 thru 354.2
356.9 thru 356.12	356.9 thru 356.12
A-1 thru A-4	A-1 thru A-4

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Remove pages:	Insert new pages:
Front and back covers	Front and back covers
Title page	Title page
iii thru vi.1 (Reverse Blank)	iii thru vi
xiii thru xiv.2	xiii thru xiv.2
1 and 2	1 thru 2.2
17 and 18	17 and 18
51 thru 54	51 thru 54
329 thru 332.1 (Reverse Blank)	329 thru 332.3 (Reverse Blank)
341 thru 344.4 also had to remove Pages 344.5 ⇨ 344.6	341 thru 344.12
355 thru 356.2	355 thru 356.2b
356.7 thru 356.13 (Reverse Blank)	356.7 thru 356.15 (Reverse Blank)
361 and 362	361 thru 366
I-1 and I-2	I-1 and I-2
A-1 thru A-4	A-1 thru A-4

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xiii thru xiv.2	xiii thru xiv.2
329 and 330	329 and 330
335 thru 338	335 thru 338
344.1 and 344.2	344.1 and 344.2
356.7 thru 356.12 removed 1 (S) page	356.7 thru 356.13 (Reverse Blank)
A-1 and A-2	A-1 thru A-4
Back cover	Back cover

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Remove pages:	Insert new pages:	Remove pages:	Insert new pages:
Front and back covers	Front and back covers	103 and 104	103 and 104
Title page	Title page	151 and 152	151 and 152
iii thru vi	iii thru vi.1 (Reverse Blank)	191 and 192	191 and 192
ix thru xiv	ix thru xiv.2	197 and 198	197 and 198
1 and 2	1 and 2	329 thru 332	329 thru 332.1 (Reverse Blank)
11 and 12	11 and 12	335 thru 356	335 thru 356.12
15 thru 18	15 thru 18	359 and 360	359 thru 362
21 and 22	21 and 22	I-1 and I-2	I-1 thru I-2.2
29 and 30	29 and 30	IV-5 and IV-6	IV-5 and IV-6
47 thru 58	47 thru 58	IV-9 and IV-10	IV-9 and IV-10
69 and 70	69 and 70	IV-15 and IV-16	IV-15 and IV-16
73 thru 76	73 thru 76	IV-21 and IV-22	IV-21 and IV-22
		A-1 thru B-2	A-1 and A-2

Note: Effective 1 October 1975, after publication of this product, the caveat NO FOREIGN DISSEM (abbreviated NFD) was changed to NOT RELEASABLE TO FOREIGN NATIONALS (abbreviated NOFORN). Appropriate changes should be made throughout the body of this publication to reflect the new policy. In addition, the caveat REL TO (Specific Country) should be changed to NOFORN wherever it appears throughout this document, in accordance with current DIA policy.

~~STS3 11612 cy 3 of 28~~

NATIONAL SECURITY INFORMATION
Unauthorized disclosure subject to criminal sanctions

~~Cy 15 of 15~~
~~STS7 1895~~

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Change 1, STS7 1895 cy 15 of 15 cys incorporated into STS3 11612 cy 3 of 28 cys.
Posted: Superseded pages were destroyed on 27 June 77 HHB

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30 May 1974

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ST-HB-03-18-74

posted
E. Lindsey
6/12/74

ERRATA

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Exemption Category: 3
Declassify on: IMPDET

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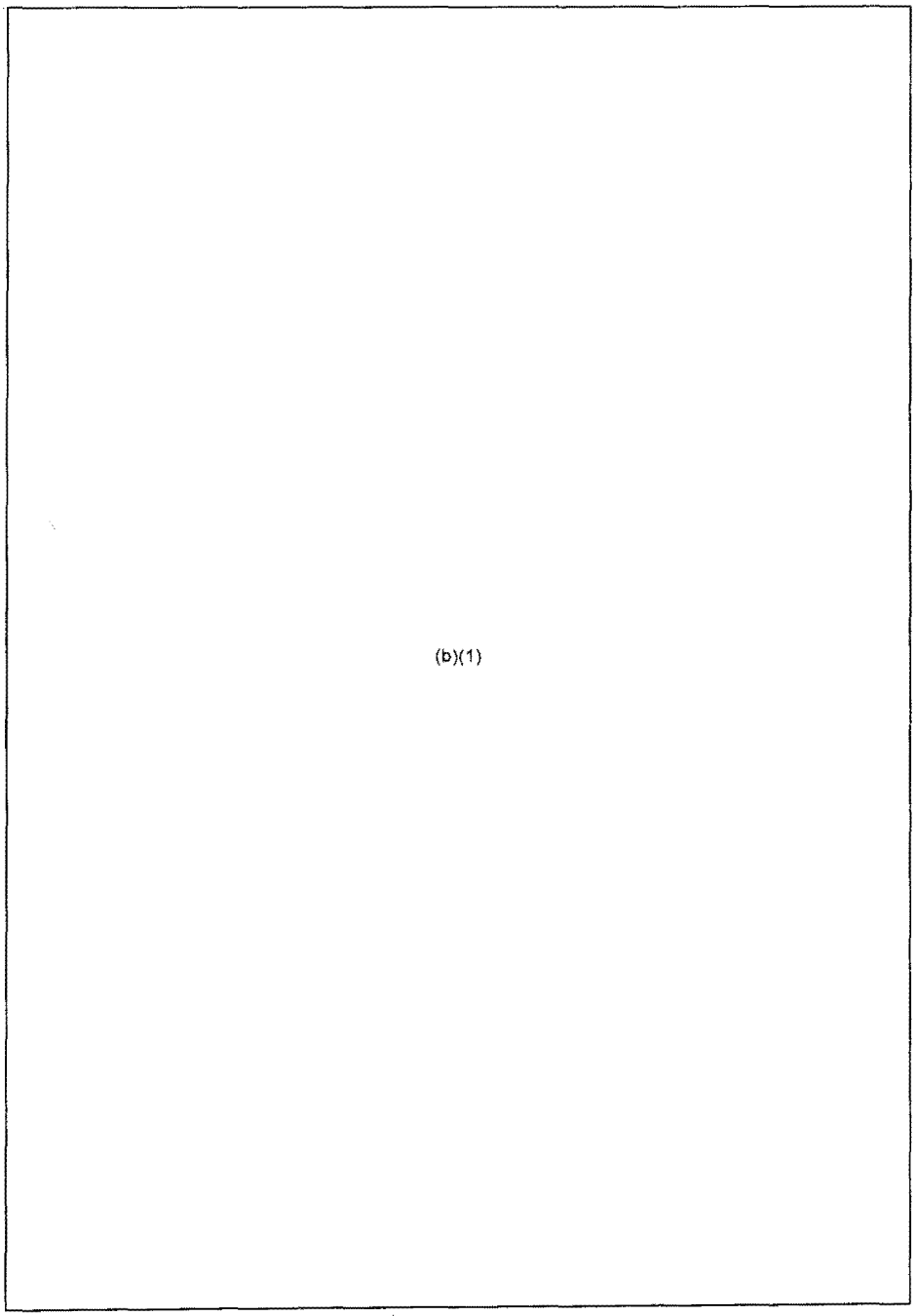

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NOTICE

Looseleaf binders have been ordered for this publication and will be furnished to the recipients in the near future.

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REFERENCE BOOK ON CHEMICAL WARFARE INFORMATION (WORLDWIDE) (U)

AUTHORS

(b)(6)

DST-1620H-018-77-CHG 4

DIA TASK UNIT PT-1620-01-02L

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PREFACE

(b)(1)

(U) This publication is intended for use by planners on the various Department of Defense and Department of the Army staffs, arms-control negotiators, and other military and civilian chemical warfare experts in the Federal Government.

(b)(1)

(U) Appropriate material was derived from both foreign and domestic sources, classified as well as unclassified. Available sources included handbooks, manuals, textbooks, periodicals, scientific reports from US and foreign research installations, as well as reports from and studies by the intelligence community.

(b)(1)

(U) This handbook is being disseminated devoid of bibliographic material to facilitate wider distribution. A compiled bibliography has been prepared separately and can be made available to authorized recipients upon request to the Commander, US Army Foreign Science and Technology Center, 220 Seventh Street NE., Charlottesville, VA 22901 (ATTN: DRXST-PO). Unannotated material in the text generally was obtained from the original document, Handbook of Chemical Warfare Information (S-NOFORN), dated June 1970, prepared by the US Navy.

(U) The Foreign Intelligence Officer and scientific personnel of the US Army research laboratories and technical directorates at Edgewood Arsenal have contributed substantially to the accuracy of this study as the result of their review of the subject matter and their subsequent recommendations.

★ (U) A star in the left margin indicates that the adjacent paragraph contains significant new or revised information since the last edition of this study. A star preceding a table or figure caption indicates either that the table or figure is new or that it has been changed in some respect.

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

The original pages of this product were published before the international system of units (Le Systeme International d'Unites) (SI) was adopted for use throughout the Department of Defense. The SI system (as described in the American Society for Testing and Materials Standard Metric Practice Guide, E 380-74) has been used, however, in recent amendments to the basic product and will be used in all future amendments to facilitate conversion to metric units of measure.

LIST OF EFFECTIVE PAGES

SUBJECT MATTER	PAGE NUMBERS	DATE
Title Page	None	31 January 1983
Preface	iii and iv	4 March 1981
List of Effective Pages ...	v thru vi.1 (Reverse Blank)	31 January 1983
Record of Changes	vii (Reverse Blank)	Original
Table of Contents	ix thru xiv.2	--------
	ix and x	June 1977
	xi thru xiv	31 January 1983
	xiv.1 and xiv.2	4 March 1981
Summary	xv and xvi	Original
Section I	1 thru 64	--------
	1 thru 2.2	4 March 1981
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	11 and 12	June 1977
	13 and 14	Original
	15 and 16	June 1977
	17 and 18	4 March 1981
	19 and 20	Original
	21 and 22	June 1977
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	29 and 30	June 1977
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	73	June 1977
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	103	June 1977
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Section III	107 thru 122	Original
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Section V	147 thru 171 (Reverse Blank)	--------
	147 thru 150	Original
	151	June 1977
	152 thru 171 (Reverse Blank)	Original
Section VI	173 thru 189 (Reverse Blank)	Original

Original

ST-HB-03-18-74

RECORD OF CHANGES

CHANGE NUMBER	DATE OF CHANGE	DATE ENTERED	SIGNATURE, RANK/RATE AND ORGANIZATION OF INDIVIDUAL ENTERING CHANGE
1	June 77	27 Jun 77	(b)(6) FSTC, GS-04
2	6 Jun 79	23 May 79	
3	4 Mar. 81	26 Mar. 81	

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Original

SUMMARY

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SECTION I

NERVE AGENTS (U)

A. INTRODUCTION (U)

1. Cholinesterase Inhibitors (U)

(U) The most important nerve agents constitute a series of organophosphorus compounds that are more toxic and insidious than any of the other standard chemical warfare (CW) agents. The organophosphorus nerve agents include the well-known conventional G-agents that were developed during World War II; the thiocholine derivatives of the G-agents are termed V-agents (they are noted for their lower volatility and their higher skin-penetrating power); and the fluorophosphorylcholines, in which an oxygen atom replaces the sulfur in the thiocholine moiety of the V-agents and a fluorine atom is attached to the phosphorus. The nerve agents may gain entry into the body through the skin and eyes, by inhalation, or by ingestion of contaminated food or water. Nerve agents inhibit the enzyme acetylcholinesterase (AChE), which hydrolyzes the neurotransmitter acetylcholine. When this enzyme is inhibited, acetylcholine accumulates at the junctions of various nerve endings (cholinergic sites). The effect of this excessive acetylcholine is overstimulation of the smooth and skeletal muscles, the ganglia, and the glands, which can lead to convulsions, paralysis, and death. The most effective known nerve agents are organophosphorus compounds. Carbamate esters are another class of compounds that inhibit AChE. The following illustration shows the mechanisms for the natural breakdown of acetylcholine, organophosphorus inhibition, and carbamate inhibition. Under normal conditions, acetylcholine binds to the active site of the enzyme and is then rapidly hydrolyzed to choline and acetic acid, freeing the enzyme to hydrolyze more acetylcholine. Organophosphorus compounds bind to the active site of the enzyme and block the hydrolysis of acetylcholine. If an oxime such as pralidoxime is added quickly enough, it can reactivate the enzyme through a nucleophilic displacement reaction; if not, the phosphorylated enzyme dealkylates, or "ages," and the enzyme is permanently blocked. Carbamate esters bind to the active site in the same manner as acetylcholine, but the reaction proceeds at less than a millionth of the rate. The enzyme is blocked during this time and acetylcholine accumulates. Unlike organophosphate inhibition, the carbamylated enzyme will readily self-reactivate.

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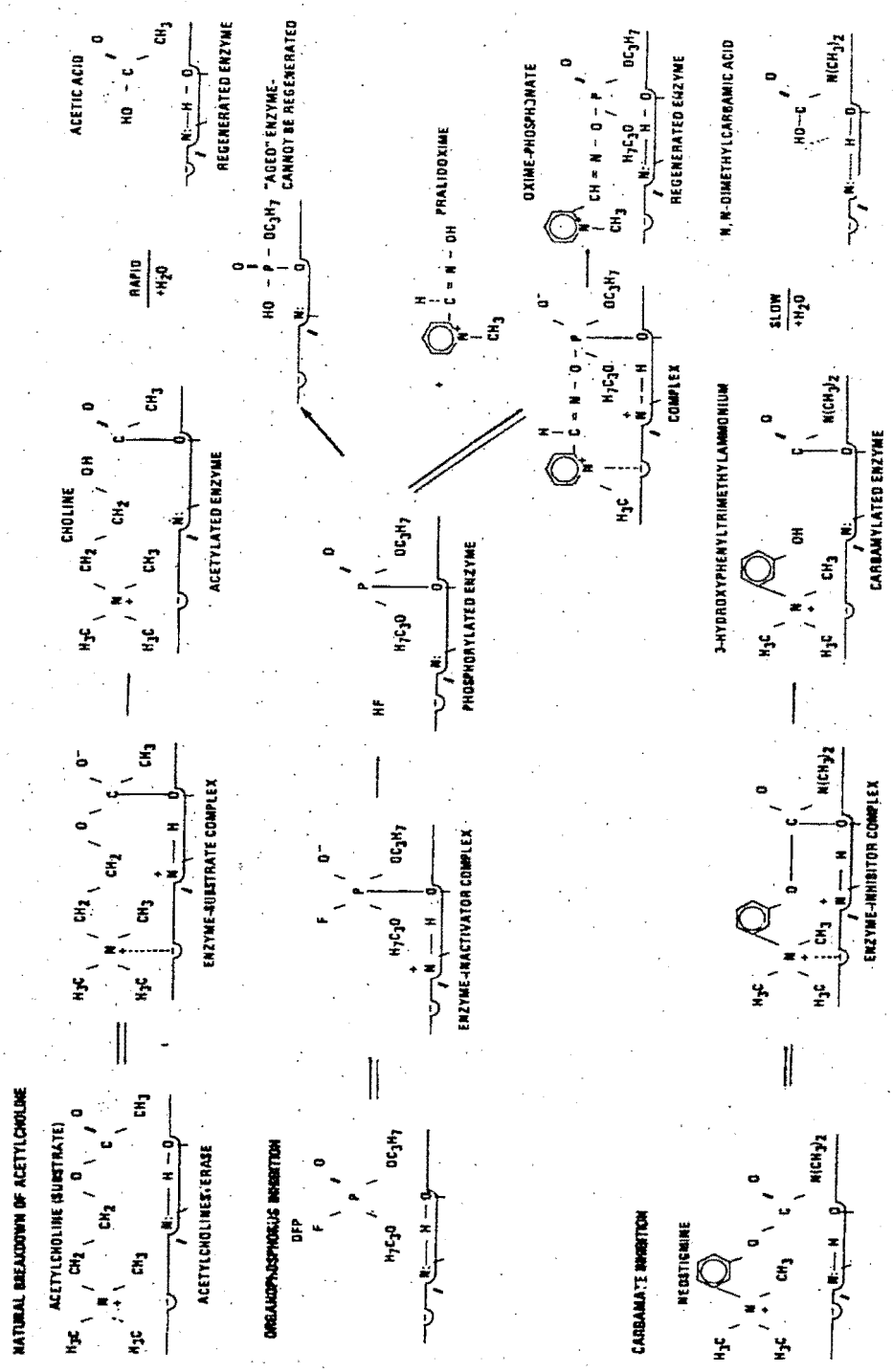
4 March 1981



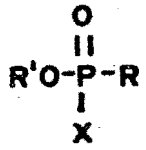
2. Symptoms of Nerve Agent Poisoning (U)

(U) In the parasympathetic system, the symptoms of nerve agent poisoning have been differentiated as muscarinic or nicotinic effects; some symptoms are also derived from central nervous system effects. Muscarinic effects are the result of the stimulation of autonomic effector cells of glands and smooth muscles and include such signs as contraction of the pupil of the eye, vomiting, salivation, loss of appetite, bronchial constriction, and bronchial spasms. Nicotinic effects result from stimulation and then blockage of the autonomic ganglia and end plates of skeletal muscles; these effects become evident by symptoms of fatigue, muscular weakness, involuntary twitching, convulsions, and paralysis of respiratory muscles. The toxic effects on the central nervous system cause dizziness, speech and equilibrium disturbances, depression of the respiratory center, and unconsciousness. The muscarinic, nicotinic, and central actions all contribute to the respiratory failure that finally results in death.

B. G-AGENTS (U)

3. General (U)

(U) The G-agents are organophosphorus nerve agents that were discovered and developed during World War II by German scientists as they searched for new insecticides. The G-agents have the basic structural configuration where R is an alkyl or amino group, R' is an alkyl group, and X is a halogen atom or cyano group. This class of compounds, typified by tabun, sarin, and soman, is considered by Western countries, and apparently also by the Soviets, to contain chemical agents suitable for military use. In the immediate post World War II period, the effects of substituting different chemical groupings in the R and R' positions on a compound's toxicity as well as its physical and chemical properties were extensively investigated.



Neg. 513054

4. Sarin (U)

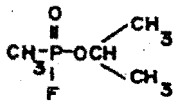
a. (C) Code or Alternate Designations (U).

- United States--GB, EA 1208, MFI, TL-1618 (U)
- (b)(1)
- Germany--Trilon 46, T-144, Gelan III (U)
- USSR--Zarin (U), (b)(1)
- (b)(1)

b. (U) Class (U). Nerve agent.

c. (U) Chemical name (U). O-isopropyl methylphosphonofluoridate.

d. (U) Formula. $C_4H_{10}FO_2P$



e. (U) Molecular Weight. 140.10.

f. (U) Alternate Chemical Names.

- Isopropyl ester of methylphosphonofluoridic acid.
- Methylisopropoxyfluorophosphine oxide.
- Isopropoxymethylphosphoryl fluoride.

g. (U) Raw Materials.

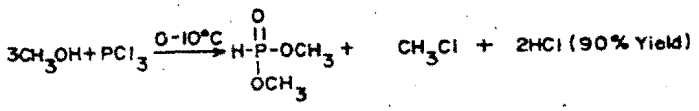
- Phosphorus (P).
- Chlorine (Cl_2).
- Methyl alcohol, 99% water-free (CH_3OH).
- Methyl chloride (CH_3Cl).
- Sodium fluoride, 97% to 98% pure (NaF).
- Hydrogen fluoride, 98% pure (HF).
- Metallic sodium (Na).
- Isopropyl alcohol, 99% pure, water-free (C_3H_7OH).

h. (U) Method of Manufacture.[2]

(1) (U) Method A. (Salt Process).

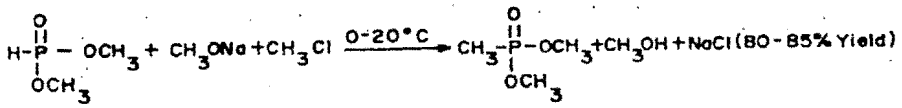
$$2P + 3Cl_2 \longrightarrow 2PCl_3$$

Phosphorus trichloride

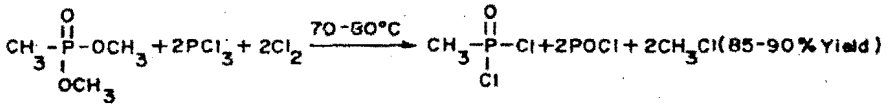


Dimethyl phosphonate

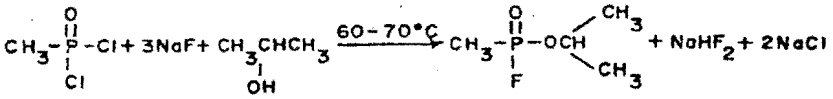
Sodium methylate



Dimethyl methyl-phosphonate

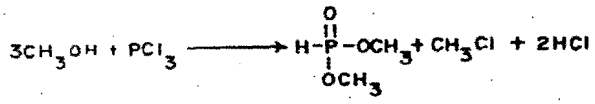


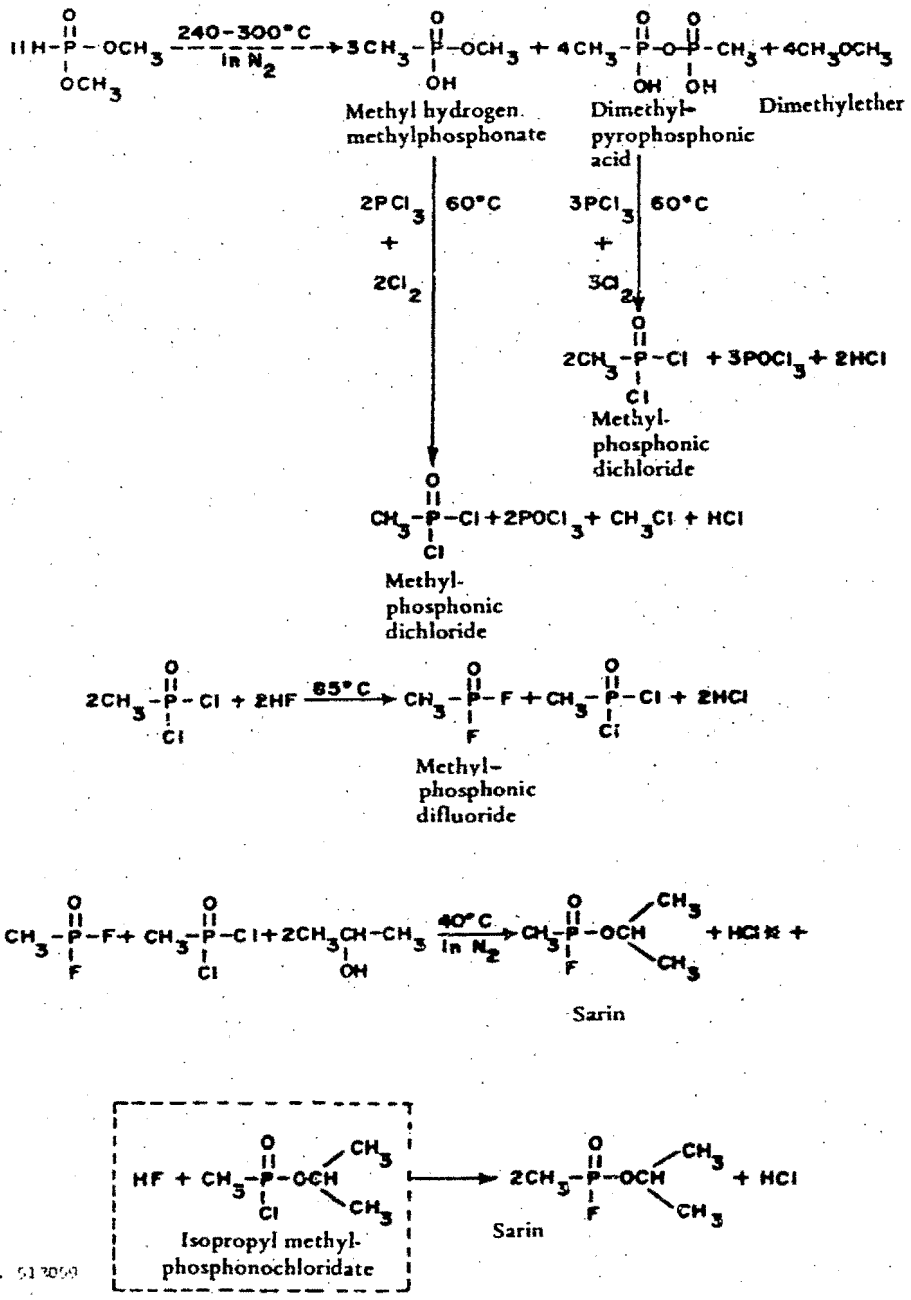
Methyl-phosphonic dichloride



Sarin

(2) (U) Method B. (Rearrangement Process).





*HCl is removed immediately; intermediate in box reacts to give the second mole of product.

i. (U) Equipment. Hastelloy "B" or silver-lined reaction vessels, pipes, and connections.

j. (U) Physical and Chemical Properties.

- Odor: Almost none when pure.[5]
- Physical state and color: Liquid and vapor both colorless.[4]
- Boiling point: 147° C at 760 mm Hg, 56° C at 16 mm Hg.[3,5]
- Melting point: -56° C.[5]
- Solubility: Miscible with water; soluble in gasoline, alcohols, fats, and oils.
- Vapor density (relative to air): 4.86.[5]
- Specific gravity (liq): 1.0887 at 25° C.[5]
- Volatility: 4300 mg/m^3 at 0° C; 21,900 mg/m^3 at 25° C; 38,500 mg/m^3 at 35° C.[4]
- Vapor pressure: 2.2 mm Hg at 25° C.[5]
- Heat of vaporization: 84.93 cal/g (average 25° and 50° C).[5]
- Flash point: Nonflammable.[5]
- Hydrolysis: In dilute acid solution, GB hydrolyzes to HF and isopropyl methylphosphonic acid. If the products are allowed to remain in the acid solution, the isopropyl methylphosphonic acid forms isopropyl alcohol and methylphosphonic acid. In more strongly acid solutions, GB hydrolyzes to isopropyl alcohol, and methylphosphonofluoridic acid. In alkaline solution, GB produces only the salts of hydrofluoric acid and isopropyl methylphosphonic acid. The rate of hydrolysis varies with pH. At pH between 4 and 6.5, the rate is at a minimum. The half-life of GB at 25° C in this pH range is about 175 hr. Rapid hydrolysis occurs under both acid and alkaline

conditions. In 0.1N acid, the half-life is approximately 15 min; in 0.1N alkali, the half-life is less than 1 sec. In unbuffered aqueous solution, the rate changes as the hydrolysis proceeds since the pH changes during the process.[5,12]

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l. (U) Use. High concentrations of GB cause death by inhalation of vapor and airborne droplets or by absorption of liquid through the skin or eyes. At low concentrations, it is effective for troop harassment and as a psychological weapon. Inhalation of even very low concentrations from ground contamination may result in blurring of vision; because eye effects may or may not indicate absorption of lethal concentrations, the morale of troops will be reduced as fears arise that a lethal dose could have been inhaled.

m. (U) Physiological Effects.

(1) (U) Typical signs and symptoms of nerve agent poisoning are tightness of the chest, nasal discharge and salivation, miosis with blurring of vision, difficulty in accommodation with frontal headache, muscular weakness and lack of coordination, profuse and uncontrollable vomiting, nausea, diarrhea, and incontinence of urine and feces. In addition to the signs and symptoms above, severe and fatal doses will lead to respiratory distress with collapse, convulsions, paralysis, and finally death due to heart muscle failure and asphyxia. Death generally occurs within an hour of exposure to a lethal concentration. Sarin, like the other nerve agents, does not give any immediate warning of its presence because it has no sensory irritation effect.

(2) (U) Poisoning may result from inhalation of the Sarin; absorption through the eyes, skin, or mucous membrane; ingestion of contaminated food and water; or from contaminated wounds.

(3) (U) Sarin is essentially a cumulative poison since it has a low rate of detoxification.

n. (U) Therapy. Administration of atropine, oximes, and artificial respiration.

o. (U) Decontamination.[6,8] Alcoholic solution of sodium or potassium hydroxide; scrubbing with hot soapy water; solutions (10%) or pastes of washing soda or baking soda; DS-2; bleach slurry. Liquid

agent on the skin may be decontaminated with fuller's earth pad in US M13 Individual Decontaminating and Reimpregnating Kit. Large supplies of GB may be destroyed by incineration at high temperatures in the presence of air.

(b)(1)

q. (U) Storage.[10,11] The stability of GB improves with purity. Pure GB is reasonably stable in steel containers at normal temperatures. A stabilizing effect is exerted by amines (triethylamine or tributylamine) and by solvents such as methanol and the halogen alkanes.

(b)(1)

*See Appendix III.

(2) ~~(C)~~ Percutaneously—

(b)(1)

s. (U) Persistence. Non-persistent (US); Soviets claim that Sarin can persist and remain a hazard in the summer for several hours and in the winter for several days.

t. (U) Historical.

- 1938: Discovered by Schrader in Germany. Production never passed the pilot plant stage.
- 1945: The plant was dismantled by the Soviets and removed from Dyhernfurth to the USSR.

u. ~~(C)~~ Detection.

(1) ~~(C)~~ Detectors.

(a) ~~(C)~~ USSR.

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(b)

(c)

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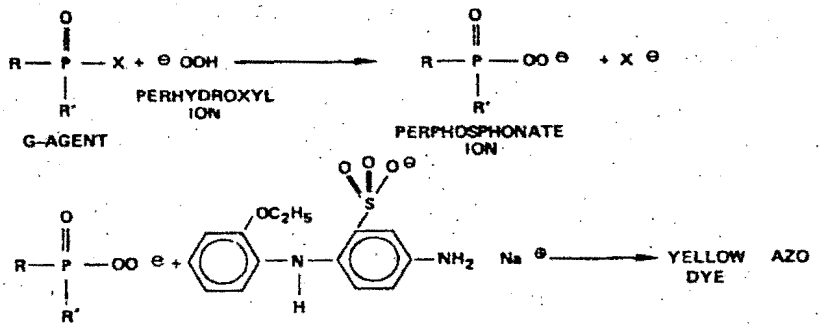
(2) ~~(C)~~ (U) Chemical reactions.[21]

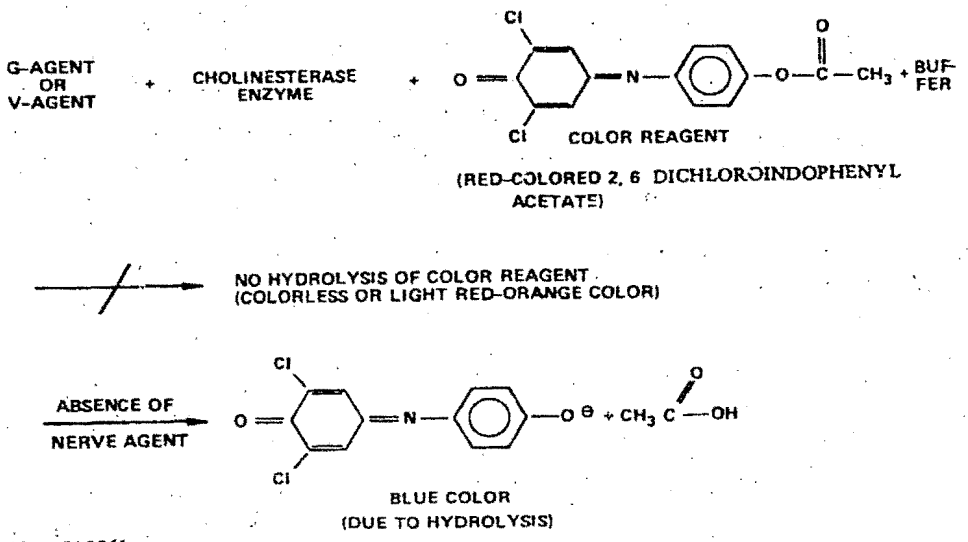
(a) (U) Schoenemann reaction.



Neg. 513060

Note - *o*-Tolidine or *o*-dianisadine also may be used as color reagent. These reagents produce a yellow-orange color and a yellow color, respectively.

(b) (U) Enzyme reaction.



Neg. 513061

Note 1. A strong base will hydrolyze the color reagent to give a false negative response.

Note 2. Enzyme reaction is being adapted to an electrochemical automatic alarm.

(c) (C) Oxime reaction (M8 Point Alarm).[23]

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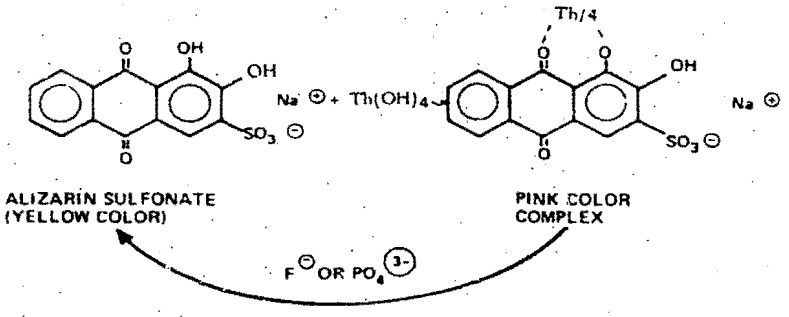
*CN$^{\ominus}$ is detected electrochemically, using a silver electrode.

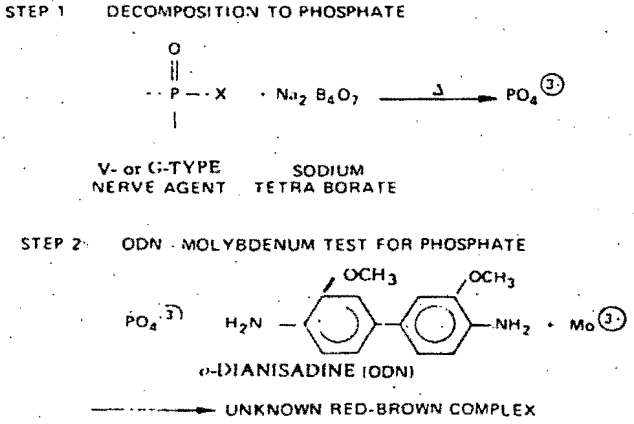
(b)(1)

(d) (U) Alizarin Lake test (for hydrolyzable fluoride and phosphate).



Note - This test is run in conjunction with step 2 of the ODN-Molybdenum Peroxide test and the Schoenemann Reaction to determine presence of Sarin, Soman, or GF. A fluoride-containing G-agent is indicated if the ODN-Molybdenum reaction is negative and if the Alizarin Lake test and Schoenemann Reaction are positive.

(e) (U) ODN-Molybdenum Peroxide test (for organophosphorus compounds).



Note - Step 2 alone must be performed on a control sample to determine if $PO_4^{\ominus}$ was present in test sample before decomposition by combustion and oxidation in Step 1.

(b)(1)

5. Soman.

a. Code or Alternate Designations.

- United States--GD, Soman. (U)

(b)(1)

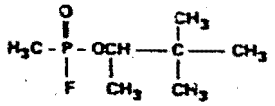
- Germany--Soman. (U)
- USSR--Zoman. (U)

(b)(1)

b. (U) Class. Nerve agent.

c. (U) Chemical Name. 3,3-Dimethyl-2-butyl methylphosphonofluoridate.

d. (U) Formula. $C_7H_{16}FO_2P$



Reg. 513063

e. (U) Molecular Weight. 182.18.

f. (U) Alternate Chemical Names.

- Pinacolyl methylphosphonofluoridate.
- 1,2,2-Trimethylpropyl methylphosphonofluoridate.
- Methylpinacolyloxyfluorophosphine oxide.
- Pinacoloxymethylphosphoryl fluoride.
- Pinacolyl methane fluorophosphonate.
- Methylfluoropinacolylphosphonite.
- Fluoromethylpinacoloxyphosphine oxide.

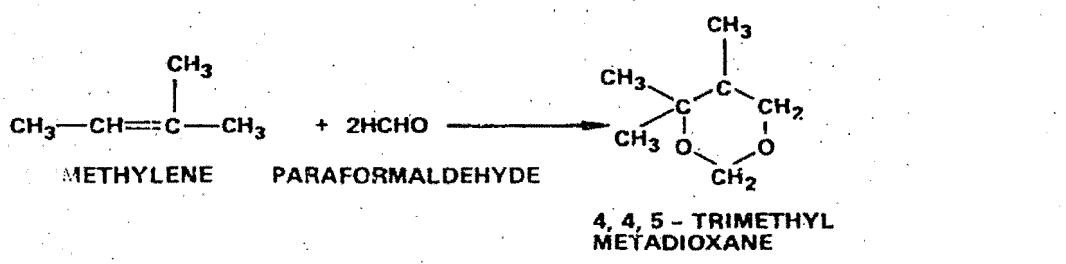
g. (U) Raw Materials.

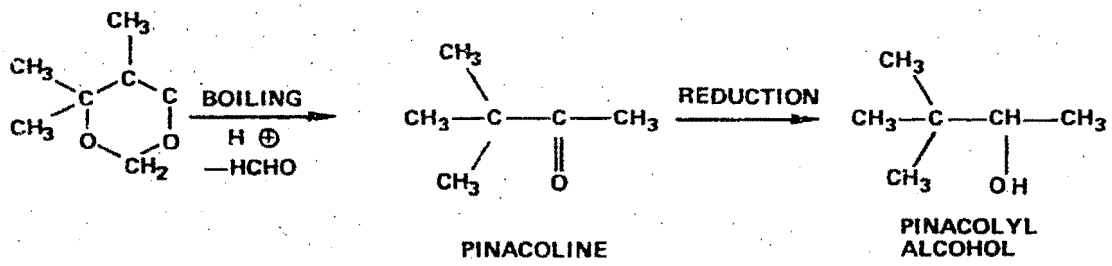
- Methyl alcohol, 99.9% pure (CH_3OH).
- Hydrogen fluoride (HF).
- Pinacolyl alcohol [$(CH_3)_3CCHOHCH_3$].
- Sodium fluoride (NaF).
- Phosphorus (P).
- Chlorine (Cl_2).

h. (U) Method of Manufacture.

(1) (U) Same as for GB, except that pinacolyl alcohol is substituted for isopropyl alcohol with a temperature of 60° C for the final step of the "Rearrangement" process and 100° C for the "Salt" process. Pinacolyl alcohol may be synthesized from acetone (CH_3COCH_3), hydrogen (H_2), metallic magnesium (Mg), and sulfuric acid (H_2SO_4).

(2) (U) A Soviet method involves the preparation of 4,4,5-trimethyl metadioxane and its subsequent conversion to pinacolyl alcohol according to the following reactions.[24]





Neg. 513064

i. (U) Equipment. Hastelloy "B" or silver-lined reaction vessels, pipes, and connections.

j. (U) Physical and Chemical Properties.

- Odor: Essentially odorless; impurities give a camphor odor.[5]
- Physical state and color: Liquid and vapor both colorless.[5]
- Boiling point: 198°C.[159]

- Melting point: -42°C. Does not crystallize at this temperature but becomes glassy.[159]
- Solubility: Soluble in water, sulfur mustard,[11] gasoline, alcohols, fats, and oils.
- Vapor density (relative to air): 6.33.[5] Specific gravity (liq): 1.022 at 25°C.[5]
- Volatility: 5880 mg/m^3 at 30°C; 4020 mg/m^3 at 25°C; 450 mg/m^3 at 0°C.[10]
- Vapor pressure: 54.7 Pa at 25°C.[5]
- Heat of vaporization: 55.35 kJ/mol.[159]
- Thermal stability: Soman decomposes noticeably above 150°C.[11]
- Hydrolysis: Hydrolysis products include HF. Rate varies with pH. Complete in 5 min in 5% NaOH solution.[4]

k. ~~(C)~~ Method of Dissemination (U).[6 7 16] (b)(1)

(b)(1)

l. (U) Use (U). Same as for sarin.

m. (U) Physiological Effects (U). Same as for sarin, except that GD is less volatile, acts faster in lower concentrations, is more readily absorbed through the skin, and GD-poisoning is less responsive to standard nerve agent therapy.

n. ~~(C-NOFORN)~~ Therapy (U). (b)(1)

(b)(1)

o. (U) Decontamination (U).[6] Same as for sarin.

NOT RELEASABLE TO FOREIGN NATIONALS

p. (U) Protection Required (U).[8 9] A well-fitting protective mask with activated charcoal in canister. Protective clothing made of nylon laminated over butyl rubber is said to afford protection against liquid GD. Absorbed by ordinary clothing, GD may be given off for about 30 min after contact with vapor.

q. (U) Storage (U). GD is stable in the pure state, but less stable than tabun (GA) or GB. GD is slightly corrosive to metals.

r. Toxicity (U).[10 12]

(1) (C) By inhalation (U). (b)(1)

(b)(1)

(2) (C) Percutaneously (U).

(b)(1)

s. (U) Persistence (U). Semipersistent. Heavily splashed liquid may persist for 1 to 2 days under average weather conditions.

t. (U) Historical (U). 1944: Discovered by Kuhn at Heidelberg, Germany. The agent was still in laboratory stage at end of World War II.

u. (U) Detection (U).

- US--Same as for sarin. Sensitivity of M8 Point Alarm is 0.4 mg/m^3.[22]
- USSR--Same as for sarin.

6. Tabun (U)

a. (U) Code or Alternate Designations (U).

(b)(1)

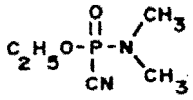
NOT RELEASABLE TO FOREIGN NATIONALS

- North Korea (USSR?) -- R-18. (C)[1]
- USSR -- Tabun. (U)
- North Vietnam -- Ta Bun. (C)

b. (U) Class. Nerve Agent.

c. (U) Chemical Name. Ethyl dimethylphosphoramidocyanidate.

d. (U) Formula. $C_5H_{11}N_2O_2P$



513069

e. (U) Molecular Weight. 162.13.

f. (U) Alternate Chemical Names.

- Ethyl N, N-dimethylphosphoramidocyanidate.
- Dimethylaminoethoxy-cyanophosphine oxide.
- Dimethylamidoethoxyphosphoryl cyanide.
- Ethyldimethylaminocyanophosphonate
- Ethyl ester of dimethylphosphoroamidocyanidic acid.
- Ethylphosphorodimethylamidocyanidate.

g. (U) Raw Materials.

- Methyl alcohol (CH_3OH).
- Ammonia (NH_3).
- Aluminum oxide (Al_2O_3).

- Phosphorus (P).
- Chlorine (Cl_2).
- Oxygen (O_2).
- Sodium cyanide (NaCN).
- Ethyl alcohol (C_2H_5OH).

h. (U) Method of Manufacture.

$$2CH_3OH + NH_3 \xrightarrow[350\text{-}380^\circ C]{Al_2O_3} (CH_3)_2NH + 2H_2O \quad (90\text{-}95\%\ Yield)$$

Dimethylamine

$$2P + 3Cl_2 \longrightarrow 2PCl_3 \xrightarrow{O_2} 2POCl_3$$

Phosphorus-trichloride — Phosphorus oxychloride

$$(CH_3)_2NH + POCl_3 \xrightarrow{85\text{-}135^\circ C} \begin{matrix} CH_3 \\ CH_3 \end{matrix}\!\!>\!N\!-\!\overset{\overset{O}{\|}}{\underset{\underset{Cl}{|}}{P}}\!-\!Cl + HCl$$

N,N-dimethylphosphoramidic dichloride

$$\begin{matrix} CH_3 \\ CH_3 \end{matrix}\!\!>\!N\!-\!\overset{\overset{O}{\|}}{\underset{\underset{Cl}{|}}{P}}\!-\!Cl + 2NaCN + C_2H_5OH \xrightarrow{30^\circ C} \begin{matrix} CH_3 \\ CH_3 \end{matrix}\!\!>\!N\!-\!\overset{\overset{O}{\|}}{\underset{\underset{CN}{|}}{P}}\!-\!OC_2H_5 + 2NaCl + HCN$$

Tabun

i. (U) Equipment.

- Jacketed enameled container with reflux condenser.
- Lead-lined steam-heated boilers.
- Lead-lined columns with Raschig rings.
- Stainless steel reaction vessels, steam jacketed and fitted with internal cooling coils.

j. (U) Physical and Chemical Properties.

- Odor: Faintly fruity; none when pure.[5]
- Physical state and color: Crude agent is dark brown; pure material is colorless liquid.[5]
- Boiling point: 240° C at $10x10^4$ Pa, 120° C at $1.3x10^3$ Pa.[3]
- Melting point: -50° C.[5]
- Solubility: Soluble in water, alcohol, gasoline, oils and fats.
- Vapor density (relative to air): 5.63.[5]
- Specific gravity: 1.073 at 25° C.[5]
- Volatility: 90 mg/m^3 at 0° C; 610 mg/m^3 at 25° C; 858 mg/m^3 at 30° C.[5]
- Vapor pressure: 9.3 Pa at 25° C (about the same as mustard).[5]
- Heat of vaporization: $33.3x10^4$ J/kg (average between 25° and 50° C).[5]
- Flash point: 78° C.[5]
- Decomposition temperature: 130° C (unstable when exposed to heat and thus likely to decompose upon explosion of munition).
- Hydrolysis: Gives off HCN as one product of hydrolysis. Reacts slowly with water but fairly rapidly with strong acids or alkalies; self-buffering at pH 4 to 5. Autocatalytic below pH 4 due to presence of HCN. Half-life of 7 hours at pH 4 to 5. Hydrolysis catalyzed by phosphate.[5]

k. (U) Method of Dissemination.[6 7] Mortar shells, artillery shells, bombs, bomblets, rockets, and land mines.

l. (U) Use. Same as for Sarin.

m. (U) Physiological Effects. Same as for Sarin.

n. (U) Therapy. Same as for Sarin, except that it is more oxime-resistant.

o. (U) Decontamination.[6] Same as for Sarin. In confined areas, however, GA reacts with chlorinating compounds to produce toxic cyanogen.

p. ~~(U)~~ Protection Required.[8,9,26] (b)(1)

(b)(1)

q. (U) Storage. Crude product is stable in steel and varnished containers at reasonably low temperatures; decomposes within 6 months at 60° C. Distilled product is more stable even under tropical storage conditions.

r. (U) Toxicity.[5]

- By Inhalation—LCt_{50} is 400 mg-min/m^3 for resting men. ICt_{50} is 300 mg-min/m^3 for resting men.
- Percutaneously—LD_{50} (liquid on skin) is 1000 to 1500 mg/man and LCt_{50} (vapor on skin) is 20 000 to 40 000 mg-min/m^3.

s. (U) Persistence. As an aerosol Tabun may persist for several minutes, depending on weather conditions. As a liquid on the ground, vapors generally evolve for more than 2 hours, depending on type of terrain as well as weather conditions.

t. (U) Historical.

- 1936: Discovered by Schrader at Elberfeld, Germany. Produced in considerable quantities by the Germans at Dyhernfurth.
- 1945: Dyhernfurth plant dismantled and removed to USSR.

u. ~~(C)~~ Detection.

(1) ~~(C)~~ Detectors.

(a) (U) USSR -- Same as Sarin.

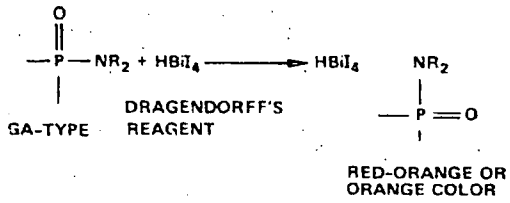
(b) ~~(C)~~ US.[21]

(b)(1)

(2) (U) Chemical reactions.[21]

(a) (U) Schoenemann, Enzyme, Oxime, ABC-M8 Detector, and ODN-Molybdenum peroxide reactions -- see Sarin.

(b) (U) Dragendorff's test (for tertiary amines and quaternary ammonium salts).



Positive reaction occurs in presence of GA as well as V-agents and HN-mustards.

(c) (U) Pyrazolane test (for hydrolyzable cyanide). See Hydrogen cyanide.

(d) (U) Prussian Blue test (for hydrolyzable cyanide). GA produces a blue color. See Hydrogen cyanide for chemical reaction.

7. ~~(U)~~ GE

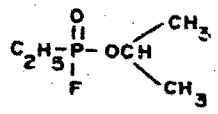
a. ~~(C)~~ Code or Alternate Designations.

- United States -- GE, T1-1620. (U)
- (b)(1) ~~(C)~~
- Germany -- Ethyl Sarin. (U)

b. (U) Class. Nerve Agent.

c. (U) Chemical Name. Isopropyl ethylphosphonofluoridate.

d. (U) Formula. $C_5H_{12}FO_2P$



Ser. 513067

e. (U) Molecular Weight. 154.12.

f. (U) Alternate Chemical Names.

- Isopropyl ethylfluorophosphonate.
- Ethylfluoroisopropylphosphonite.
- Ethylfluoroisopropoxyphosphine oxide.
- Isopropyl ester of ethylphosphonofluoridic acid.

g. (U) Raw Materials.

- Chlorine (Cl_2).
- Phosphorus trichloride (PCl_3).
- Hydrogen fluoride (HF).
- Ethyl alcohol (C_2H_5OH).
- Isopropyl alcohol (C_3H_7OH).

h. (U) Method of Manufacture. Same as for Sarin, Rearrangement Process, except using ethanol instead of methanol.

i. (U) Equipment. Hastelloy "B" or silver-lined reaction vessels, pipes, and connections.

j. (U) Physical and Chemical Properties.

- Odor: Fruity.
- Physical state and color: Colorless liquid.

- Boiling point: 162° C.
- Melting point: Below -10° C (does not crystallize readily).
- Solubility: Soluble in water, gasoline, alcohols, fats and oils.
- Volatility: 1,210 mg/m^3 at 25° C.
- Vapor pressure: 1.56 mm Hg at 25° C.
- Hydrolysis: Hydrolysis catalyzed by both acids and bases. Less easily hydrolyzed than GB.

k. (U) Method of Dissemination. Not known.

l. (U) Use. Developmental agent.

m. (U) Physiological Effect. Same as for Sarin.

n. (U) Therapy. Same as for Sarin.

o. (U) Decontamination. Same as for Sarin.

p. (U) Protection Required. Not known.

q. (U) Storage. Pure GE stored in Pyrex or mild steel shows no deterioration after 6 months. The impure product, containing acid and stored in steel bombs, deteriorates. The presence of even 0.2% chlorine will cause rapid breakdown.

r. (U) Toxicity.

- By inhalation -- Estimated LCt_{50} for man is 350-450 $mg\text{-}min/m^3$.
- Percutaneously -- Estimated LD_{50} is 220 mg/man.

s. (U) Persistence. Non-persistent.

t. (U) Detection. Same as for Sarin.

8. (U) GF

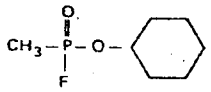
a. (U) Code or Alternate Designations.

- United States — GF.
- United Kingdom -- GF.

b. (U) Class. Nerve agent.

c. (U) Chemical Name. Cyclohexyl methylphosphonofluoridate.

d. (U) Formula. $C_7H_{14}FO_2P$



e. (U) Molecular Weight. 180.16.

f. (U) Alternate Chemical Names.

- Cyclohexyl ester of methylphosphonofluoridic acid.
- Cyclohexylmethanefluorophosphonate.
- Methylfluorocyclohexylphosphonite.

g. (U) Raw Materials.

- Phosphorus (P).
- Chlorine (Cl_2).
- Methyl alcohol, 99%, water-free (CH_3OH).
- Sodium fluoride 98% pure (NaF) or Hydrogen fluoride, 98% (HF)
- Metallic sodium (Na).

- Methyl chloride (CH_3Cl).
- Cyclohexyl alcohol ($C_6H_{11}OH$).

h. (U) Method of Manufacture. Same as for GB except that cyclohexyl alcohol is substituted for isopropyl alcohol and the conditions for the final step of the rearrangement process are changed to 40° to 60° C at 100 to 200 mm Hg.

i. (U) Physical and Chemical Properties.

- Physical state and color: Clear liquid.
- Melting point: Less than -30° C.[4]
- Volatility: 438 mg/m^3 at 20° C, 581 mg/m^3 at 25° C.[4]
- Vapor pressure: 0.042 mm Hg at 20° C, 0.06 mm Hg at 25° C.[4]
- Hydrolysis: Decomposed by alkali.

j. (U) Methods of Dissemination. Not known.

k. (U) Use. Same as for Sarin.

l. (U) Physiological Effects. Same as for Sarin, but GF is more readily absorbed through the skin.

m. (U) Therapy. Same as for Sarin.

n. (U) Decontamination. Soap and water; solutions or pastes of washing soda; and calcium hypochlorite.

o. (U) Protection Required. Not known.

p. (U) Storage. Reasonably stable in steel cylinders at normal temperatures.

q. ~~(C)~~ Toxicity.

- (b)(1)

r. (U) Persistence. Persistent.

s. ~~(C)~~ Historical.

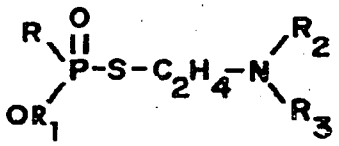
- (b)(1)

t. (U) Detection. Same as for Sarin.

C. V-AGENTS

9. (U) General

a. The V-agents are highly toxic, sulfur-containing organophosphorus compounds that were first described by the British scientists R. Ghosh and J. F. Newman in 1955. This new type of anticholinesterase has the general formula

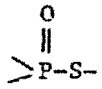


Nom. 513066

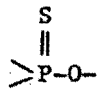
where R, R_1, R_2, and R_3 are alkyl groups. Compounds of this type can easily be quaternized at the nitrogen atom to form salts. One of the compounds synthesized and studied by Ghosh and Newman was O,O-dimethyl S-2-diethylaminoethyl phosphorothioate or VG.

b. The V-agents are liquids with high boiling points and low volatility. They are more persistent than the G-type agents, and may be disseminated in the form of droplets, aerosols, or vapor. They also are toxic via the respiratory route, but in contrast with the G-agents, are more readily absorbed into the body through the skin. The V-agents are highly persistent once deposited on a surface; aerosols (particle size of approximately 5 μm or larger), which are produced mechanically or explosively, can result in the deposition of serious or lethal concentrations of nerve agent upon impact on surface.

c. The basic difference between the V-agent and the organophosphorus insecticides lies in the position of the sulfur atom. The V-agents have the thiolo structure



while insecticides generally have the thiono structure



The thionate, which is the less toxic form, may isomerize to the toxic thiolate form spontaneously or upon application of heat. Because of this close chemical relationship between the V-agents and the insecticides, it has been suggested that facilities capable of producing organophosphorus insecticides can readily be converted to the production of the more toxic CW nerve agents. Others claim, however, that despite this close similarity in chemical structure, the processes required in their manufacture are grossly different and the basic requirements in material, equipment, and safety facilities may also differ.

10. ~~(C)~~ VE

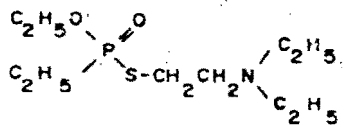
a. ~~(C)~~ Code or Alternate Designations.

- (b)(1) (~~C~~)
- (~~C~~)
- Canada—VE. (U)

b. (U) Class. Nerve agent.

c. (U) Chemical Name. O-Ethyl S-2-diethylaminoethyl ethylphosphonothiolate.

d. (U) Formula. $C_{10}H_{24}NO_2PS$



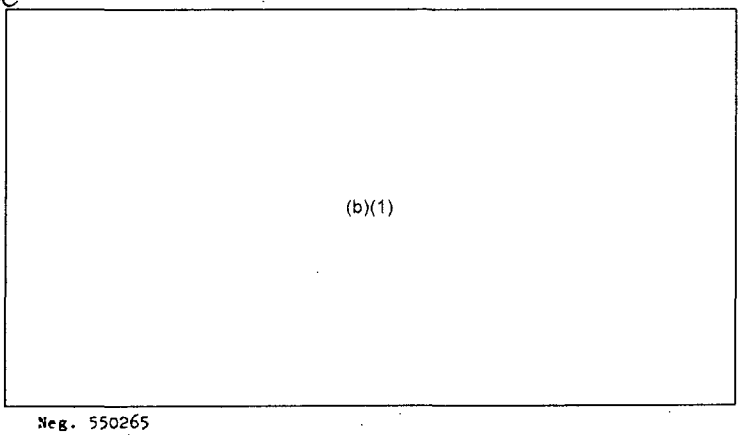
e. (U) Molecular Weight. 253.35.

f. (U) Raw Materials.

- Ethanol (C_2H_5OH).
- Sulfur (S).
- Sodium hydroxide (NaOH).
- Ethyldichlorophosphine ($C_2H_5Cl_2P$).
- 2-Diethylaminoethyl chloride $(C_2H_5)_2NCH_2CH_2Cl$.

g. ~~(C)~~

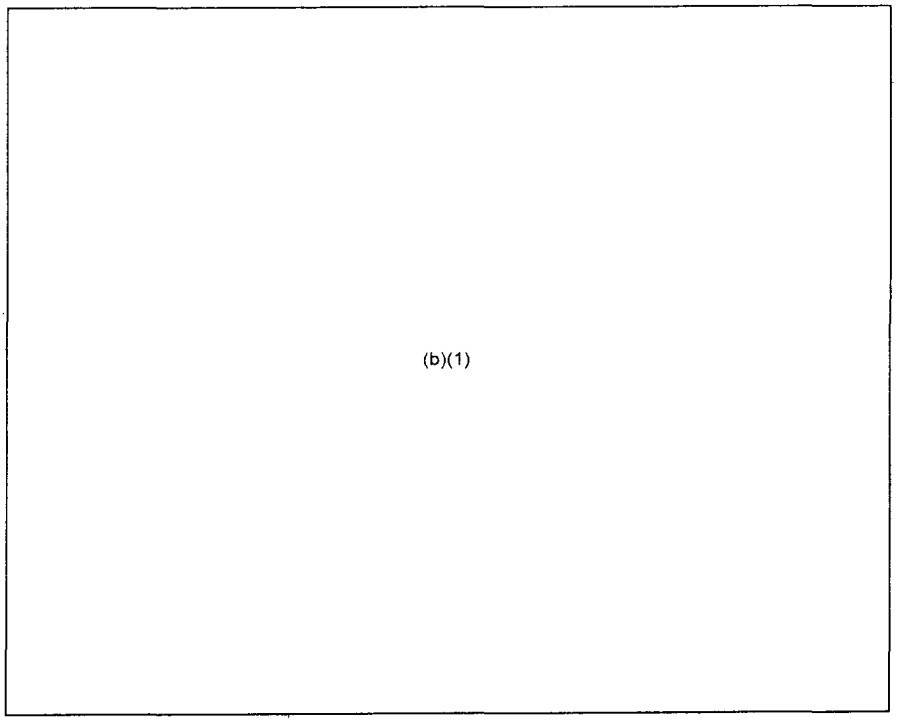
(b)(1)



Neg. 550265

h. (U) Equipment. Since there is no corrosion problem such as exists in the production of GD, no special equipment is necessary. Standard chemical plant reactors and accessory equipment can be used.

i. ~~(C)~~ Physical and Chemical Properties.



j. (U) Method of Dissemination. Not known.

k. (U) Use. Developmental agent.

l. (U) Physiological Effects. Typical cholinesterase inhibition symptoms (see Tabun), which may be delayed for an hour or two depending on the dosage. With percutaneous contamination, the eye symptoms may not occur at all. Effects are accelerated by super-lethal percutaneous dose or by inhaled aerosols.

m. (U) Therapy. Same as for Sarin.

n. (U) Decontamination.[6,8,27] DS-2, bleach slurry or 5% sodium hypochlorite solution, M5 protective ointment, DANC solution. Alkali solutions destroy V-agents much more slowly than G-agents. Plain hot water is generally ineffective, since the boiling water will contain a large amount of unhydrolyzed agent and the steam will distill some of the agent into the atmosphere. Liquid droplets on skin may be removed with the fuller's earth pad, and large drops of agent on clothing may be neutralized by the XXCC3 pad, both of which are found in the US M13 Individual Decontamination and Reimpregnating Kit.

o. ~~(U)~~ Protection Required. (b)(1)

(b)(1)

r. (U) Persistence. Persistent.

s. (C) Detection.

(1) (C) Detectors.

(a) (C) USSR

- (b)(1)

(b) (U) PRC -- Detector kit, type 64.[20]

(c) (C) US[21]

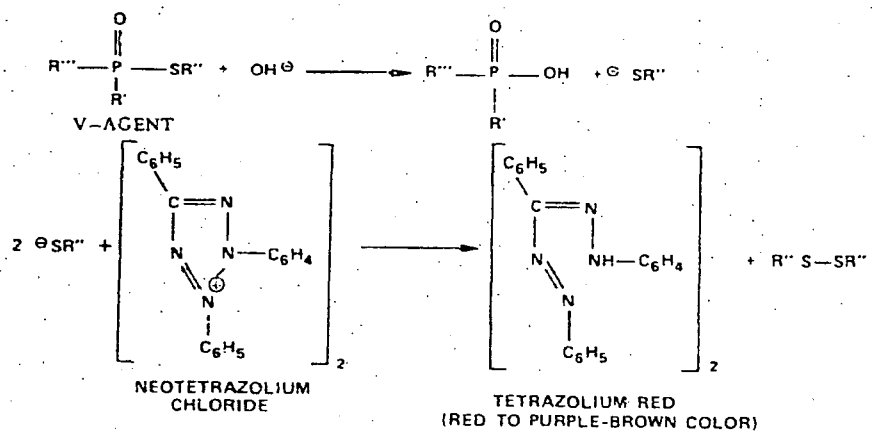
- (b)(1)

(2) (U) Chemical Reactions.[21]

(a) (U) Dragendorff's Test - See Tabun. A positive reaction occurs in presence of V-agents as well as GA and nitrogen mustards.

(b) (U) Enzyme, Oxime, and ODN-Molybdenum Peroxide reactions — See Sarin.

(c) (U) Tetrazolium Test (for mercaptans, -SR).



Neg. 550366

(d) (U) ABC-M8 Detector Paper. See Sarin for dyes used. VE, like all V-agents, produces a green color.

11. ~~(U)~~ VG

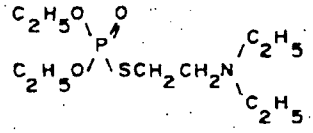
a. ~~(U)~~ Code or Alternate Designations.

- (b)(1)
- Canada -- VG. (U)
- West Germany -- Amiton. (U)
- Italy -- Inferno. (U)
- USSR -- GD-80, Amiton V-gas. (U)

b. (U) Class. Nerve agent.

c. (U) Chemical Name. O,O-Diethyl S-2-diethylaminoethylphosphorothioate.

d. (U) Formula. $C_{10}H_{24}NO_3PS$



e. (U) Molecular Weight. 269.35.

f. (C) Raw Materials.

- (b)(1)

g. (C)

(b)(1)

(b)(1)

h. (U) Equipment. Standard chemical processing equipment.

i. (C) Physical and Chemical Properties.

(b)(1)

(c)

- (b)(1)

j. (U) Methods of Dissemination. Not known.

k. (U) Use. Developmental agent. Although its toxicity is significantly lower than most candidate CW agents, it still is considered by some countries to be of importance as a potential agent. Analogs of VG have been studied by some countries.

l. (U) Physiological Effects. Same as for VE.

m. (U) Therapy. Same as for Sarin.

n. (U) Decontamination.[6] Same as for VE.

o. (U) Protection Required. Protective mask and full protective clothing.

(c) (b)(1)

q. (c) Toxicity.

- (b)(1)

r. (U) Persistence. Persistent.

s. (U) Historical.

- 1952: Synthesized by Ghosh at CDE Porton. Patented in 1955.
- 1953: Synthesized in Kabachnik's laboratory in USSR.

t. (U) Detection. Same as for VE.

12. (C) VM

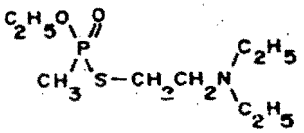
a. (C) Code or Alternate Designations.

- (b)(1) (C)
- (C)
- Canada -- VM. (U)
- Sweden -- Edemo. (U)
- USSR -- V-gas. (U)

b. (U) Class. Nerve agent.

c. (U) Chemical Name. O-Ethyl S-2-diethylaminoethyl methylphosphonothiolate.

d. (U) Formula. $C_9H_{22}NO_2PS$



e. (U) Molecular Weight. 239.28.

f. (C) Raw Materials.

- (b)(1)

g. (C) (b)(1)

(b)(1)

h. (U) Equipment. Standard chemical processing.

i. (C) Physical and Chemical Properties.

(b)(1)

j. (U) Method of Dissemination. Not known.

k. (U) Use. Developmental agent.

l. (U) Physiological Effects. Same as for VE.

m. (U) Therapy. Same as for Sarin.

n. (U) Decontamination.[6] Same as for VE.

o. (U) Protection Required. Protective mask and impermeable protective clothing.

p. ~~(C)~~ Storage. (b)(1)

(b)(1)

r. (U) Persistence. Persistent.

s. ~~(C)~~ Historical. Synthesized by Ford-Moore in United Kingdom.

t. (U) Detection. Same as for VE.

13. ~~(C)~~ VS

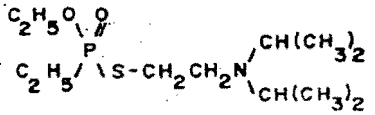
a. ~~(C)~~ Code or Alternate Designations.

- (b)(1) ~~(C)~~
- ~~(C)~~

b. (U) Class. Nerve agent.

c. (U) Chemical Name. O-Ethyl S-2-diisopropylaminoethyl ethylphosphonothioate.

d. (U) Formula. $C_{12}H_{28}NO_2PS$



e. (U) Molecular Weight. 281.36.

f. ~~(C)~~ Raw Materials.

- [redacted]
- [redacted]
- [redacted]
- [redacted]

(b)(1)

g. ~~(C)~~ Method of Manufacture.[2,12]

(b)(1)

h. (U) Equipment. Standard chemical processing equipment.

i. ~~(C)~~ Physical and Chemical Properties.

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

(b)(1)

- [redacted]
- [redacted]
- [redacted]
- [redacted]

j. (U) Method of Dissemination. Not known.

k. (U) Use. Developmental agent.

l. (U) Physiological effects. Same as for VE.

m. (U) Therapy. Same as for Sarin.

n. (U) Decontamination.[6] Same as for VE.

o. (U) Protection Required. Protective mask and full protective clothing.

p. ~~(C)~~ Storage. (b)(1) [redacted]

(b)(1) [redacted]

(b)(1)

r. (U) Persistence. Persistent.

s. (U) Historical. Synthesized in the United States and the United Kingdom.

t. (U) Detection. Same as for VE.

14. ~~(C)~~ VX

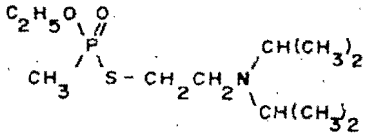
a. ~~(C)~~ Alternate Code or Designations.

- (b)(1) ~~(C)~~ ~~(C)~~
- France -- A-4. (U)

b. (U) Class. Nerve agent.

c. (U) Chemical Name. O-Ethyl S-2 diisopropylaminoethyl methylphosphonothioate.

d. (U) Formula. $C_{11}H_{26}NO_2PS$



e. (U) Molecular Weight. 267.37.

f. ~~(C)~~ Raw Materials.

- (b)(1)

g. (C) Method of Manufacture.[2,12]

(b)(1)

h. (U) Equipment. Standard chemical processing equipment.

i. (C) Physical and Chemical Properties.

- (b)(1)

(b)(1)

j. (U) Method of Dissemination. Same as for Sarin.

k. (U) Use. To produce casualties and cause death by inhalation of vapor or aerosol, by liquid droplet contamination of skin or eyes, or by ingestion with food or water. To cause harassment by requiring personnel to wear heavy, special clothing and masks, or to seek shelter.

l. (U) Physiological Effect. (b)(1)

(b)(1)

m. (U) Therapy. Same as for Sarin.

(b)(1)

(b)(1)

(b)(1)

o. (U) Protection Required.

(b)(1)

(b)(1)

p. (U) Storage.

(b)(1)

q. (C) Persistence.

(b)(1)

(b)(1)

r. (C) Toxicity.[10]

(b)(1)

(b)(1)

s. ~~(C)~~ Detection.[22] (b)(1) (b)(1)

15. RESERVED FOR FUTURE USE

16. (C) EA 1699

a. ~~(C)~~ Code or Alternate Designations.

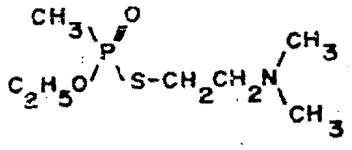
- (b)(1) ~~(C)~~
- Sweden--F-gas. (U)
- USSR--V-gas. (U)
- Romania and Yugoslavia--Vx. Also assign VX to the whole group of phosphorylthiocholines. (U)

b. (U) Class. Nerve agent.

c. (U) Chemical Names.

- O-Ethyl-S-(dimethylaminoethyl) ester of methylthiophosphonic acid.
- Ethoxydimethylaminothioethyl methylphosphonate.
- S-Thiocholine-O-ethylmethylphosphonothiolate.
- O-Ethyl S-2-dimethylaminoethyl methylphosphonothioate.

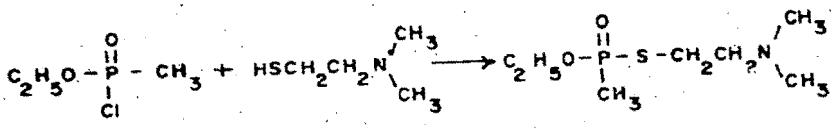
d. (U) Formula. $C_7H_{18}NO_2PS$



Neg. 550278

e. (U) Molecular Weight. 208.26.

f. (U) Method of Preparation.



Neg. 513071

EA 1699

g. (U) Physical and Chemical Properties.

- Odor: Odorless.
- Physical state and color: Colorless liquid.
- Boiling point: 80° C at 8 Pa.
- Solubility: Soluble in organic solvents, slightly soluble in water.
- Specific gravity (liquid): 1.0725 at 25° C.
- Volatility: Low.
- Hydrolysis: Hydrolyzed spontaneously in aqueous solution.
- Reactions: Reacts strongly with oxidizing agents such as chloride of lime, sodium hypochlorite, and potassium permanganate; also reacts with ammonia and amines.

h. (U) Dissemination. Can be disseminated as an aerosol.

i. (U) Physiological Effects. The effects are similar to VX. Vx has no irritating effect on the skin and is more liposcluble than Sarin. Vx penetrates the skin and mucous membrane rapidly and also penetrates the blood-brain barrier.

j. (U) Decontamination.[6] Same as for VE.

k. (U) Therapy. Same as for Sarin.

l. (U) Protection. Protective masks and clothing.

m. (U) Storage. Stable in storage, if dry.

n. (U) Toxicity. Fatal dosage in man is given as 5 to 10 mg-min/m^3 by inhalation route.[29] LD_{50} in mice is 0.05 mg/kg (IP); LD_{50} in rabbits is 0.014 mg/kg (IV) and 0.16 mg/kg (PC).

o. (U) Persistence. Persistent.

p. (U) Detection. Same as VE.

q. ~~(C)~~ ~~(U)~~ Historical.[11] (b)(1)

17. (U) (NOFORN) EA 3148[30 31]

a. ~~(C)~~ Code or Alternate Designation. (b)(1)

b. ~~(C)~~ Class. (b)(1)

c. ~~(C)~~ Chemical Name. (b)(1)

(b)(1)

d. ~~(C)~~ (b)(1)

e. (U) Molecular Weight. 279.37.

f. ~~(C)~~ Physical and Chemical Properties.

- (b)(1)

g. (U) Use (U). Developmental agent.

h. (C) Physiological Effects (U). (b)(1)

(b)(1)

(b)(1)

i. (C) Therapy (U). (b)(1)

j. (C) Decontamination (U). (b)(1)

k. (C-NOFORN) Toxicity (U). (b)(1)

l. (U) Detection (U). Same as for VE.

D. EXPERIMENTAL AND UNKNOWN AGENTS (U)

18. General (U)[32] [33]

(b)(1)

NOT Rreleasable TO FOREIGN NATIONALS

(b)(1)

(b)(1)

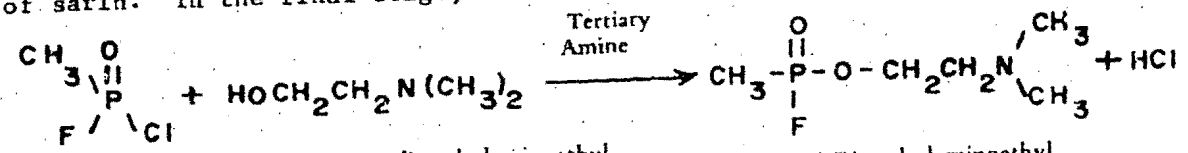
(b)(1)

(b)(1)

19. Methylfluorophosphorylcholine (U)[11]

a. (U) Code of Alternate Designations (U). Yugoslavia refers to the group of fluorophosphorylcholines as F-poisons or Tammelin poisons.

b. (U) Synthesis (U). The synthesis of methylfluorophosphorylcholine (2-dimethylaminoethyl methylphosphonofluoridate) is similar to that of sarin. In the final stage, the reaction is as follows:



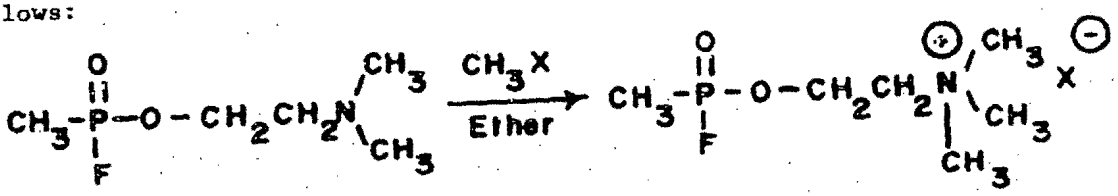
Methylphosphonic chloride fluoride

2-dimethylaminoethyl alcohol

2-Dimethylaminoethyl methylphosphonofluoridate

Neg. 513073

Quaternization of the unstable dimethylamino compound can be performed as follows:



Methhalide of 2-dimethylaminoethyl methylphosphonofluoridate

Neg. 513073

where X is a halide. The quaternized form is more stable.

19.1. VR-55 (U)

a. (U) Code or Alternate Designation (U). None.

b. (U) Class (U). A standard Soviet agent, probably a nerve agent.

c. (U) Chemical Name (U). Unknown; possibly thickened soman.

d. (U) Formula (U). Unknown.

e. (U) Physical and Chemical Properties (U). Liquid.

(b)(1)

(b)(1)

h. (U) Physiological Effects (U). Unknown. Probably same as soman.

i. (U) Decontamination (U). Individual decontamination kit, mobile showers, clothing decontamination units and decontamination truck-mounted sprays.

j. (U) Protection Required (U). Full protective clothing, protective masks.

k. (U) Storage (U). Unknown, presumed to be relatively stable.

l. (C-NOFORN) Toxicity (U). (b)(1)

(b)(1)

(b)(1)

n. (U) Historical (U). Soviet development.

20. Experimental Agents (U)

a. EA 5365 (U).[34] [35]

(1) (C) Alternate code or designation (U). (b)(1)

(2) (U) Class (U). Nerve agent.

(3) (C) Chemical name (U). (b)(1)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(4) ~~(C)~~ Formula (U). (b)(1)

(b)(1)

Neg. 550280

(5) ~~(C)~~ Molecular weight (U). (b)(1)

(6) ~~(C)~~ Raw Materials (U).

- (b)(1)

(7) ~~(C)~~ Method of preparation (U).

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

June 1977

(b)(1)

EA 5365

Neg. 550281

(8) ~~(C)~~ Physical and Chemical Properties.

(b)(1)

(9) ~~(C)~~ Method of dissemination.

(b)(1)

(b)(1)

(b)(1)

(10) ~~(C)~~ Use.

(b)(1)

(b)(1)

(11) ~~(C)~~ Physiological effects.

(b)(1)

(b)(1)

(b)(1)

(12) (C) Therapy.

(b)(1)

(b)(1)

(13) (C) Decontamination.

(b)(1)

(b)(1)

(14) (C) Protection required.

(b)(1)

(b)(1)

(b)(1)

(16) (C) Toxicity.

(b)(1)

(17) (C) Detection.

(a) (C) US detectors.

- (b)(1)

(b)(1)

(b)(1)

(b) (U) Chemical reactions. For enzyme reaction and ABC-M8 Detector Paper, see Sarin.

(b)(1)

c. (C) EA 5414.[12,34,36]

(1) (C) Code or alternate designation. (b)(1)

(2) (C) Chemical name. (b)(1) (b)(1)

(3) (C) (b)(1)

(4) (C) Molecular weight. (b)(1)

(5) (U) Physiological effects. Same as EA 5365.

(6) (U) Therapy. Probably similar to EA 5365.

(7) (U) Storage. No data.

(8) (C) Toxicity.[13] (b)(1)

(b)(1)

E. STUDIES IN SUPPORT OF BINARY MUNITIONS

21. (C) General[12]

(b)(1)

22. (C) Binary Systems for G-agents[37-39]

(b)(1)

(b)(1)

(b)(1)

23. (C) Binary Systems for VX[12,38-41]

(b)(1)

(b)(1)

F. CARBAMATES

24. (C) General[42]

(b)(1)

25. (C) EA 3990[43]

a. (U) Class. Nerve agent.

b. (C) Chemical Name. (b)(1)

(b)(1)

c. ~~(C)~~ Formula.[43] (b)(1)

(b)(1)

d. (U) Molecular Weight. 718.

e. ~~(C)~~ Raw Materials.[43]

- (b)(1)

(b)(1)

g. ~~(C)~~ Physical and Chemical Properties.[44]

(b)(1)

h. ~~(C)~~ Physiological Effects.[45-48] (b)(1)

(b)(1)

i. ~~(C)~~ Therapy.[46] (b)(1)

(b)(1)

j. ~~(C)~~ Storage.[44,46] (b)(1)

(b)(1)

k. ~~(C)~~ Toxicity.[44,45] (b)(1)

(b)(1)

Original

ST-HB-03-18-74

(b)(1)

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Section II.

VESICANTS (BLISTER AGENTS)

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1. (U) General

Vesicants (blister agents) are used for casualty effect. These agents blister or irritate the skin and also affect eyes and lungs. Most of these agents are insidious in action with little or no pain at the time of exposure; Lewisite and Phosgene Oxime, however, cause immediate pain on contact.

2. (U) Ethyldichloroarsine

a. Code or Alternate Designations.

- United States--ED.
- United Kingdom--ED.
- Germany--DICK, Yellow Cross 1, Green Cross 3.

b. Class. Blister agent--lung irritant.

c. Chemical Name. Ethyldichloroarsine.

d. Formula. $C_2H_5AsCl_2$

e. Molecular Weight. 174.88.

f. Raw Materials.

- Arsenous oxide (As_2O_3).
- Sodium hydroxide (NaOH).
- Hydrochloric acid (HCl).
- Ethyl chloride (C_2H_5Cl).
- Sulfur dioxide (SO_2).

- Diethyl sulfate [$(C_2H_5)_2SO_4$].
- Calcium chloride ($CaCl_2$) as a drying agent.

g. Method of Manufacture.

- American Method (yield 75-80%):

$$As_2O_3\,(Aq.\,Soln) + 6NaOH \longrightarrow 2Na_3AsO_3 + 3H_2O$$

Sodium arsenite

$$Na_3AsO_3 + (C_2H_5)_2SO_4 \longrightarrow C_2H_5NaSO_4 + C_2H_5AsO_3Na_2$$

Sodium ethyl sulfate — Disodium ethyl arsenite

$$C_2H_5AsO_3Na_2 + SO_2 \longrightarrow Na_2SO_4 + C_2H_5AsO$$

Ethyl arsenic oxide

$$C_2H_5AsO + 2HCl \longrightarrow C_2H_5AsCl_2 + H_2O$$

ED

- German Method (requires 2.5 days):

$$Na_3AsO_3 + C_2H_5Cl \longrightarrow C_2H_5AsO_3Na_2 + NaCl$$

DISODIUM ETHYL ARSENITE

$$C_2H_5AsO_3Na_2 + 2HCl \longrightarrow 2NaCl + C_2H_5AsO_3H_2$$

ETHYL ARSENIC ACID

$$C_2H_5AsO_3H_2 + SO_2 \longrightarrow C_2H_5AsO + H_2SO_4$$

ETHYL ARSENIC OXIDE

$$C_2H_5AsO + 2HCl \longrightarrow C_2H_5AsCl_2 + H_2O$$

ED

h. Equipment.

- Pfaudler kettle.
- Lead-lined iron kettle.
- Autoclave.

i. Physical and Chemical Properties.[5]

- Odor: Fruity, but biting and irritating.
- Physical state and color: Clear liquid.
- Boiling point: 156° C.
- Melting point: -64° C.
- Solubility: Soluble in ethyl chloride, alcohol, ether, benzene, acetone, and cyclohexane.
- Vapor density (relative to air): 6.0.
- Specific gravity (liq): 1.69 at 20° C.
- Volatility: 6,500 mg/m^3 at 0° C; 20,000 mg/m^3 at 20° C; 27,200 mg/m^3 at 25° C.
- Vapor pressure: 2.09 mm Hg at 20° C; 15.1 mm Hg at 50° C.
- Heat of vaporization: 52.5 cal/g.
- Flash point: High enough not to interfere with the military use of the agent.
- Decomposition temperature: Stable up to boiling point.
- Hydrolysis: Liquid rapidly hydrolyzed by water to give hydrogen chloride and ethylarsenious oxide. Vapor is more stable.

j. Method of Dissemination. Artillery and mortar shells.

k. Use. Delayed-action casualty agent.

l. Physiological Effect. ED is a delayed reaction agent. The vapor is irritating to eyes, and the liquid may cause eye injury. The agent causes respiratory irritation, pulmonary congestion, edema, and pneumonia. Both the liquid and vapor blister the skin, and absorption of sufficient amounts through the skin will cause systemic poisoning or death. Liquid ED has about 1/20 the blistering action of liquid Lewisite.[8]

m. Decontamination.[6,8] Not required in open field. For enclosed spaces use water, caustic soda, DS-2, DANC solution, bleach slurry or dry STB. For self-decontamination, skin decontamination pad in US M13 Individual Decontaminating and Reimpregnating Kit is recommended.

n. Protection Required. Protective masks and clothing.

o. Storage. Stable in steel, attacks brass at 50° C, and is destructive to rubber and plastics.

p. Toxicity.[5]

- By inhalation--LCt_{50} is 3000 to 5000 mg-min/m^3 depending upon the period of exposure since the agent is rapidly detoxified in the body; ICt_{50} is 5 to 10 mg-min/m^3.

- Percutaneously--LCt_{50} is 100,000 mg-min/m^3.

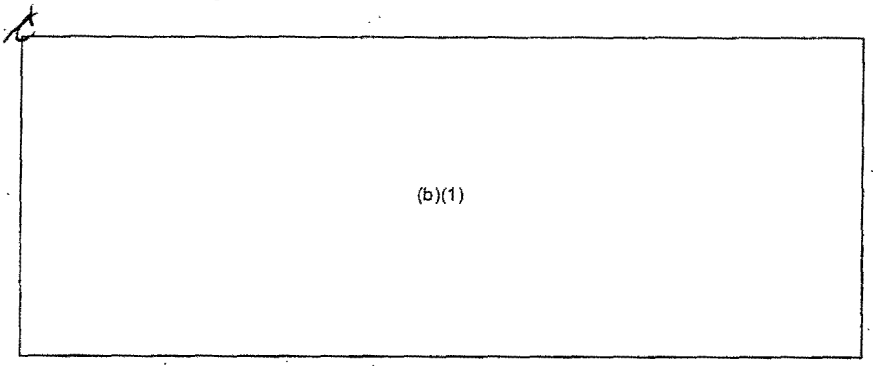
q. Persistence. Persistent enough to knock out enemy forces, but not enough to deny the area to the attacking forces. Persistence in summer is 1 to 2 hr in the open and 2 to 6 hr in the woods; in winter, 2 to 4 hr in the open and 12 hr in the woods.

r. Historical. March 1918: Introduced by Germans in an attempt to produce a volatile nonpersistent agent that would be quicker acting than diphosgene and mustard, more lasting than diphenylchloroarsine.

s. Detection.

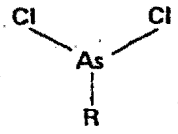
(1) US Detectors.[12,21]

- Yellow band tube (Molybdenum blue test) in M18A2 and M19 kits. Sensitivity, about 10 mg/m^3.



(2) Chemical reactions.[21]

(a) Molybdenum Blue test (for strong reducing agents and volatile arsenical compounds).



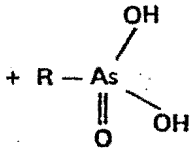
$+ (NH_4)_2 MoO_4 + H_2O$

AMMONIUM MOLYBDATE

TRIVALENT ARSENIC COMPOUND WHERE R = C_2H_5, CH_3 OR C_2H_2Cl

OXIDATION REDUCTION →

MOLYDENUM BLUE COMPLEX (BLUE COLOR)



$+ NH_4OH + NH_4Cl$

PENTAVALENT ARSENIC COMPOUND

Neg. 513076

(b) DB3-SO_3 test. Gel is speckled with black spots. Reaction unknown.

(c) ABC-M8 Detector Paper. See Sarin. ED produces a red color.

(d) Gutzeit test. See Lewisite.

3. (U) Lewisite

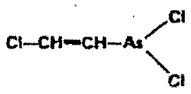
a. (U) Code or Alternate Designations.

- United States--L. (U)
- United Kingdom--M-1, L. (U)
- USSR--Lyuizit. (U)
- (b)(1) (U)
- Germany--Lewisite. (U)
- (b)(1) (U)

b. (U) Class. Vesicant.

c. (U) Chemical Name. Dichloro(2-chlorovinyl)arsine.

d. (U) Formula. $C_2H_2AsCl_3$



e. (U) Molecular Weight. 207.35.

f. (U) Alternate Chemical Names.

- Chlorovinylarsine dichloride.
- 2-Chlorovinyldichloroarsine.

g. (U) Raw Materials.

- Hydrochloric acid (HCl).
- Acetylene (C_2H_2).
- Aluminum chloride ($AlCl_3$) as a catalyst.
- Mercuric chloride ($HgCl_2$).

- Cupric chloride ($CuCl_2$).
- Silicon tetrachloride ($SiCl_4$).
- Aluminum monoxychloride (Al_2OCl_4).
- Arsenic trichloride ($AsCl_3$).

h. (U) Method of Manufacture.

(1) (U) US Method:

$$C_2H_2 + AsCl_3 \xrightarrow[30\,C]{AlCl_3} ClCH{=}CHAsCl_2$$

LEWISITE

Wash with HCl to extract excess $AsCl_3$ and distill.

(2) (U) Soviet Methods:

- Method A:

$$C_2H_2 + AsCl_3 \xrightarrow{HgCl_2 \text{ OR } CuCl_2} ClCH = CHAsCl_2$$

LEWISITE

- Method B:

$$C_2H_2 + SiCl_4 \xrightarrow{Al_2OCl_4} ClCH = CHSiCl_3$$

TRICHLORO (2-CHLOROVINYL) SILICIDE

$$ClCH = CHSiCl_3 + AsCl_3 \longrightarrow ClCH = CHAsCl_2 + SiCl_4$$

LEWISITE

This method forms only the primary Lewisite. The American method produces a mixture of primary, secondary, and tertiary forms which must be distilled in order to obtain the desired primary Lewisite.

i. (U) Equipment. Enameled autoclave.

j. (U) Physical and Chemical Properties.

- Odor: Geranium odor; very faint if agent is pure.[5]
- Physical state: Liquid.

- Boiling point: 76° to 77°C (12.5 mm Hg); 93°C (26 mm Hg); 190°C (760 mm Hg).[3]
- Melting point: -18° C.[5]
- Solubility:[3,11] Soluble in ordinary organic solvents; insoluble in water and dilute mineral acids. Because of its good miscibility with other CW agents, Lewisite is suitable for the preparation of tactical mixtures.
- Vapor density (relative to air): 7.2.[5]
- Liquid density: 1.89 at 20° C.[5]
- Volatility: 967 mg/m^3 (0° C), 2300 mg/m^3 (20° C), 8890 mg/m^3 (30° C).[5]
- Vapor pressure: 0.087 mm Hg at 0° C; 0.394 mm Hg at 20° C; 32.50 mm Hg at 100° C.[5]
- Heat of vaporization: 58 cal/g (0° to 190° C).[5]
- Flash point: None.
- Decomposition temperature: Above 100° C.[5]
- Hydrolysis: Rapidly hydrolyzed in liquid or vapor state. Products include hydrogen chloride and chlorovinyl arsenious oxide. The latter is a solid with blister properties. These properties are destroyed by alkaline hydrolysis.

k. (U) Method of Dissemination. Land mines, spray tanks, bombs, rockets, artillery and mortar shells.

l. (U) Use. Used in the summer against living targets; in the winter it is an effective terrain contaminant.

m. (U) Physiological Effects. Lewisite produces effects similar to Sulfur Mustard (see para 10) but, in addition, acts as a systemic poison, causing pulmonary edema, diarrhea, restlessness, weakness, subnormal temperature, and low blood pressure. In order of severity and appearance of symptoms it is: a blister agent; a toxic lung irritant; and, when absorbed in the tissues, a systemic poison. The liquid causes

an immediate searing sensation in the eye and permanent loss of sight if not decontaminated within 1 min. Lewisite produces an immediate and strong stinging sensation to the skin; reddening of the skin starts within 30 min. Blistering does not appear until after about 13 hours. Like Sulfur Mustard, it is a cell poison, but its skin burns are much deeper. When inhaled in high concentrations, it may be fatal in as short a time as 10 min. It is a cumulative poison since it is not significantly detoxified in the body. It is rapid in action, but its duration of effectiveness is slightly shorter than sulfur mustard.[8]

n. (U) Decontamination. Water, DANC solution, DS-2, caustic soda, bleach slurry or dry STB,[6] or treatment with a solution of sodium hydroxide in glycerin followed by soap and water. Liquid agent may be decontaminated with skin decontamination pad in US M13 Individual Decontamination and Reimpregnating Kit.[8] The Soviets also include a 10% aqueous or alcoholic solution of chloramine.[50]

o. (U) Therapy. BAL (British anti-Lewisite, dimercaprol) either on the skin as ointment or injected intramuscularly in oil. Also, 30% lanoline based unithiol ointment (USSR).[50]

p. (U) Protection Required. (b)(1)

(b)(1)

q. (U) Storage. Stable in steel or glass containers. Attacks aluminum. Storage of Lewisite in shells and bombs is made possible by use of stabilizers and corrosion inhibitors.[11]

r. (U) Toxicity.

- By inhalation—LCt_{50} is 1200 to 1500 mg-min/m^3.[5] Lethal concentration is also given as 500 to 1300 mg/m^3 (PRC).[51]
- Skin absorption[5]—LCt_{50} is 100 000 mg-min/m^3 for vapor (when humidity is high, Lewisite hydrolyzes so rapidly that it is difficult to maintain a concentration sufficient for blistering bare skin). The estimated LD_{50} for liquid on the skin is 38 mg/kg. A dose of 0.02 to 0.04 mg liquid on the skin causes blisters.

s. (U) Persistence. Summer—24 hours in the open and 1 week in the woods. Winter—1 week. Has a very short duration under humid conditions.

t. (U) Historical.

- 1917: First prepared by Dr. W. Lee Lewis in United States.
- 1917-1918: Germans claim manufacture independently.
- Nov. 1918: First lot manufactured shipped overseas. Armistice intervened, material destroyed at sea.

u. (C) Detection.

(1) (C) Detectors.

(a) (C) USSR.

- [redacted]
- [redacted] (b)(1)

(b) (U) PRC—Detector Kits Model 1950? and Type 64.[19,20] A three yellow band tube produces an orange to red color in presence of L. Sensitivity, 2 mg/m^3.[51]

(c) (U) US[21]

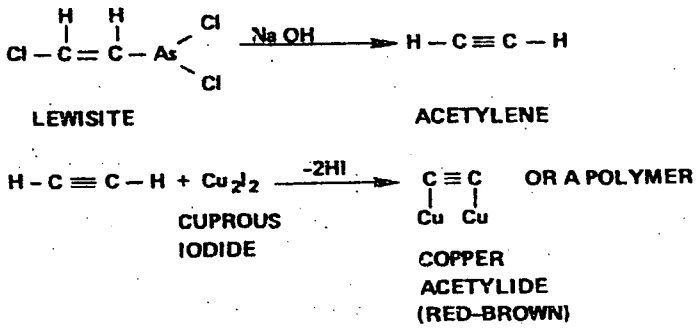
- Double yellow band tube (Acetylide test) in M19 kit. Sensitivity, 8 mg/m^3.[12]
- One yellow band tube (Molybdenum Blue Test) in M18A2 and M19 kits. Sensitivity, about 10 mg/m^3.[12]
- M7A1 Vesicant Detection Crayon.[53] ABC-M8 Detector paper for liquid agent. AN-M2 Water Testing kit (Gutzeit test).[8] White band sampling tube using Dithiophenylcarbazone Reagent.

d. (U) East Germany—Three yellow band indicator paper in CHNS kit.[54]

(2) (U) Chemical reactions.

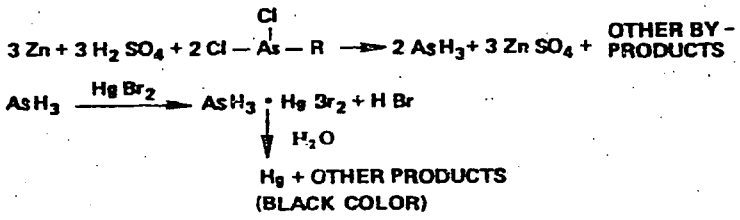
(a) (U) Molybdenum Blue test. See Ethyldichloroarsine.

(b) (U) Acetylide test.



Neg. 513077

(c) (U) Gutzeit test.



Neg. 513078

(d) (U) M7A1 Vesicant Detector Crayon. See Sulfur Mustard. L produces a blue color. Reaction is unknown.

(e) (U) ABC-M8 Detector Paper. See Sarin for dye components. L produces a red color.

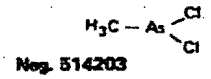
4. (U) Methyldichloroarsine

a. Code or Alternate Designation. United States—MD.

b. Class. Blister agent.

c. Chemical Name. Methyldichloroarsine.

d. Formula. CH_3AsCl_2



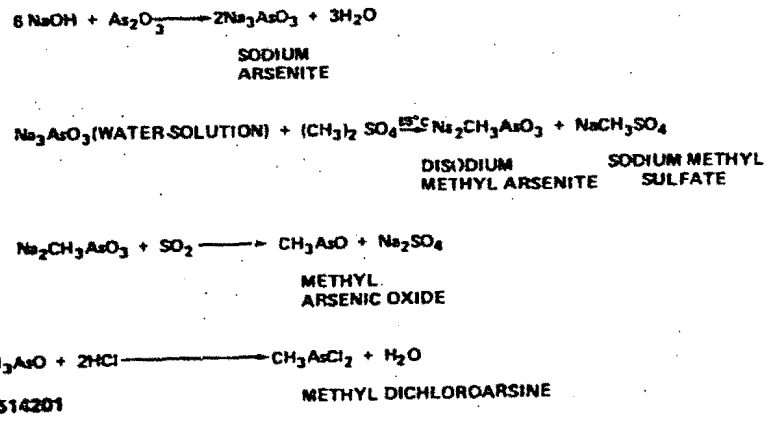
Neg. 514203

e. Molecular Weight. 160.86.

f. Raw Materials.

- Arsenous oxide (As_2O_3).
- Sodium hydroxide (NaOH).
- Dimethyl sulfate [$(CH_3)_2SO_4$].
- Sulfur dioxide (SO_2).
- Gaseous hydrogen chloride (HCl).

g. Method of Manufacture.



Neg. 514201

h. Equipment. Pfaudler kettle.

i. Physical and Chemical Properties.[5]

- Odor: Odorless (does cause burning sensation).
- Physical state and color: Colorless liquid.
- Boiling point: 133° C.
- Melting point: -55° C.
- Solubility: Soluble in common organic solvents. Slightly soluble in water.
- Vapor density (relative to air): 5.5.
- Specific gravity (liq): 1.830 at 20° C.
- Volatility: 74,900 mg/m^3 at 20° C.
- Vapor pressure: 2.17 mm Hg (0° C), 7.6 mm Hg (20° C).
- Heat of vaporization: 49 cal/g.
- Flash point: Sufficiently high not to interfere with military use.
- Decomposition temperature: Stable to the boiling point.
- Hydrolysis: Rapidly hydrolyzed to give hydrogen chloride and methyl arsenious oxide.

j. Method of Dissemination. Not known.

k. Use. Developmental agent.

l. Physiological Effect. MD causes immediate irritation of eyes and nose and produces lung injury upon sufficient exposure. The liquid may produce severe eye injury, but is less irritating to the skin than ED. MD penetrates fabrics faster than Sulfur Mustard, and the lesions produced are less severe and heal faster than those caused by Sulfur Mustard.

m. Decontamination.[6] Same as for Ethyldichloroarsine.

n. Protection Required. Protective masks and clothing.

o. Storage. Stable in steel containers.

p. Toxicity. By inhalation, LCt_{50} is approximately 3000 to 5000 mg/m^3, varying with time of exposure, and the ICt_{50} is 25 mg-min/m^3. MD is detoxified at an appreciable rate.

q. Persistence. Summer--1 hr. Winter--2 to 3 hr.

r. Historical.

- 1858: Prepared by Bayer.
- 1918: Prepared by Uehlinger and Cook. Not used by either side in World War I. Prepared too late.

s. Detection. (US)—Same as for Ethyldichloroarsine.

5. (C) Nitrogen Mustard (HN-1)[5]

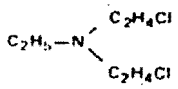
a. (C) Code or Alternate Designation.

- United States--HN-1, TL 329. (U)
- United Kingdom--Ethyl S. (U)
- Germany--Stickstoff Lost. (U)
- USSR--TO(?) (U)
- (b)(1) (C)

b. (U) Class. Blister agent.

c. (U) Chemical Name. 2,2'-Dichlorotriethylamine.

d. (U) Formula. $C_6H_{13}Cl_2N$

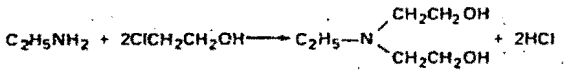


e. (U) Molecular Weight. 170.08.

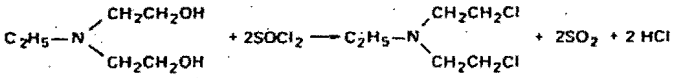
f. (U) Raw Materials.

- Ethylamine ($C_2H_5NH_2$).
- Ethylene chlorohydrin ($ClCH_2CH_2OH$).
- Ethylene oxide (C_2H_4O).
- Ammonia (NH_3).
- Thionyl chloride ($SOCl_2$).

g. (U) Method of Manufacture.

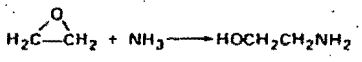


ETHYL DIETHANOLAMINE

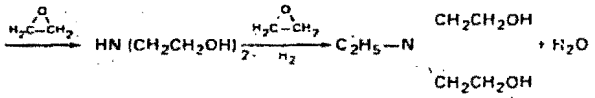


HN-1 MUSTARD

Alternate Method (1)

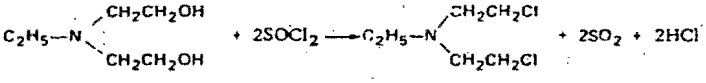


ETHANOLAMINE



DIETHANOL AMINE

ETHYL DIETHANOL AMINE



HN-1 MUSTARD

h. (U) Physical and Chemical Properties.[5]

- Odor: Faint fishy or musty odor.
- Physical state and color: Colorless to pale yellow liquid.
- Boiling point: 85° C at 10 mm Hg, decomposes below boiling point at atmospheric pressure.
- Melting point: -34° C.
- Solubility: Soluble in acetone.
- Vapor density (relative to air): 5.9.
- Specific gravity (liq): 1.0858 at 25° C.
- Volatility: 140 mg/m^3 at -10° C, 329 mg/m^3 at 0° C, 1590 mg/m^3 at 20° C, and 3240 mg/m^3 at 30° C.
- Vapor pressure: 0.25 mm Hg at 25° C.
- Heat of vaporization: 77 cal/g.
- Flash point: High enough not to interfere with military use of the agent.
- Decomposition temperature: Decomposes before boiling point is reached.
- Hydrolysis: Slow rate of hydrolysis. Products include hydroxyl derivatives and condensation products. Toxic intermediates are produced during hydrolysis.

i. (U) Method of Dissemination. Not known.

j. (U) Physiological Effects. The agent irritates the eyes in dosages that do not significantly damage the skin or respiratory tract for single exposures. This irritation appears in a shorter time than that from HD; after a mild vapor exposure, there may be no skin lesions. After severe vapor exposure, or exposure to liquid HN-1, erythema may appear earlier than in HD contamination along with irritation and itching.

Later, blisters may appear in the erythematous areas. Effects on the respiratory tract include irritation of the nose and throat, hoarseness progressing to loss of voice, and a persistent cough. Fever, labored respiration, and moist rales may develop. Broncho-pneumonia may appear after the first 24 hr. Following ingestion or systemic absorption, HN-1 causes inhibition of cell mitosis resulting in depression of the blood-forming mechanism and injury to other tissues. Severe diarrhea, which may be hemorrhagic, occurs. Lesions are most marked in the small intestine and consist of degenerative changes and necrosis in the mucous membranes. Ingestion of 2 to 6 milligrams causes nausea and vomiting. Susceptibility to secondary infection is not as great as with HN-2 and HN-3. It is essentially a cumulative poison. Onset of symptoms are delayed for 12 hr or longer.[8]

k. (U) Decontamination.[6] Bleach slurry, DANC solution, DS-2, M5 protective ointment.

l. (U) Protection Required. Protective mask and protective clothing. Impregnated clothing protects against mustard vapor, and impermeable clothing protects against liquids.[8]

m. (U) Storage. HN-1 is relatively stable, but is not as stable as Sulfur Mustard. Some precipitation occurs after 180 hr at 60° C; 4% to 5% polymerization occurs in steel after 30 days at 65° C.

n. (U) Toxicity.[5]

(1) (U) Median lethal vapor dosage.

- By inhalation--LCt_{50} is 1500 mg-min/m^3.
- Skin absorption (masked personnel)--LCt_{50} is 20,000 mg-min/m^3.

(2) (U) Median incapacitating vapor dosage.

- Eye injury--ICt_{50} is 200 mg-min/m^3.
- Skin absorption (masked personnel)--ICt_{50} is 9000 mg-min/m^3.

o. (U) Persistence. Much less persistent than Sulfur Mustard.

p. ~~(c)~~ Detection.u

(1) ~~(c)~~ Detectors.u

(a) ~~(c)~~ USSR.u

- c

=

(b)(1)

(b) (U) PRC[19,20,55]--Detector Kits Model 1950? and Type 64. A two yellow band tube produces a yellow to orange color in presence of L. Sensitivity, about 1 mg/m^3.

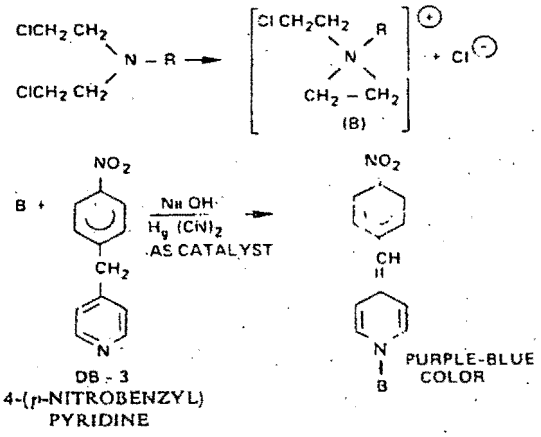
(c) (U) US.[21]

- Blue band tube (DB3-NaOH test) in M15A2A, M18A2, and M19 kits. Sensitivity, about 1 mg/m^3.
- White band sampling tube (Dragendorff's test using appropriate reagents) in M19 kit. Sensitivity, about 20 mg/m^3.[12]
- ABC-M8 Detector paper for liquid agent.
- AN-M2 Water testing kit.[12]

(2) (U) Chemical reactions.

(a) (U) Dragendorff's test. See Tabun.

(b) (U) DB3-NaOH test (for alkylating and acylating agents).



(c) (U) ABC-M8 Detector paper. See Sarin for dye components. HN-1 produces a red color.

6. ~~(C)~~ Nitrogen Mustard (HN-2)[5c]

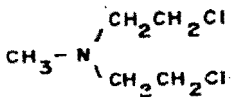
a. ~~(C)~~ Code or Alternate Designations

- United States--HN-2. (U)
- United Kingdom--S. (U)
- Germany--Stickstoff Lost. (U)
- (b)(1) ~~(C)~~

b. (U) Class. Blister agent.

c. (U) Chemical Name. Bis(2-chloroethyl) methylamine.

d. (U) Formula. $C_5H_{11}Cl_2N$



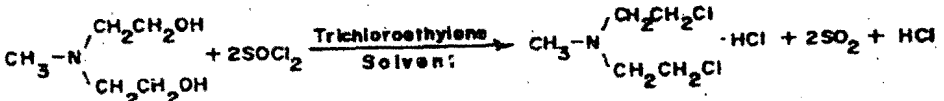
e. (U) Molecular Weight. 156.07.

f. (U) Raw Materials.

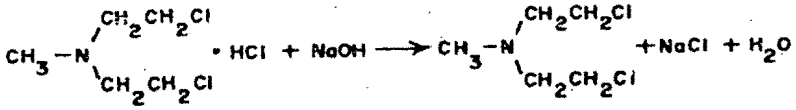
- Ethylene oxide (C_2H_4O).
- Monomethylamine (CH_3NH_2).
- Thionyl chloride ($SOCl_2$).
- Sodium hydroxide (NaOH).
- Trichloroethylene ($Cl_2C{=}CHCl$) as solvent.

g. (U) Method of Manufacture.

Diethanol–methylamine



Bis (2-chloroethyl) methylamine HCl



HN-2

Yield about 95%, with 96% purity.

h. (U) Physical and Chemical Properties.

- Odor: High concentrations give a fruity odor.
- Physical state and color: Pale yellow liquid.[5]
- Boiling point: 75° C at 15 mm Hg and 93° C at 23 mm Hg; decomposes below boiling point at atmospheric pressure.[5]
- Melting point: -65° to -60° C.[5]
- Solubility: Soluble in organic solvents.
- Vapor density (relative to air): 5.4.[5]
- Specific gravity (liq): 1.15.[5]
- Volatility: 2580 mg/m^3 at 25° C; 5106 mg/m^3 at 30° C; 9300 mg/m^3 at 40° C.[5]
- Vapor pressure: 0.29 mm Hg at 20° C; 0.427 mm Hg at 25° C; 1.16 mm Hg at 40° C.[5]
- Heat of vaporization: 78.8 cal/g.[5]
- Flash point: High enough not to interfere with military use of the agent.
- Decomposition temperature: Decomposes below boiling point. Instability of HN-2 is associated with its tendency to polymerize or condense; the reactions involved could generate sufficient heat to cause an explosion.
- Hydrolysis: Fairly rapid, catalyzed by alkalies. Hydrolysis products include complex condensates or polymers.

i. (U) Methods of Dissemination. Not known.

j. (U) Physiological Effects. Same as HN-1. It is a cumulative poison.

k. (U) Decontamination.[6] Bleach slurry, DANC solution, DS-2, decontaminant 40 (trichlorocyanuric acid), M5 protective ointment.

l. (U) Protection Required. Protective clothing and protective mask. See HN-1.

m. (U) Storage.[8] It is relatively unstable. It does not corrode metals, but dimerizes in glass and metal containers. HN-2 should never be stored in single containers in excess of 50-gal capacity in view of the fact that dimerization evolves so much heat as to render bulk storage hazardous. Ferric chloride is a powerful catalyst of dimer formation, as are water and oxygen. Normal dimerization occurs at a rate of about 18% per annum.

n. (U) Toxicity.[5,8] Median lethal vapor dosage = 3000 mg-min/m^3, and the median incapacitating vapor dosage for eye injury is 100 mg-min/m^3. For skin absorption in liquid form (masked personnel), HN-2 is intermediate between HN-1 and HN-3; in vapor form, HN-2 has the greatest blistering power of all the mustards.

o. (U) Persistence. HN-2 decomposes on damp ground, and is not suitable for hot climates. It persists from 1.5 to 3 hr at 4° C, and from 1/4 to 1/2 hr at 32° C.

p. (U) Detection. Same as for HN-1.

7. (U) Nitrogen Mustard (HN-3)

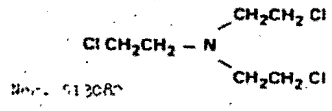
a. (U) Code or Alternate Designations.

- United States--HN-3, TL 145. (U)
- United Kingdom--T-773. (U)
- Germany--Stickstoff Lost, Green Ring 1. (U)
- USSR--TO. (U)
- (b)(1) (U)

b. (U) Class. Blister agent-vesicant

c. (U) Chemical Name. 2,2',2"-Trichlorotriethylamine.

d. (U) Formula. $C_6H_{12}Cl_3N$

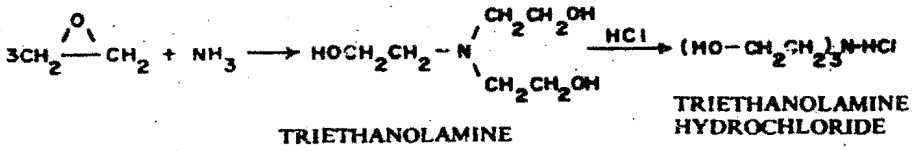


e. (U) Molecular Weight. 204.54

f. (U) Raw Materials.

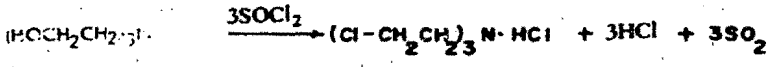
- Gaseous hydrogen chloride (HCl).
- Ethylene oxide (C_2H_4O).
- Sodium carbonate (Na_2CO_3).
- Triethanolamine [$N(CH_2CH_2OH)_3$].
- Thionyl chloride ($SOCl_2$).

g. (U) Method of Manufacture.[2]

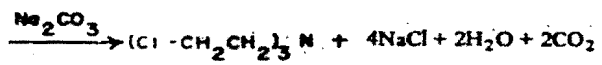


TRIETHANOLAMINE

TRIETHANOLAMINE HYDROCHLORIDE



TRICHLOROTRIETHYLAMINE HYDROCHLORIDE



HN-3

Note - 60 to 75° yield for pure product and 80 to 90% yield for technical product.

h. (U) Physical and Chemical Properties.

- Odor: Faint odor of geraniums.
- Physical state/color: Colorless oily liquid becoming a yellow liquid after 3 to 4 days.[11]
- Boiling point: 137° to 138° C at 15 mm Hg; decomposes before boiling at atmospheric pressure.[5]
- Melting point: -4° C.[5]
- Solubility: Soluble in Sulfur Mustard and chloropicrin. Insoluble in water, being less soluble than Sulfur Mustard.[11] Soluble in ether, benzene, and acetone.
- Vapor density (relative to air): 6.9.[5]
- Specific gravity (liq): 1.24 at 25° C.[5]
- Volatility: 24 mg/m^3 at 0° C, 120 mg/m^3 at 25° C, 257 mg/m^3 at 30° C, 400 mg/m^3 at 40° C (too low to yield an effective vapor concentration).[5]
- Vapor pressure: 0.0109 mm Hg at 25° C.[5]
- Heat of vaporization: 72 cal/g.[5]
- Flash point: High enough not to interfere with military use.[5]
- Decomposition temperature: Decomposes below boiling point.[5]
- Hydrolysis: Slow rate of hydrolysis.

i. (U) Method of Dissemination. Not known.

j. (U) Physiological Effect. Similar to those for HN-1. It has a low rate of detoxification, being essentially a cumulative poison.

k. (U) Decontamination.[6] Same as for HN-2.

l. (U) Protection Required. Protective mask and protective clothing.

m. (U) Storage. HN-3 is not entirely stable at room temperature in glass. The agent darkens slightly and deposits a small amount of black precipitate. Carbon disulfide and triphenyl carbinol are good stabilizers. The agent is stable in high carbon steel at 25° C for 40 to 50 weeks, also in low carbon steel if stabilizer is added.

n. (U) Toxicity.[5]

(1) (U) Median lethal vapor dosage:

- By inhalation--LCt_{50} is 1500 mg-min/m^3.
- Skin absorption (masked personnel)--LCt_{50} is 10,000 mg-min/m^3.

(2) (U) Median incapacitating dosage:

- Eye injury--ICt_{50} is 200 mg-min/m^3.
- Skin absorption (masked personnel)--ICt_{50} is 2500 mg-min/m^3.

o. (U) Persistence. Summer--24 hr in open areas and 1 week in the woods. Winter--several weeks.

p. (U) Detection. Same as for HN-1.

8. (U) Phosgene Oxime

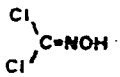
a. Code or Alternate Designations.

- United States--CX.
- USSR--Fosgen Oksim.
- Germany--Kanton.

b. Class. Irritant.

c. Chemical Name. Phosgene oxime.

d. Formula. $CHCl_2NO$



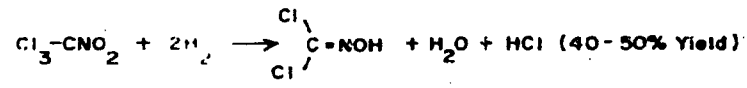
e. Molecular Weight. 113.94.

f. Alternate Chemical Name. Dichloroformoxime.

g. Raw Materials.

- Chloropicrin (Cl_3CNO_2).
- Hydrogen (H_2).
- Iron powder (Fe).
- Zinc (Zn).

h. Method of Manufacture.



This process may be carried out on a continuous basis and results in a very pure product. The reaction may also be catalyzed with iron powder or zinc.

i. Physical and Chemical Properties.

- Odor: Unpleasant, penetrating.
- Physical state and color: Colorless prismatic crystals; impure product is light yellow.
- Boiling point: 129° C.
- Melting point: 39° C.
- Solubility: Dissolves slowly but completely in water; soluble in organic solvents.

- Volatility: 1800 mg/m^3 at 20° C.
- Vapor pressure: 11.2 mm Hg at 25° C.
- Heat of vaporization: 100.9 cal/g.[56]
- Hydrolysis: Hydrolyzes slowly in water at room temperature; not hydrolyzed by dilute acids. Rapidly destroyed by alkali.

j. Method of Dissemination. Effective only when disseminated as an aerosol. Usually disseminated as a nonpersistent spray and preferably sprayed directly on human targets.

k. Use. As an immediate urticant. Not persistent enough for use as a ground contaminant.

l. Physiological Effects.[8] On contact with the skin, Phosgene Oxime produces immediate pain varying from a mild prickling sensation to a feeling resembling a severe bee sting. A wheal forms in about 30 min with a scab forming in about a week. Itching may be present throughout the healing process. Large doses of liquid cause deep-seated lesions and painful wounds. Resorption of the agent by the skin is considerable, and the effects can reappear if the skin becomes moist. The agent irritates the eyes, mucous membrane of the nose and can cause blindness if agent droplets come in contact with the eye. The agent also causes edema, convulsions, hemorrhage, and cyanosis.

m. Decontamination.[6] Large amounts of water, DS-2.

n. Protection Required. Agent penetrates ordinary clothing. Protective mask is satisfactory unless concentration is excessively high.

o. Storage. Extremely unstable in presence of traces of metals or other impurities. Even traces of iron chloride may cause explosive decomposition. Pure material stable only for 1 to 2 months. It may be stabilized by nitromethane, chloropicrin, glycine, ethyl acetate, or ether--but only in glass vessels below 20° C. Apparently, it is most stable in aromatic solvents.

p. Toxicity. The lowest irritant concentration after a 10-sec exposure is 1 mg/m^3. The effects of the agent become unbearable after 1 min at 3 mg/m^3.

q. Persistence. Persists in soil approximately 2 hr; has about 1/100 the persistence of mustard.

r. Historical.

- 1928: Prepared by Germans and rejected.
- 1929: Prepared by Prandtl and Sennewald in Germany.
- 1932: Prepared by G. Endres.
- 1941: Renewed interest after capture of Russian records claiming that it was as good as Sulfur Mustard.

s. Detection.

(1) US detectors.[21,22]

- Blue band tube (DB3-NaOH) in M19, M15A2, and M18A2 kits.
- M8 Point Alarm. Sensitivity, about 1 mg/m^3.

(2) Chemical reactions.[12,21] DB3-NaOH test--CX produces a red-brown color. Reaction is unknown.

9. (U) Sesqui Mustard

a. (U) Code or Alternate Designations.

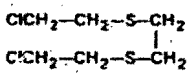
- United States--Q.
- Germany--Doppel-O, DO.

b. (U) Class. Vesicant.

c. (U) Chemical Names.

- 1,2-bis(2-chloroethylmercapto)ethane.
- 1,2-di(chloroethylthio)ethane.
- Ethylene bis-B-chloroethylsulfide.

d. (U) Formula. $C_6H_{12}Cl_2S_2$



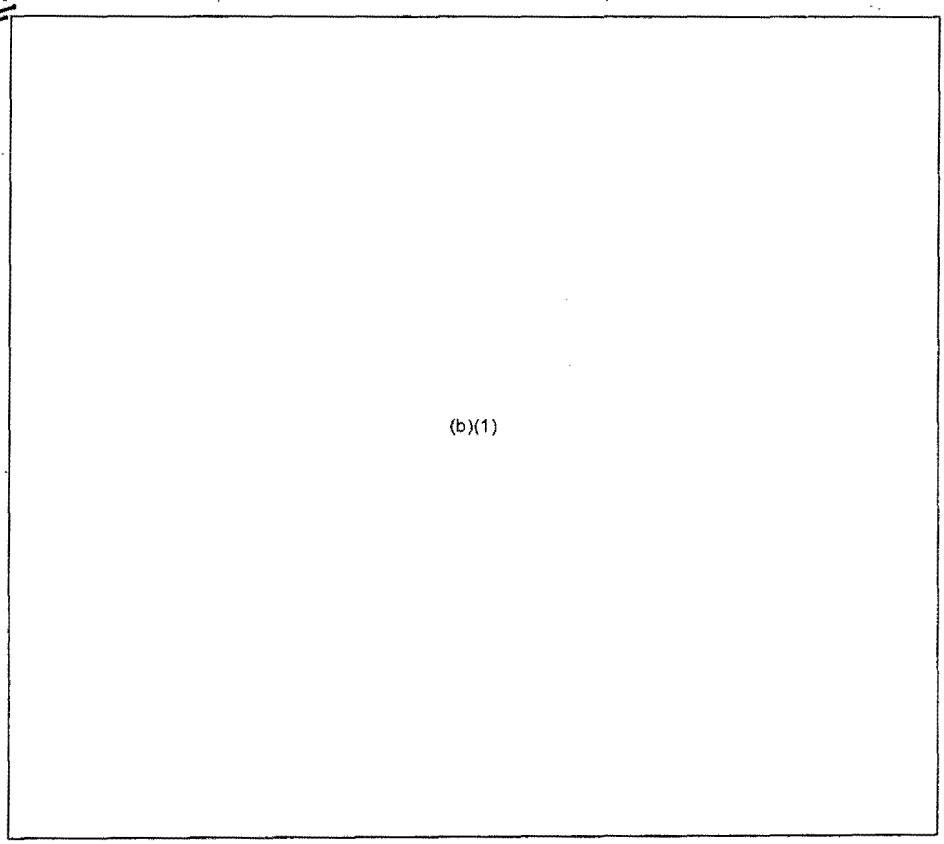
e. (U) Molecular Weight. 219.21.

f. (U) Raw Materials.

- Sodium salt of monothioglycol or MTG($HOCH_2CH_2SNa$).
- Ethylene chlorohydrin ($ClCH_2CH_2OH$).
- Disodium salt of ethane 1,2-dithiol ($NaSCH_2CH_2SNa$).
- Ethylene dibromide (BrC_2H_4Br).
- Thionyl chloride ($SOCl_2$).
- Thiodiglycol or TG [$S(CH_2CH_2OH)_2$].

g. (C) Method of Manufacture.[2]

(b)(1)



h. (U) Physical and Chemical Properties.

- Odor: Nauseating.
- Physical state: Solid.
- Boiling point: 80° C at 0.01 mm Hg.
- Melting point: 54° C.
- Solubility: Soluble in oils, carbon tetrachloride, Sulfur Mustard, benzene, acetone, chloroform, and alcohol.
- Specific gravity: 1.27 at 20° C.

- Volatility: 0.4 mg/m^3 24° C.
- Vapor pressure: 0.000013 mm Hg at 20° C.
- Decomposition temperature: 200° C under reduced pressure.
- Hydrolysis: Rapidly hydrolyzed by water.

i. ~~(C)~~ Method of Dissemination.

- (b)(1)
-

j. ~~(C)~~ Use. (b)(1)

(b)(1)

k. (U) Physiological Effects. Sesqui Mustard is five times more vesicant than Sulfur Mustard and is the most vesicant substance known. The agent inflames the eyes and causes vomiting, and prolonged exposure may cause blindness. Sesqui Mustard is absorbed through the skin and lung tissues to produce lesions that heal slowly.

l. (U) Decontamination. Bleaching powder, alcoholic solution of alkali, DANC, M5 protective ointment.

m. (U) Protection Required. Protective mask and clothing. Liquid HQ penetrates ordinary clothing and some types of impregnated clothing.

n. (U) Storage. Stable in steel containers.

o. ~~(C)~~ Toxicity.

- (b)(1)
-

p. (U) Persistent. Extremely persistent.

q. (U) Historical. 1921: Prepared by Bennett and Whincop.

r. (U) Detection.[21]

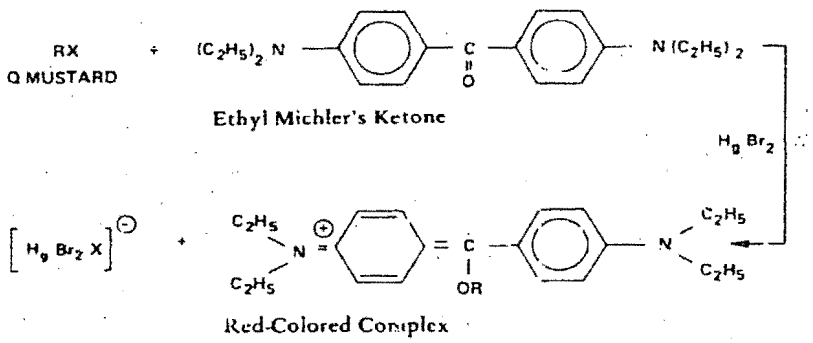
(1) (U) US detectors.

- Blue band tube (DB3-NaOH or DB3-NH_4OH test) in M19, M15A2, and M18A2 kits.
- EMK test in M19 kit. Maximum detectable range, 0.1 to 10 mg/m^3.

(2) (U) Chemical reactions.

(a) (U) DB3-NaOH Test (produces a blue color)-see Sulfur Mustard. With NH_4OH instead of NaOH, a purple blue color is obtained.

(b) (U) Ethyl Michler's Ketone (EMK) test.



10. ~~(C)~~ Sulfur Mustard[5]

a. (b)(1)

- USSR--Iprit, yperite. (U)
- (b)(1) (c)1
- French--Yperite, mustard gas, Yc, Yt. (U)[11]
- (b)(1) (c)

b. (U) Class. Blister agent.

c. (U) Chemical Names.

- Bis(2-chloroethyl)sulfide
- 2,2' Dichlorodiethyl sulfide.

d. (U) Formula. $C_4H_8Cl_2S$

$ClCH_2CH_2-S-CH_2CH_2Cl$

e. (U) Molecular Weight. 159.08.

f. (U) Alternate Chemical Names.

- Dichloroethyl sulfide.
- 1-Chloro-2-(chlorethylthio)ethane.
- 2,2'-Dichloro-diethylsulfide.

g. (U) Raw Materials.

- Ethyl alcohol (C_2H_5OH).
- Aluminum oxide (Al_2O_3).
- Sulfur (S).
- Chlorine (Cl_2).
- Ethylene chlorohydrin ($ClCH_2CH_2OH$).
- Sodium monosulfide (Na_2S).
- Hydrochloric acid (HCl).

h. (U) Method of Manufacture.

(1) (U) Levenstein Process:

$$C_2H_5OH + Al_2O_3 \xrightarrow{300^\circ C} C_2H_4 + Al_2O_3H_2O$$

Ethylene Aluminum oxide hydrate

$$2S + Cl_2 \longrightarrow S_2Cl_2$$

Sulfur monochloride

$$2C_2H_4 + S_2Cl_2 \longrightarrow ClCH_2CH_2-S-CH_2CH_2Cl + S$$

Mustard (H)

"H" mustard is purified by washing and vacuum distillation to produce "HD" mustard.[5]

(2) (U) German Method: (produces a pure product with a high yield).

$$2ClCH_2CH_2OH + Na_2S \longrightarrow HOCH_2CH_2-S-CH_2CH_2OH + 2NaCl$$

Thiodiglycol

$$S(CH_2CH_2CH)_2 + 2HCl \longrightarrow ClCH_2CH_2-S-CH_2CH_2Cl + 2H_2O$$

Mustard

i. (U) Physical and Chemical Properties.

- Odor: Garlic-like; HD has less odor than H.[4,5]
- Physical state and color: Amber or colorless oily liquid depending upon purity.[4,5,11]
- Boiling point: 227.8° C at 760 mm Hg, 93° C at 10 mm Hg.[4]

- Melting point: 14° C.[4,5]
- Solubility:[11,12,57] Poorly soluble in water (<1%); mustard on or under water undergoes hydrolysis only at the phase boundary and as a result, new mustard is constantly diffusing in small amounts into the water at the interface to replace that which had been hydrolyzed. Miscible with Diphosgene, Lewisite, Ethyldichloroarsine, Phenyldichloroarsine, and the organophosphorus nerve agents. Soluble in oils, Chloropicrin, alcohol, carbon tetrachloride, and titanium tetrachloride.
- Vapor density (relative to air): 5.4.[4,5]
- Specific gravity: 1.27 at 20° C (liq);[4,5] 1.37 at 0° C (solid).[4,5]
- Volatility: 22 mg/m^3 (-18° C, solid), 108 mg/m^3 (0° C, solid), 628 mg/m^3 (20° C, liquid), 2860 mg/m^3 (40° C, liquid).[5]
- Vapor pressure: 0.025 mm Hg at 0° C; 0.072 mm Hg at 20° C; 0.090 mm Hg at 30° C.[3,4,5]
- Heat of vaporization: 94 cal/g.
- Flash point: 105° C. Low enough to cause occasional ignition, if explosive charges in the shell are too great.[4,5]
- Decomposition temperature: 149° to 177° C.[4,5]
- Hydrolysis: Slow rate of hydrolysis at ordinary temperature; half-life is 8 min at room temperature when agent is in solution.[12] Hydrolysis products include HCl and thiodiglycol.[5]

j. (U) Methods of Dissemination.[5,6,8,11]

(1) (U) Sulfur Mustard. Aerial spray and bombs, artillery and mortar shells, land mines, and possibly rockets. A serious drawback in the use of mustard is its melting point. Since it solidifies at about 14° C, the solid phase tends to interfere with shell ballistics and cause serious problems with airplane spray tanks. To lower the

freezing point, Lewisite (see Agent Mixture, HL) or solvents such as chlorobenzene, nitrobenzene, benzene, and carbon tetrachloride may be added. Mustard thickened with methyl methacrylate may be used to disseminate the agent from great heights so that it can hardly be detected from the ground and can maintain its droplet form on its way to the ground.

(2) (U) Simulated mustard. Simulated mustard (MR) was developed as a substitute for H in the testing of dispersion apparatus and munitions as well as for training purposes. MR is a solution of 25% molasses in water, with cresol as a stabilizer. It is a dark brown liquid with a thin, syrupy consistency; it has a viscosity and surface tension sufficiently close to H to insure comparable flow characteristics; its low freezing point makes it suitable in moderately cold weather without danger of freezing. The patterns obtained by dispersion from airplane smoke tanks, chemical land mines, and thin-case bombs are similar to those produced by H. Although it has a pH of 4.5, MR causes no corrosion when used as a fill in these munitions.

k. (U) Use. The primary military application of Sulfur Mustard is to deny terrain or to lower mobility of an enemy force on a contaminated area. The effects are optimal on heavily vegetated tropical terrain. Since the agent is effective by inhalation as well as through the skin (penetrates ordinary clothing, rubber, and leather), special protective clothing as well as protective masks must be worn, thus lowering the efficiency of the troops. The agent is very persistent and may poison the soil for several weeks, denying the territory to enemy forces.[8]

l. (U) Physiological Effects. Mustard is primarily a vesicant, blisters being formed by either liquid or vapor contact. It also attacks the eyes and lungs, and is a systemic poison. The agent acts first as a cell irritant and finally as a cell poison on all tissue surfaces contacted. The first symptoms of mustard poisoning usually appear in 4 to 6 hr. The higher the concentration, the shorter the interval of time between exposure to the agent and the first symptoms; thus, the effects resulting from liquid mustard are more rapid in onset than mustard vapor.[57] The physiological action results in conjunctivitis or inflammation of the eyes and erythema, which may be followed by blistering or ulceration and inflammatory reaction of the nose, throat, trachea, bronchi, and lung tissue. Susceptibility varies with individuals. Injuries produced by mustard heal much more slowly and are more liable to infection than burns of similar intensity produced by physical means or by other chemicals.[5] The rate of detoxification is very low. Mustard exerts a casualty effect at lower concentrations in hot humid weather since wet skin absorbs more mustard than dry skin.

m. (C) Decontamination.[8,27,57] (b)(1)

(b)(1)

n. (U) Therapy. Basically symptomatic, but antibiotics such as chloramphenicol should be used to prevent infection.[57] For small doses, a dressing alone is sufficient.

o. (C) Protection Required.[8,3] (b)(1)

(b)(1)

p. (U) Storage. Stable in steel or aluminum containers and can be stabilized with acridine or naphthoquinoline. HD is more stable than H.[5]

q. (U) Toxicity.[4,5,8,11]

(1) (U) Median lethal dosage.

- By inhalation--LCt_{50} = 1500 mg-min/m^3.
- Skin absorption (masked personnel)--LCt_{50} = 10,000 mg-min/m^3. LD_{50} for liquid on skin is 20 to 25 mg/kg, depending on amount of moisture present on skin; LD_{100} is given as 60 to 70 mg/kg.[58]

(2) (U) Median incapacitating dosage.

- Eye injury--ICt_{50} = 200 mg-min/m^3.
- Skin absorption (masked personnel)--ICt_{50} = 2000 mg-min/m^3 at 21° to 27° C. Wet skin absorbs more mustard than dry skin; above 27° C, perspiration increases so that at 32° C the ICt_{50} for skin absorption is reduced to

1000 mg-min/m^3. Absolute erythemata occurs with 0.01 mg of H/cm^2 of skin; small blisters form at 0.1 to 0.15 mg/cm^2 and larger ones at 0.5 mg/cm^2.

r. (U) Persistence. Summer--3 to 4 days in the open and 1 week in the woods. Winter--several weeks, both in the open and in the woods. Considered to be nonpersistent if released as an aerosol. Liquid agent can be very persistent, since it vaporizes very slowly at ambient temperatures.[57]

s. (U) Historical.

- 1822: First obtained by Despritz (ethylene and sulfur monochloride).
- 1854: Prepared by Richie.
- 1860: Prepared by Guthrie, also Niemann, independently.
- 1886: Meyer, in Germany, used a new process (thiodiglycol and phosphorus trichloride).
- 1912: Clarke used thiodiglycol and HCl.
- July 1917: First used by the Germans. The German term "lost" was formed from the two names of the scientists, Lommel and Steinkopf, who investigated the characteristics of Sulfur Mustard.
- 1920: Gibson and Pope perfected Guthrie's method, used dry and alcohol-free ethylene and sulfur monochloride.

t. (U) Detection.

(1) (U) Detectors.

(a) (U) USSR.

- (b)(1)

(b) (U) PRC.

- Detector kits Model 1950? and Type 64.[19,20] One yellow band tube to produce a yellow to red color. Sensitivity, about 2 mg/m^3.[59]

(c) (U) US.[12,21]

- Blue band tube (DB3-NaOH test) in M15A2A, M18A2, and M19 kits. Sensitivity, about 1 mg/m^3.
- White band sampling tube (Dragendorff's test to differentiate Sulfur Mustard from Nitrogen Mustard using appropriate reagents) in M19 kit.
- ABC-M8 Indicator paper.
- M7A1 Vesicant Detector Crayon.
- AN-M2 Water Testing kit (DB3 test).

(d) (C) (b)(1) (b)(1)

(2) (U) Chemical reactions.[12,21]

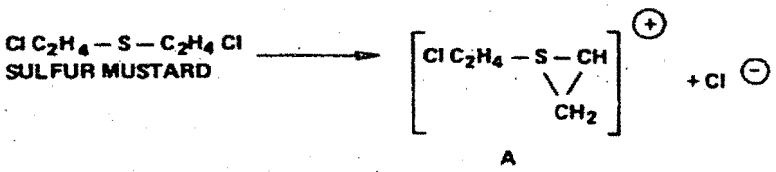
(a) (U) Dragendorff's Test—See Tabun. Test is positive for Nitrogen Mustard but negative for Sulfur Mustard.

(b) (U) M7A1 Vesicant Detector Crayon.

Sulfur Mustard $\xrightarrow{\text{Chloramine}}$ HCl $\xrightarrow{\text{Congo Red}}$ Blue color.

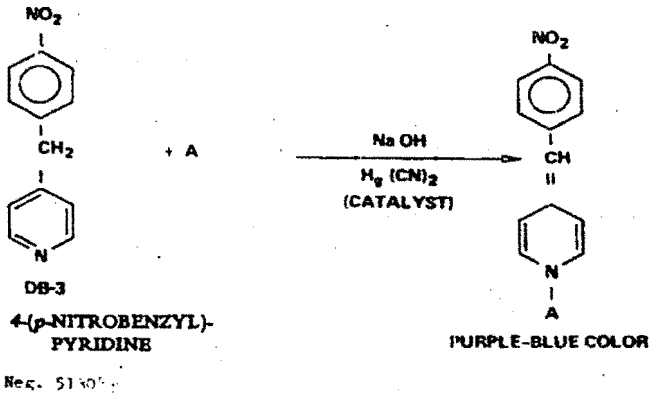
L, ED, and MD also respond to this test, but the nitrogen mustards do not.

(c) (U) DB3-NaOH Test (for alkylating and acylating agents).



A

Neg. 513089



Neg. 51305

(d) (U) ABC-M8 Detector Paper. See Sarin for dye content. H produces a red color.

11. ~~(C)~~U T - Mustard

a. ~~(C)~~ Code or Alternate Designations.

- (b)(1)

b. (U) Class. Vesicant.

c. (U) Chemical Name. Bis[2-(2-chloroethylthio)ethyl] ether.

d. (U) Formula.

$C_8H_{16}Cl_2OS_2$

$ClCH_2CH_2-S-CH_2CH_2-O-CH_2CH_2-S-CH_2CH_2Cl$

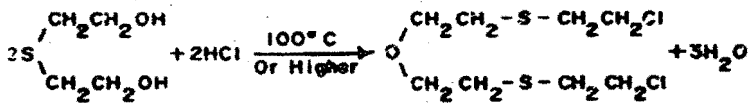
e. (U) Molecular Weight. 279.26.

f. (U) Alternate Chemical Names. 2,2-di(chloroethylthio)diethyl ether.

g. (U) Raw Materials.

- Thiodiglycol $(C_2H_4OH)_2S$.
- Gaseous hydrogen chloride (HCl).

h. (U) Method of Manufacture.



(Yields a 60-40 Mixture of H and T)

i. (U) Physical and Chemical Properties.

- Odor: Mustard-like.
- Physical state: Liquid.
- Boiling point: 80° C at 0.02 mm Hg; 120° C at 0.5 mm Hg.
- Melting point: 8.97° C. The H and T mixture (60:40) has a lower freezing point than H alone.[8]
- Solubility: Soluble in oils, carbon tetrachloride, methyl alcohol, chloroform, ether, acetone, benzene, toluene, monochlorobenzene, and Sulfur Mustard. Insoluble in water and petroleum ether.
- Specific gravity (liq): 1.24 at 20° C.
- Volatility: 2.8 mg/m^3 at 25° C.
- Vapor pressure: 0.000029 mm Hg at 25° C.
- Decomposition temperature: 174° C at 2.0 mm Hg.

j. (U) Method of Dissemination. Standard chemical munition charged with a 60:40 mixture with Sulfur Mustard.

k. (U) Use. 60:40 mixture of H and T.

l. ~~(C)~~ Physiological Effects. (b)(1)

(b)(1)

m. (U) Decontamination. Alcoholic KOH or NaOH, bleach slurry, sodium hypochlorite, DANC solution, and M5 protective ointment. Decontaminants also apply to the H and T mixture.[5]

n. (U) Protection Required. Protective mask and protective clothing. T is less effective than Sulfur Mustard through clothing.

o. (U) Storage. Stable in steel containers. The H and T mixture (60:40) is more stable than H alone.[8]

p. ~~(C)~~ Toxicity.

- (b)(1)
-

q. ~~(C)~~ Persistence. (b)(1)

(b)(1)

r. (U) Detection. Same as for Sesqui Mustard.

Section III.

SYSTEMIC (BLOOD AGENTS)

1. (U) General

Blood agents are absorbed into the body primarily by inhalation. They affect bodily functions through action on blood hemoglobin or on the enzyme cytochrome-oxidase system so as to prevent the normal transfer of oxygen from the blood to body tissue and cellular respiration.

2. (U) Arsine

a. Code or Alternate Designations.

- United States--SA.
- United Kingdom--SA.

b. Class. Systemic poison.

c. Chemical Name. Arsenic trihydride.

d. Formula. AsH_3.

e. Molecular Weight. 77.95.

f. Alternate Chemical Names.

- Hydrogen arsenide.
- Arseniuretted hydrogen.

g. Raw Materials.

- Sodium arsenide (Na_3As).
- Sodium hydroxide (NaOH).
- Water (H_2O).
- Arsenic trichloride ($AsCl_3$).
- Hydrogen (H_2).

h. Method of Manufacture.

- Method A:

$$Na_3As + NaOH + 3H_2O \longrightarrow AsH_3 + 4NaOH$$

SA

- Method B:

$$AsCl_3 + 3H_2 \longrightarrow AsH_3 + 3HCl$$

SA

i. Physical and Chemical Properties.

- Odor: Disagreeable garlic odor.
- Physical state and color: Colorless neutral gas.
- Boiling point: -63° C.
- Melting point: -117° C.[5]
- Solubility: Soluble in carbon disulfide, trichloroethylene, acetone, phosgene, carbon tetrachloride. Slightly soluble in water.
- Vapor density (relative to air): 2.69.
- Liquid density: 1.34 at 20° C.
- Volatility: 30,900,000 mg/m^3 at 0° C.[5]
- Vapor pressure: 11,360 mm Hg at 20° C.[5]
- Heat of vaporization: 53 cal/g.[5]
- Flash point: Very low. SA ignites so easily that it cannot be used in shells; it tends to explode in air.
- Decomposition temperature: 300° C. Decomposes on exposure to light.[8]
- Hydrolysis: Hydrolyzes rapidly.

j. Method of Dissemination. No munitions available.

k. Physiological Effects. Rapidly absorbed through the lungs into the bloodstream, arsine reacts immediately with the hemoglobin. The compound has no effect on the eyes, nose, respiratory tract, or skin. Damage to the liver and kidneys can occur. Slight exposure causes headache and uneasiness. In larger doses the victim becomes jaundiced, loses appetite, trembles, becomes weak, has abdominal pains, nausea and vomiting. In severe cases, collapse occurs followed by convulsions, delirium, coma, and death. Effects may be delayed from 2 hr to 11 days.

l. Use. Delayed action casualty agent.

m. Therapy. Morphine sulfate, oxygen inhalation, unithiol, whole blood transfusion.

n. Decontamination. None required.

o. Protection Required. Protective mask.

p. Storage. Stable if stored in varnished steel containers at room temperature, away from light. Metal catalyzes decomposition. Relatively stable in mild steel and Swedish iron if hydrogen sulfide is added as a stabilizer. Stability is impaired by small amounts of water.

q. Toxicity. Median incapacitating dosage is 2,500 mg-min/m^3. It is estimated that a dose of 2 mg/kg would be lethal to man. Maximum allowable concentration for prolonged exposure is 0.05 ppm.

r. Persistence. Nonpersistent.

s. Detection.[21]

(1) US Detectors.

- Blue band tube (DB3 test) in M19 kit.
- AN-M2 Water Test Kit (Gutzeit test).

(2) Chemical reactions.

- DB3 test--SA produces a yellow to orange color.
- Gutzeit test--$AsH_3 + HgBr_2$ (on impregnated paper) $\longrightarrow$ Hg
  Black color

t. Historical. 1873: Prepared by Janowsky.

3. (CNU) Cyanogen Chloride

a. (CNU) Code or Alternate Designations.

- United States--CK. (U)
- United Kingdom--CK. (U)
- France--Mauginite, Vitrite. (U)
- USSR--Klortsian. (U)
- (b)(1) (U)

b. (U) Class. Systemic poison and lacrimator.

c. (U) Chemical Name. Cyanogen chloride.

(U) Formula. CNCl.

e. (U) Molecular Weight. 61.48.

f. (U) Alternate Chemical Names.

- Chlorine cyanide.
- Chlorocyanide.

g. (U) Raw Materials.

- Hydrogen cyanide (HCN).
- Chlorine (Cl_2).
- Sodium cyanide (NaCN) or Potassium cyanide (KCN).

h. (U) Method of Manufacture.

- Method A.

$$HCN + Cl_2 \longrightarrow \underset{\text{Cyanogen chloride}}{CNCl} + HCl$$

- Method B.

$$NaCN + Cl_2 \longrightarrow \underset{\text{Cyanogen chloride}}{CNCl} + NaCl$$

i. (U) Equipment. Iron vessel and cooling coils.

j. (U) Physical and Chemical Properties.

- Odor: Irritating and lacrimatory to extent that odor is unnoticed.
- Physical state and color: Colorless liquid.
- Boiling point: 14° C.[5]
- Melting point: -6° C.[5]
- Solubility: Soluble in water, alcohol, carbon disulfide, acetone, benzene, carbon tetrachloride, Chloropicrin, Sulfur Mustard, and HCN.[11]
- Vapor density (relative to air): 2.1.
- Specific gravity: 1.18 at 20° C.
- Volatility: 6,132,000 mg/m^3 at 25° C.[5]
- Vapor pressure: 1,010 mm Hg at 20° C.[5]
- Heat of vaporization: 103 cal/g.[5]
- Flash point: None.
- Decomposition temperature: Above 100° C.
- Hydrolysis: Very slowly hydrolyzed by moisture; products are HCl and HOCN.

k. (U) Method of Dissemination.[6] Artillery and mortar shells, bombs, grenades. Mixed with HCN as an airplane spray.

l. (U) Use. CK is a toxic gas which remains close to the ground and produces immediate casualties, usually lethal. CK does not hydrolyze in damp regions, and is thus effective in rain or fog. The gas is usable both in the tropics and in cold climates.

m. (U) Physiological Effect. CK irritates the eyes and lungs and rapidly paralyzes nerve centers, especially those controlling the respiratory system. The gas causes delayed deaths in low concentrations and very rapid deaths in high concentrations. Rate of detoxification in body is 0.02 to 0.1 mg/kg-min. Unlike Hydrogen Cyanide, it has a lacrimating effect and does not stimulate breathing rate.

n. (U) Decontamination.[6] Sodium hydroxide and DS-2. None generally required under field conditions.

o. (U) Therapy. Amyl nitrite; artificial respiration is used if breathing fails or threatens to fail. Alternate injections of sodium nitrite and sodium thiosulfate (subcutaneously or intravenously) could be administered. Also the use of dicobalt edetate (Kelocyanor) is suggested.[57]

p. (U) Protection Required. Protective mask. CK will break or penetrate a protective mask canister or filter element more readily than most other agents. To protect against CK, the charcoal is impregnated with salts of copper, chromium, and silver. Canister life is shortened if humidity is high.

q. (U) Storage.[8] The pure product will stand for 30 days at 65° C without excessive decomposition. It polymerizes in 40 to 60 days; impurities tend to promote polymerization which may occur with explosive violence. The impure product may be stabilized by propylene oxide or arsenic trichloride.

r. (U) Toxicity.[5] LCt_{50} is 11,000 mg-min/m^3 and ICt_{50} is 7000 mg-min/m^3. Lethal dose also is given as 4,000 mg-min/m^3 for 10 min and about 3,500 mg-min/m^3 for ½ min (East Germany).[11]

s. (U) Persistence. Summer--10 min in the open and 20 min in the woods. Winter--20 min in the open and 2 hr in the woods.

t. (U) Historical.

- Discovered by Wurtz in Germany.
- 1802: First prepared by Berthollet in France.
- 1916: Used by French as "Vitrite" stabilized with $AsCl_3$.

u. ~~(C)~~ u Detection.

(1) ~~(C)~~ Detectors.

(a) ~~(C)~~ USSR.

(b)(1)

(b) ~~(C)~~ US.[12,21]

(b)(1)

(c) ~~(C)~~ East Germany.

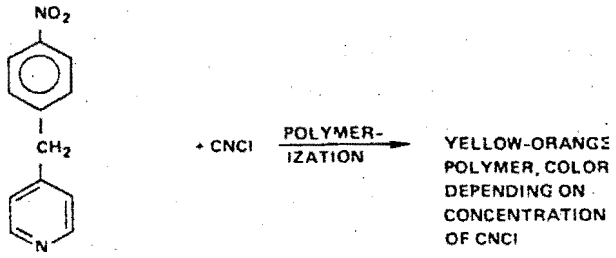
(b)(1)

(d) (U) PRC.

- Two green band tube to produce a yellow to red color. Sensitivity, about 8 mg/m^3.[61]

(2) (U) Chemical reactions.

(a) (U) DB3 test (for highly reactive alkylating and acylating agents, i.e., carbonium ion formation).



4-(*p*-NITROBENZYL)-PYRIDINE

Ref. 513093

(b) (U) DB3-NaOH test--Unknown chemical reaction. Forms a red to black color.

(c) (U) Pyrazolone test--See Hydrogen Cyanide for chemical reaction. Forms red-purple color.

(d) (U) Prussian Blue test (for cyanide ion)--see Hydrogen Cyanide for chemical reaction. Forms a blue color.

(e) (U) Tetra-Base test--See Hydrogen Cyanide for chemical reaction. Decomposing CK gives a positive light to deep blue color.

(f) (U) DB3-SO_3 test--Reaction is unknown. CK produces a purple color.

4. ~~(C)~~ (U) Hydrogen Cyanide

a. ~~(C)~~ (U) Code or Alternate Designations.

- United States--AC. (U)
- United Kingdom--AC. (U)
- France--Vincennite (50% AC, 30% arsenic trichloride, 15% stannic chloride, and 5% chloroform to reduce volatility), Manguinite (mixture of AC and CK), Vincornite, Fragenite, Forestite.[11] (U)
- (b)(1) ~~(C)~~ [1]
- (b)(1) ~~(C)~~ [1]
- Germany--Blausaure, Cyklon. (U)
- (b)(1) ~~(C)~~

b. (U) Class. Systemic poison.

c. (U) Chemical Names.

- Hydrogen cyanide.
- Hydrocyanic acid.

d. (U) Formula. HCN.

e. (U) Molecular Weight. 27.02.

f. (U) Alternate Chemical Name. Prussic acid.

g. (U) Raw Materials.

- Sodium cyanide (NaCN).
- Sulfuric acid (H_2SO_4).
- Acetylene (C_2H_2).
- Nitrogen (N_2).
- Chloroform ($CHCl_3$).
- Ammonia (NH_3).

h. (U) Method of Manufacture.[2]

- Method A.

$$2NaCN + H_2SO_4 \xrightarrow{Heat} 2HCN + Na_2SO_4 \text{ (Industrial Process)}$$

- Method B.

$$C_2H_2 + N_2 \xrightarrow{\text{Electric Spark}} 2HCN$$

- Method C.

$$CHCl_3 + NH_3 \xrightarrow{Heat} HCN + 3HCl$$

i. (U) Equipment. Cooling coils, distillation apparatus, and electrodes to produce an electric spark.

j. (U) Physical and Chemical Properties.

- Odor: Bitter almonds.
- Physical state and color: Colorless gas.
- Boiling point: 26.5° C.
- Melting point: -13.4° C. AC congeals at this temperature to a fibrous crystalline mass which melts at 15° C. Vaporization occurs so rapidly in air that the cooling effect causes some of the agent to congeal.[11]
- Solubility: Miscible in water and alcohol. Soluble in ether, glycerine, chloroform, benzene, tricresyl phosphate, and organophosphates.
- Vapor density (relative to air): 0.95.

- Specific gravity (liq): 0.697 at 10° C.
- Volatility: 1,075,000 mg/m^3 at 25° C;[5] 37,000 mg/m at -40° C.[8]
- Vapor pressure: 756 mm Hg at 26° C.[5]
- Heat of vaporization: 210 cal/g.[5]
- Flash point: Low; agent is ignited 50% of the time when disseminated from an artillery shell.
- Decomposition temperature: Above 66° C.
- Hydrolysis: Slow under field conditions. Hydrolysis products NH_3, HCOOH.

k. (U) Method of Dissemination. Rockets, mortar shells, and aerial bombs.

l. (~~C~~) Use. (b)(1)

(b)(1)

m. (U) Physiological Effect. HCN interferes with utilization of oxygen by body tissues due to inhibition of cytochrome-oxidase enzyme system. HCN causes a marked stimulation of the breathing rate. Symptoms appear within a few sec to min after inhalation of vapors; high doses usually are fatal in a few min. Symptoms of poisoning include weakness, convulsions, loss of consciousness, respiratory paralysis, and finally, death.[52] Its rate of detoxification in the body is 0.017 mg/kg-min.[11]

n. (U) Decontamination.[6] None required under field conditions.

o. (U) Therapy. Amyl nitrite (or propyl nitrite) are used as inhalants to oxidize hemoglobin to methemoglobin; the latter binds with cyanide to prevent inhibition of the cytochrome-oxidase system. Aminophenol, sodium thiosulfate, and dicobaltic ethylenediaminetetraacetate also are claimed to be effective antidotes.

p. (U) Protection Required. Protective mask with canister containing charcoal impregnated with salts of copper, zinc, and chromium. Extremely high concentrations of HCN tend to degrade the chemical impregnants and could cause death even against masked personnel if there is a long exposure time.[11]

q. (U) Storage. The pure material, in even small admixtures of water or alkali, forms an explosive polymer on standing;[58] it can be stabilized by adding small amounts of phosphoric acid and sulfur dioxide, or by dissolving in solvents. AC is also unstable when impure.[8]

r. (U) Toxicity. The median lethal dosage varies with concentration due to high rate of detoxification by the body. The following human estimates have been reported:[63]

Exposure Time (Min)	LCt_{50} (mg-min/m^3)
0.5	2032
1	3404
3	4400
10	6072
30	20632

Note--The Soviets' values of LCt_{50} for AC are considerably lower than the US estimates given above. AC penetrates healthy skin, the ICt being about 220,000 mg-min/m^3, for 10 min.[62,64]

s. (U) Persistence. Although AC is lighter than air, the concentrations that can be generated by modern means of delivery are stable for short periods of time, up to 10 min in summer and under favorable conditions of terrain (plant cover), up to 1 hr in winter.[11] AC probably is the Soviet's principal nonpersistent agent, and would be used on target areas where immediate occupation of an area is contemplated.[16]

t. (U) Historical.

- 1782: Discovered by Scheele.
- July 1916: Used by French at Somme as Vincennite and later as Manguinite.

u. ~~(C)~~ Detection.

(1) (C) Detectors.

(a) ~~(C)~~ USSR.

-
- (b)(1)

(b) (U) US.[21]

- Red band tube (Tetra-Base test) in M19 kit. Sensitivity, 5 mg/m^3.
- White band sampling tube (Pyrazolone test using appropriate reagents) in M19 kit.
- Prussian Blue test in M19 kit.
- M8 Point Alarm; minimum detectable range, 0.1 to 0.3 mg/m^3.[22]

(c) ~~(C)~~ East Germany.

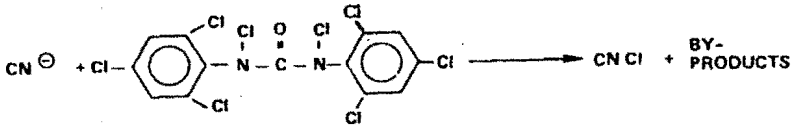
- (b)(1)
-

(d) (U) PRC.

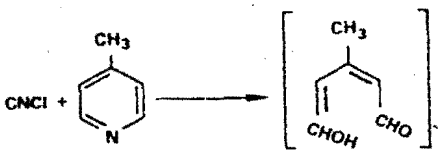
- One black band tube to produce an orange to red color. Sensitivity, about 5 mg/m^3.[65]

(2) ~~(C)~~ (U) Chemical reactions.[21]

(a) (U) Pyrazolone test (for hydrolyzable cyanide ion).

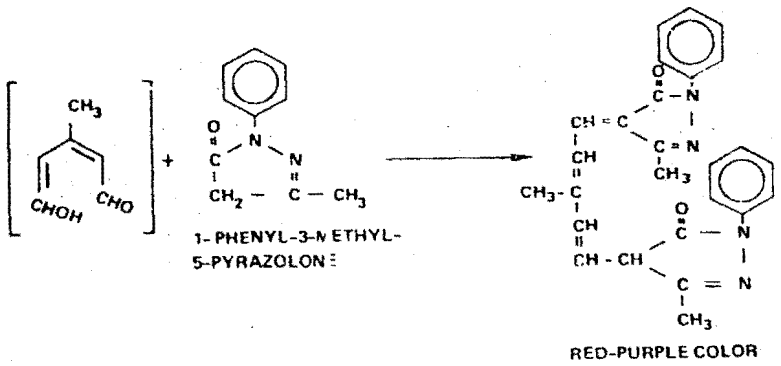


OCTOCHLORO-*SYN*-DIPHENYLUREA



4-PICOLINE AN NTERMEDIATE

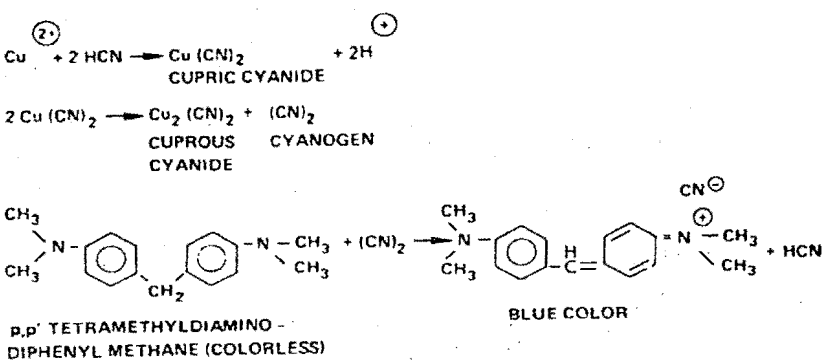
Neg. 513097



NOTE: GA, CK, AC AND DC GIVE POSITIVE TESTS BECAUSE THEY CONTAIN HYDROLYZABLE CYANIDE.

Ref: 513097

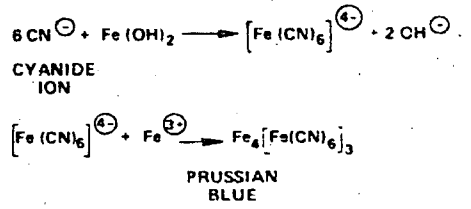
(b) (U) Tetra-Base test.



Nascent cyanogen oxidizes color reagent to a deep blue compound.

Note--Free cyanide, usually associated with Tabun, will give a positive test. Decomposing CK and DC also will produce a color change.

(c) (U) Prussian Blue test (for hydrolyzable cyanide ion).



(d) ~~(C)~~ (b)(1)

(b)(1)

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Section IV.

RESPIRATORY (CHOKING AGENTS)

1. (U) General

Choking agents injure unprotected personnel chiefly in the lungs. Irritation and inflammation result in edema. Lungs become filled with liquid in severe cases, and death results from lack of oxygen (known as dry-land drowning).

2. (U) Chlorine

a. Code or Alternate Designations.

- United States--Cl.
- United Kingdom--Cl.
- France--Bertholite.
- Germany--KLOP (mixture with chloropicrin).

b. Class. Lung injurant.

c. Chemical Name. Chlorine.

d. Formula. Cl_2

e. Molecular Weight. 70.91.

f. Raw Materials.

- Sodium chloride (NaCl).
- Water (H_2O).
- Nitric acid (HNO_3).
- Nitrosyl chloride (NOCl).
- Oxygen (O_2).
- Hydrochloric acid (HCl).
- Ferric oxide (Fe_2O_3).

g. Method of Manufacture.[2]

- Electrolytic Method:

$$2NaCl + 2H_2O \xrightarrow[Current]{Direct} Cl_2 + 2NaOH + H_2$$

Neg. 513100

- Salt and Nitric Acid Method:

$$3NaCl + 4HNO_3 \longrightarrow Cl_2 + 3NaNO_3 + NOCl + 2H_2O$$

$$2NOCl + O_2 \longrightarrow Cl_2 + 2NO_2$$

Neg. 513101

- Hydrochloric Acid and Air Method:

$$6HCl + Fe_2O_3 \longrightarrow 2FeCl_3 + 3H_2O$$

$$4FeCl_3 + 3O_2 \longrightarrow 6Cl_2 + 2Fe_2O_3$$

Neg. 513102

h. Equipment. Nelson cell (electrolysis).

i. Physical and Chemical Properties.

- Odor: Pungent.
- Physical state and color: Greenish-yellow gas.
- Boiling point: -34.6° C.
- Melting point: -101.0° C.
- Solubility: Soluble in water, Phosgene, Chloropicrin, carbon tetrachloride.
- Vapor density (relative to air): 2.4.
- Specific gravity (liq): 1.41 at 20° C.
- Volatility: 19,369,000 mg/m^3 at 20° C.[5]

- Vapor pressure: 4992 mm Hg at 20° C.[5]
- Heat of vaporization: 68.8 cal/g.[5]
- Flash point: None.
- Decomposition temperature: Greater than 1000° C.
- Hydrolysis: Hydrolyzes slowly to HCl and HOCl.

j. Method of Dissemination. There are no standard munitions for chlorine.

k. Use. Training.

l. Physiological Effect. The agent causes intense irritation of the eyes and throat and causes coughing. Chlorine burns the upper respiratory tract and can cause fatal pulmonary edema. Chlorine is rapidly detoxified in the body.

m. Decontamination. None required.

n. Protection Required. Protective mask.

o. Storage. Stable in iron cylinders, if dry.

p. Toxicity. LCt_{50} is 19,000 mg-min/m^3. ICt_{50} is 1800 mg-min/m^3.[8]

q. Persistence. Summer--5 min in open areas and 20 min in the woods. Winter--10 min in open areas and 1 hr in the woods.

r. Historical. April 1915: First gas used on an effective scale in World War I. Employed by the Germans against French and British Colonial troops in Ypres, Belgium.

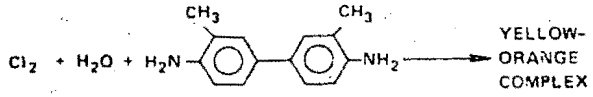
s. Detection.[21]

(1) US Detectors.

- Blue band tube (DB3-SO_3) in M19 kit.
- AN-M2 Water Testing Kit (*o*-Tolidine Test).

(2) Chemical reactions.

- DB3-SO_3 test--Reaction unknown. Cl produces a purple color.
- *o*-Tolidine Test.



3. (U) Dichlorodimethyl Ether

a. Code or Alternate Designations. None.

b. Class. Toxic lung irritant.

c. Chemical Name. 1,1'-Dichlorodimethyl ether.

d. Formula. $C_2H_4Cl_2O$

$ClCH_2-O-CH_2Cl$

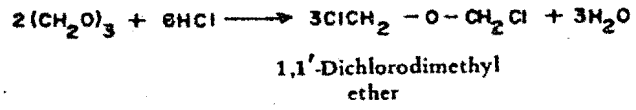
e. Molecular Weight. 114.96.

f. Raw Materials.

- Trioxymethylene $[(CH_2O)_3]$.
- Chlorosulfonic acid ($HOSO_2Cl$).
- Monochloroacetic acid ($ClCH_2COOH$).
- Hydrochloric acid (HCl).
- Formaldehyde (CH_2O).

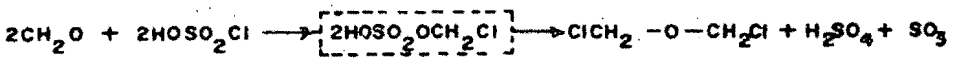
g. Method of Manufacture.[2]

- Method A:



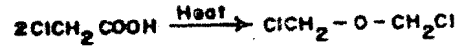
1,1'-Dichlorodimethyl ether

- Method B:



Chloromethoxysulfonic acid

- Method C:



Neg. 513106

h. Equipment. Iron vessels (1100 gal capacity) coated internally with acid-resistant materials and fitted with stirring apparatus and lead cooling coils.

i. Physical and Chemical Properties.

- Color: Colorless liquid.
- Boiling point: 104° C.
- Solubility: Insoluble in water; miscible in methanol and ethanol; soluble in benzene and acetone.
- Vapor density (relative to air): 3.9.
- Specific gravity: 1.33 at 25° C.
- Volatility: 180 mg/m^3 at 20° C.

j. Method of Dissemination. Aerial spray, bombs, land mines, artillery shells.

k. Use. Considered too unstable for military use.

l. Physiological Effect. The agent has a powerful irritant effect and is more toxic than Phosgene (see Phosgene, IV para 7). The organs of equilibrium are also affected; the victim staggers and reels and cannot maintain his balance.

m. Decontamination. Alkaline solutions.

n. Protection Required. Protective mask.

o. Storage. Unstable in presence of moisture, heat, or sunlight.

p. Toxicity. Lowest irritant concentration for 10 min exposure is 15 mg/m^3. Lethal concentration for 10 min exposure is 470 mg/m^3.

q. Historical. January 1918: First used by Germans, in mixture with ethyl dichloroarsine.

4. (U) Dimethyl Sulfate

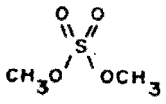
a. Code or Alternate Designators.

- United States--None.
- Germany--D-Stoff (with methylchlorosulfonate).
- France--Rationite (with chlorosulfonic acid).

b. Class. Toxic lung injurant, vesicant, lacrimator.

c. Chemical Name. Dimethyl sulfate.

d. Formula. $C_2H_6O_4S$.



e. Molecular Weight. 126.13.

f. Raw Materials.

- Methyl nitrite (CH_3ONO).
- Methyl chlorosulfonate (CH_3SO_3Cl).
- Chlorosulfonic acid ($ClSO_3H$).
- Methanol (CH_3OH).
- Sulfuryl chloride (SO_2Cl_2).
- Sulfuric acid (H_2SO_4).

g. Method of Manufacture.

- Method A:

$$2CH_3OH + SO_2Cl_2 \longrightarrow \underset{\text{Dimethyl sulfate}}{(CH_3)_2SO_4} + 2HCl$$

- Method B:

$$2CH_3OH + H_2SO_4 \longrightarrow (CH_3)_2SO_4 + 2H_2O$$

- Method C:

$$CH_3ONO + CH_3SO_3Cl \longrightarrow (CH_3)_2SO_4 + NOCl$$

Neg. 513109

- Method D:

$$2CH_3OH + ClSO_3H \xrightarrow{CCl_4} (CH_3)_2SO_4 + HCl + H_2O$$

Neg. 513110

h. Physical and Chemical Properties.

- Odor: Faint odor of onions.
- Physical state and color: Colorless liquid.

- Boiling point: 188° C with decomposition.
- Melting point: -3° C to -7° C.
- Solubility: Soluble in water, ether, dioxane, acetone, aromatic hydrocarbons.
- Vapor density (relative to air): 4.35.
- Specific gravity: 1.33 at 15° C.
- Volatility: 3,300 mg/m^3.
- Flash point: 182° C.
- Hydrolysis: Rapidly hydrolyzes in water at or above 18° C.

i. Method of Dissemination. Artillery shells, hand grenades.

j. Use. Use too limited to establish combat value. Vapor too easily decomposed by moisture to make it militarily effective. Used at present in industry as a methylating agent for amines and phenols. Also used as a catalyst in preparation of cellulose esters.

k. Physiological Effect. Delayed appearance of symptoms may permit unnoticed exposure to lethal quantities. Powerful irritant of mucous membrane, especially the eyes, nose, throat, and lungs. Action on lungs results in bronchitis, pneumonia, and lung edema. It also has a blistering and necrotic action on skin which may last 6 months. Causes prostration, convulsions, delirium, paralysis, coma, and death. Also damages liver, heart, and kidneys.

l. Decontamination. Alkaline solutions and steam.

m. Protection Required. Protective mask and protective clothing.

n. Storage. May be stored if kept dry Decomposes in presence of moisture.

o. Toxicity. Lethal concentration for 10 min exposure is 500 mg/m^3.

p. Historical.

- August 1915: Introduced by Germans as filling for artillery shells.
- September 1918: Used by French for artillery shells and hand grenades.

5. ~~(C)~~ (U) Diphosgene

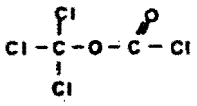
a. ~~(C)~~ (U) Code or Alternate Designations.

- United States--DP. (U)
- United Kingdom--DP. (U)
- Germany--Perstoff, Green Cross (mixture with chloropicrin). (U)[11]
- France--Superpalite. (U)
- USSR--Difosgen. (U)
- (b)(1) ~~(C)~~[1]
- (b)(1) ~~(C)~~

b. (U) Class. Lung injurant.

c. (U) Chemical Name. Trichloromethyl chloroformate.

d. (U) Formula. $C_2Cl_4O_2$.



Neg. 513111

e. (U) Molecular Weight. 197.83.

f. (U) Alternate Chemical Names.

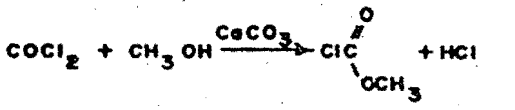
- Trichloromethyl ester of chloroformic acid.
- Perchloromethyl formate.

g. (U) Raw Materials.

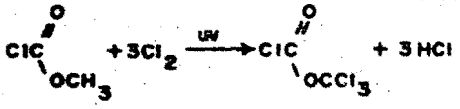
- Phosgene ($COCl_2$).
- Formic acid (HCOOH).
- Methanol (CH_3OH).
- Chlorine (Cl_2).

h. (U) Method of Manufacture.[2]

- US Method:

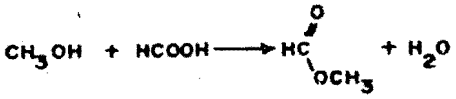


Methyl chloroformate

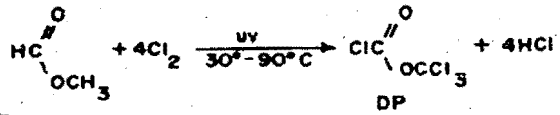


Neg. 513112 DP

- USSR Method:



Methyl formate



Neg. 513113 DP

i. (U) Equipment. Special tile-lined reaction vessels and an ultraviolet light source.

j. (U) Physical and Chemical Properties.

- Odor: Newly mown hay or grass.
- Physical state and color: Colorless oily liquid.
- Boiling point: 127° C.
- Melting point: -57° C.
- Solubility: Its solubility in Phosgene, Chloropicrin, Diphenyl chloroarsine as well as certain smokes make DP valuable for preparing tactical agent mixtures.[8]
- Vapor density (relative to air): 6.9.
- Specific gravity: 1.66 at 20° C.
- Volatility: 19,300 mg/m^3 at 0°C; 54,300 mg/m^3 at 20° C.[5]
- Vapor pressure: 2.4 mm Hg at 0° C; 10.3 mm Hg at 20° C.[5]
- Flash point: None.
- Decomposition temperatures: 301° to 351° C (yields two molecules of CG). Metals tend to catalyze the conversion of DP to CG.[8]
- Hydrolysis: Slow at ordinary temperatures. Hydrolysis products are HCl and CO_2.

k. (U) Method of Dissemination. Artillery shells, bombs, grenades, and rockets.

l. (U) Use. Casualties are produced and enemy troops are incapacitated without denying the area to the attacking forces. DP is a delayed or immediate-action casualty agent, depending on its dosage.[8]

m. (U) Physiological Effect. The agent irritates eyes, throat and respiratory tract. By its conversion to Phosgene in the body, it exerts its primary effect on the lungs by producing edema; lethal quantities of DF cause flooding of lungs with watery fluid so that the victim dies of oxygen deficiency. DP is slightly lacrimatory and differs from CG in this respect. DP is not significantly detoxified in the body; thus, its effect is cumulative.[8]

n. (U) Decontamination.[6] Alkaline solutions (including ammonia), live steam, and aeration in confined areas; however, decontamination is not required in the field.

o. (U) Protection Required. Protective mask.

p. (U) Storage. Less active than Phosgene. Pure product can be stored for longer periods of time. Needs no artificial refrigeration; therefore, shells can be filled in the field. The impure product is unstable in storage. Soviet material is stabilized with 1% to 2% phenol.

q. (U) Toxicity.[4,5] LCt_{50} is 3200 mg-min/m^3 and the ICt_{50} is 1600 mg-min/m^3.

r. (U) Persistence. Summer--15 min in the open and 60 min in the woods. Winter--30 min in the open and 3 hr in the woods. DP is more persistent in the field than CG because of its lower vapor pressure.

s. (U) Historical. May 1916: Used by Germans in retaliation for French Phosgene shells.

t. ~~(C)~~(U) Detection.

(1) ~~(C)~~(U) Detectors.

(a) ~~(C)~~ USSR.

- (b)(1)

(b) (U) US.[21]

- Single green band tube (PDB-PAN Test) in M19 and M18A2 kits.
- Blue band tube (DB3-SO_3 Test) in M19 kit.

(c) ~~(C)~~ East Germany.[60]

- (b)(1)

(2) (U) Chemical reactions.

- PDB-PAN test--DP produces a green color. See Phosgene for reactions.
- DB-SO_3 test--DP produces an orange to red color. Reaction is unknown.

6. (U) Phenyl Dichloroarsine

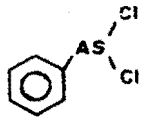
a. Code or Alternate Designations.

- United States--PD.
- Germany--Blue Cross #1, Pfifficus.
- France--Sternite.

b. Class. Toxic lung injurant and vesicant.

c. Chemical Name. Phenyl dichloroarsine.

d. Formula. $C_6H_5AsCl_2$



e. Molecular Weight. 222.93.

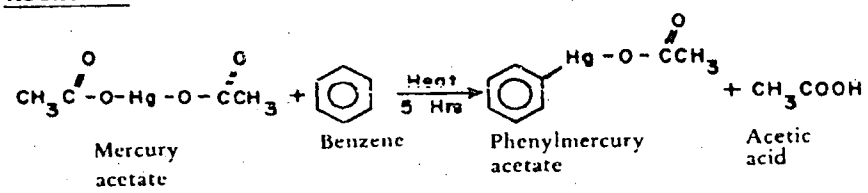
f. Alternate Chemical Name. Dichlorophenylarsine.

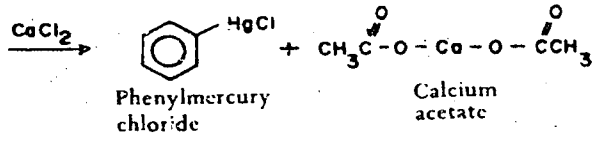
g. Raw Materials.

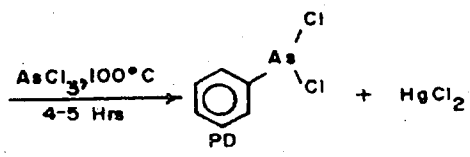
- Mercury acetate $[(CH_3COO)_2Hg]$.
- Arsenic trichloride ($AsCl_3$).
- Diphenylmercury $[(C_6H_5)_2Hg]$.
- Triphenyl arsine $[(C_6H_5)_3As]$.
- Benzene (C_6H_6).
- Calcium chloride ($CaCl_2$).

h. Method of Manufacture[2]:

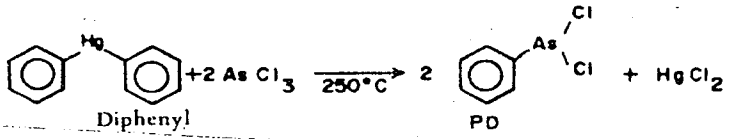
- Method A:





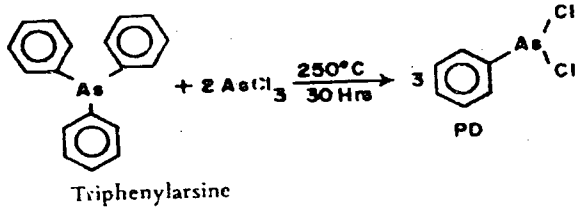


- Method B:



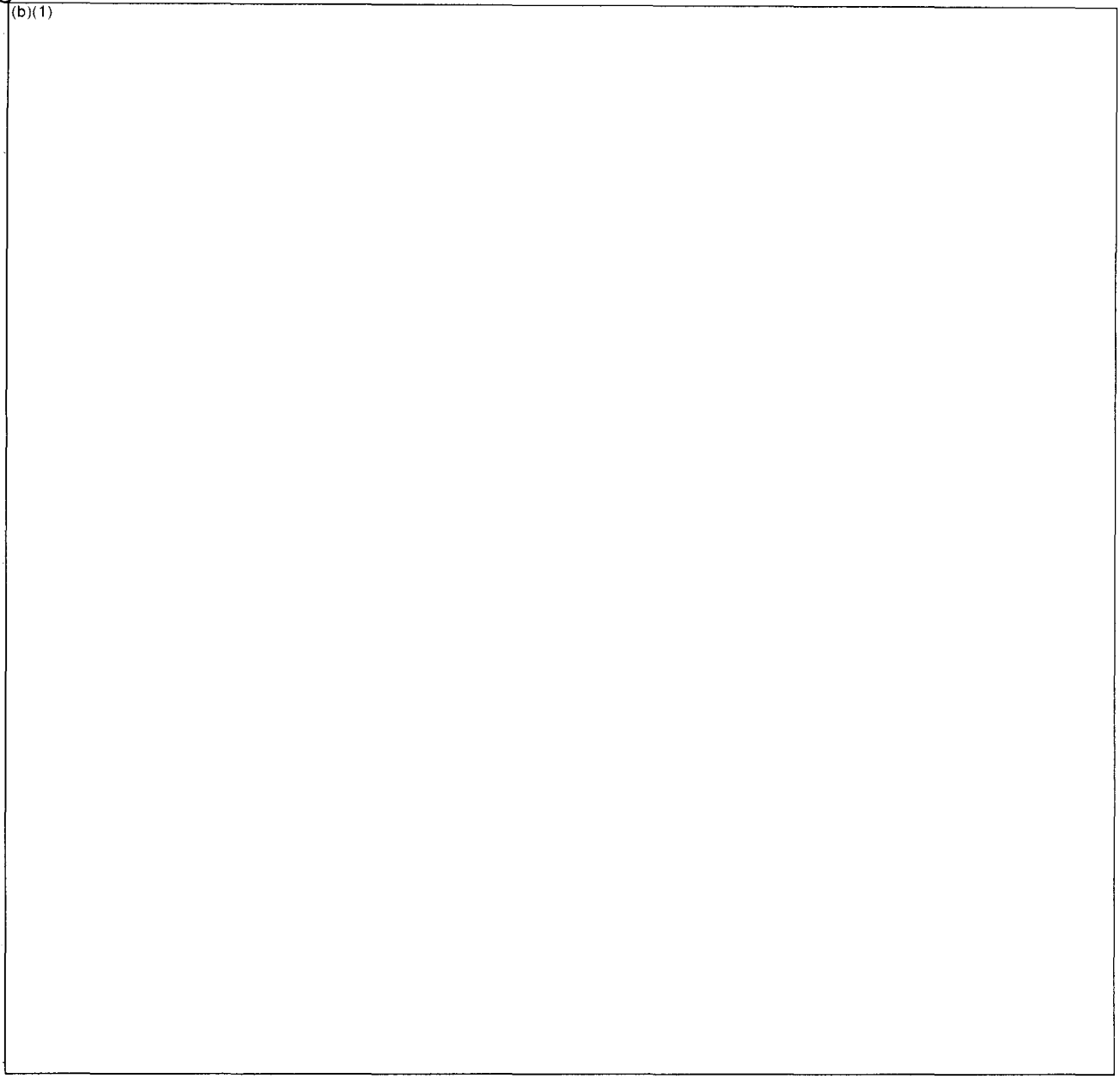
Neg. 513116

- Method C:



Neg. 513117

(b)(1)



m. Decontamination. Bleach, caustic soda, DS-2 and DANC. Also the skin decontamination pad in the US M13 Individual Decontaminating and Re-impregnating kit.[8]

n. Protection Required. Protective mask and protective clothing.

o. Storage. May be stored in iron cylinders if dry. Does not attack iron.

p. Toxicity. LCt_{50} by inhalation for 10 min exposure is 2600 mg-min/m^3. ICt_{50} is 16 mg-min/m^3 as a vomiting agent, and 1800 mg-min/m^3 as a blister agent.

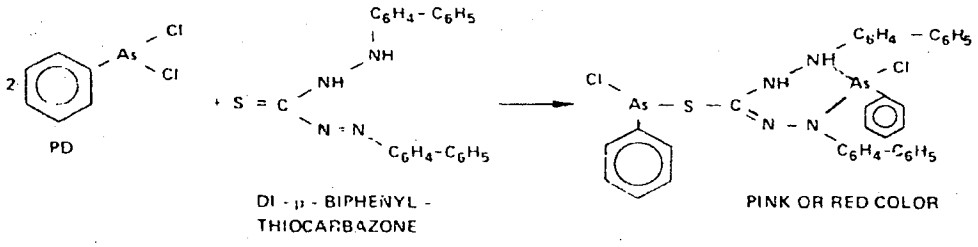
q. Historical.

- 1878: Prepared by LaCoste and Michaelis.
- 1914: Roeder and Blasi developed method used commercially.
- 1917: Used by Germans as solvent for Diphenyl cyanoarsine. Later used by French with Diphenyl chloroarsine as "Sternite."

r. Detection.[21]

(1) US Detectors. DBT-Benzene test in M19 kit. Sensitivity, 1.0 mg/m^3.[12]

(2) Chemical reaction. DBT-Benzene test (for arsenicals and heavy metal salts).



Note - In absence of PD, a tan, light orange-brown, or yellow-orange color develops in the presence of DM, DC, or DA.

7. ~~(C)~~ Phosgene

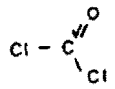
a. ~~(C)~~ Code or Alternate Designations.

- United States--CG. (U)
- United Kingdom--CG, G-1 PG (mixture with Chloropicrin). (U)[11]
- Germany--D-Stoff. (U)
- France--Collognite (Phosgene mixed with tin tetrachloride).
- USSR--Fosgen (U) (b)(1) ~~(C)~~
- (b)(1) ~~(C)~~
- (b)(1) ~~(C)~~

b. (U) Class. Lung injurant.

c. (U) Chemical Name. Carbonyl chloride.

d. (U) Formula. CCl_2O



e. (U) Molecular Weight. 98.92.

f. (U) Alternate Chemical Names.

- Carbon oxychloride.
- Chloroformyl chloride.

g. (U) Raw Materials.

- Bone charcoal (catalyst).
- Oxygen (O_2) from liquid air.
- Coke (C).
- Dry chlorine (Cl_2).

h. (U) Method of Manufacture.

$$C + O_2 \longrightarrow CO_2$$

$$CO_2 + O_2 + 3C \longrightarrow 4CO$$

$$CO + Cl_2 \longrightarrow Cl-C(=O)-Cl$$

i. (U) Physical and Chemical Properties.

- Odor: Newly mown hay or grass.
- Physical state and color: Colorless liquid, impure product yellow.
- Boiling point: 8.2° C.
- Melting point: -104° C to -128° C.
- Solubility: Soluble in Chlorine, Chloropicrin, titanium tetrachloride, mustard, Diphosgene, and other organic liquids. Slightly soluble in water.
- Vapor density (relative to air): 3.42.
- Specific gravity: 1.4.
- Volatility: 2,200,000 mg/m^3 at -10° C; 6,370,000 mg/m^3 at 20° C.[5]
- Vapor pressure: 555 mm Hg at 0° C; 1180 mm Hg at 20° C.[5]
- Heat of vaporization: 60 cal/g.[5]
- Flash point: None.
- Hydrolysis: Not readily hydrolyzed under field conditions; however, rain destroys its effectiveness. Hydrolysis products are HCl and CO_2.[8]

j. (U) Method of Dissemination. Mortar shells and aerial bombs.

k. (U) Use. Delayed action casualty gas in cloud gas attacks.

l. (U) Physiological Effects. Same as for Diphosgene, except that it has no lacrimatory effect. It is not significantly detoxified in body; thus its effects are cumulative.[8]

m. (U) Decontamination.[6] DS-2, water followed by alkaline solutions (including ammonia) may be used to destroy Phosgene. Although decontamination is not required in the field, aeration is desirable in confined areas.

n. (U) Therapy. Oxygen should be administered initially in high concentration and at positive pressure (hyperbarically) where there is cough, cyanosis, labored breathing, or restlessness. Artificial respiration procedures are undesirable.[5,7]

o. (U) Protection Required. Protective mask.

p. (U) Storage. Stable in dry steel containers. Requires refrigeration for filling shells.

q. (U) Toxicity. LCt_{50} is 3200 mg-min/m^3, and ICt_{50} is 1600 mg-min/m^3.[5] Exposure to 1000 mg/m^3 for 5 min is given as lethal in 50% to 75% of cases, i.e. LCt_{50-75}=5000 mg-min/m^3 (East Germany).[11]

r. (U) Persistence. Summer--30 min in the open and 30 min in the woods. Winter--20 min in the open and 2 hr in the woods.

s. (U) Historical.

- 1812: Prepared by John Davy, English chemist, using carbon monoxide, chlorine, and sunlight.
- 1848: Bone charcoal first used as catalyst.
- 1915: Manufactured on large scale by Germans. Used against British.
- 1916: Used in artillery shells against French by Germans.
- 1916: Used by British against Germans.

t. ~~(C)~~(U) Detection.

(1) ~~(C)~~(U) Detectors.

(a) ~~(C)~~ USSR.

- (b)(1)

(b) ~~(C)~~ US.[21]

- (b)(1)

(c) ~~(C)~~ East Germany.

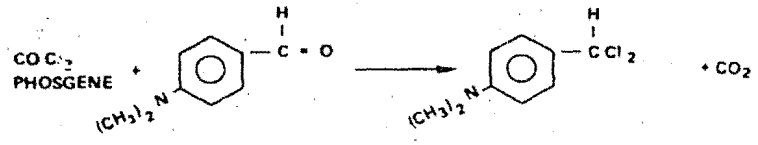
- (b)(1)

(d) (U) PRC.

- One green band tube to produce a yellow to purple color. Sensitivity, about 0.5 mg/m^3.[66]

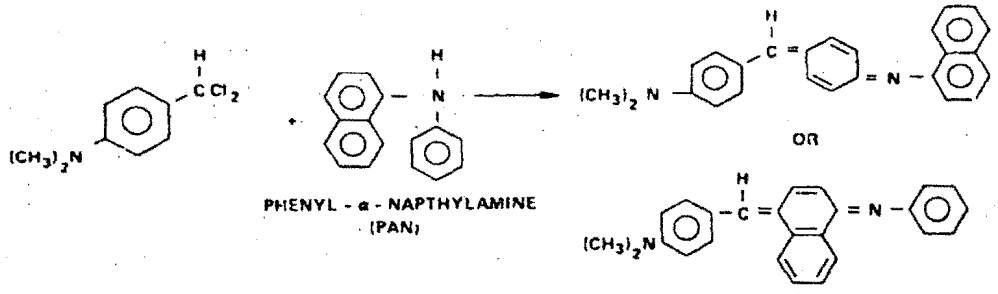
(2) (U) Chemical reactions.

(a) (U) PDB-PAN test.



P - DIMETHYLAMINO - BENZALDEHYDE (PDB)

P - DICHLOROMETHYL - N, N DIMETHYLANILINE



PHENYL - α - NAPTHYLAMINE (PAN)

Ncg. 513120

GREEN TO GREENISH-BLACK COLOR

Note - Very high concentration of CK, CG, and Triphosgene give positive reactions

(b) (U) DB3-NaOH test--CG produces a red-brown color. Reaction unknown.

(c) (U) DB3-SO_3 test--CG produces an orange to red color. Reaction unknown.

(d) (U) Detector Crayon. N-phenylbenzylamine, 4-(p-nitrobenzyl)-pyridine, and sodium carbonate react with Phosgene to produce a red color. Reaction not known.[53]

8. (U) Triphosgene

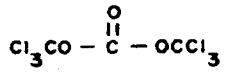
a. Code or Alternate Designations. None.

b. Class. Lung injurant.

c. Chemical Names.

- Hexachloromethyl carbonate.
- Carbonic acid-bis(trichloromethyl)ester.

d. Formula. $C_3Cl_6O_3$

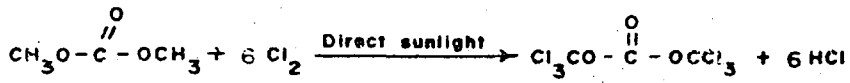


e. Molecular Weight. 296.75.

f. Raw Materials.

- Dimethyl carbonate $[CO(OCH_3)_2]$.
- Dry Chlorine (Cl_2).

g. Method of Manufacture.



h. Physical and Chemical Properties.

- Odor: Freshly mown hay or grass.
- Physical state and color: White crystals.
- Boiling point: 205° C with decomposition to CG and DP.[11]
- Melting point: 78° C.
- Solubility: Soluble in benzene, carbon tetrachloride, and ether.
- Decomposition temperature: Decomposes into Phosgene and Diphosgene on heating.
- Hydrolysis: Reacts rapidly with hot water.

i. Physiological Effect. Triphosgene causes coughing, tightness in chest, eye irritation; burns eyes, throat and respirator tract.

j. Decontamination. Excess methyl alcohol.

k. Protection Required. Protective mask.

l. Storage. Stable if dry. Does not corrode metals.

m. Historical. 1880: First prepared by Councler in Germany.

n. Detection. Same as for DP.

Section V.

RIOT CONTROL AGENTS

1. (U) General

a. Riot control agents are used when it becomes necessary for the civilian and military police, or other agencies of control, correction, or authority to dispell mobs, quell riots and rebellions, control public disturbances and maintain the public peace. Ideally, riot control agents are characterized by a combination of toxicological properties that will ensure that lethal exposures will be extremely rare.

b. In recent years, the irritant agent has found a place in combat operations to temporarily reduce the effectiveness of enemy personnel. One of its major advantages in tactical operations is its use to penetrate fortified positions for the purpose of flushing-out the enemy.

c. Riot control agents generally are algogenic (pain-producing) in nature. One important characteristic of these agents is the short interval between exposure to agent and onset of effects. Usually the effects disappear soon after exposure ceases.

d. General methods of dissemination include:

(1) Mechanical irritant gas dispensers (truck mounted) are capable of immediate action or prompt discontinuance when desired. They cover large areas by continuous use from one point or by movement while in action. They are designed to operate with a minimum of noise, and the operator is protected from the effects of the gas. The agents are disseminated in concentrations which will be effective against personnel, but not permanently harmful to them. The dispensers can be used at temperatures between -32° and 52° C.

(2) Portable gas dispensers are capable of being easily and safely carried and operated by one man. Like the truck-mounted item, they are capable of immediate action and prompt discontinuance when needed. They project micropulverized powdered agent a minimum of 40 feet.

(3) Bursting-type grenades provide for the dissemination of a non-lethal dose of an incapacitating agent under normal field conditions. The burster type explodes immediately and therefore cannot be kicked away or thrown back, as can the conventional burning-type grenades They are operational under all types of weather conditions.

(4) Helicopter-mounted dispensers disseminate riot control agents over a larger area than would be possible with ground dispensers. These facilitate the delivery of agent to the center and rear of enemy troops too large in numbers to be controlled from the ground. Further, the downdraft of the rotary blades assists in the dissemination of the agents. Commercial crop dusting equipment has been tried for this purpose and it is believed that, with certain modifications, it will be suitable for use in dispersing riot control agents.

2. (C) Bromobenzyl Cyanide

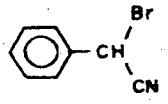
a. (U) Code or Alternate Designations.

- United States--BBC, CA.
- United Kingdom--BBC.
- France--Camite.
- Germany--T-Stoff.

b. (U) Class. Riot control, lacrimator.

c. (U) Chemical Name. α-Bromo-α-cyanotoluene.

d. (U) Formula. C_8H_6BrN

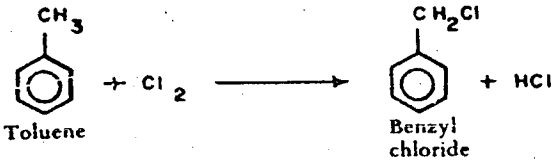


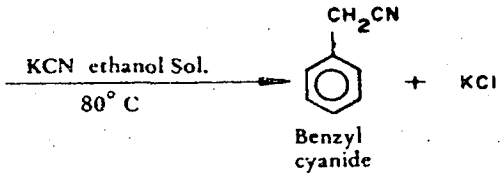
e. (U) Molecular Weight. 196.00.

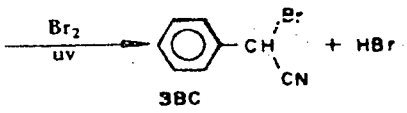
f. (U) Raw Materials.

- Toluene ($C_6H_5CH_3$).
- Chlorine (Cl_2).
- Potassium cyanide (KCN).
- Bromide (Br_2).

g. (U) Method of Manufacture.







h. (U) Physical and Chemical Properties.

- Odor: Bitter almonds or soured fruit.[5]
- Physical state and color: Yellowish-white crystalline solid.
- Boiling point: 242° C with decomposition.
- Melting point: 25° C to brownish oily liquid.
- Solubility: Soluble in Phosgene, Chloropicrin and organic solvents; insoluble in water and cold alcohol.
- Vapor density (relative to air): 6.6.
- Specific gravity: 1.47 at 25° C (liq).[5]
  1.52 at 20° C (solid).
- Volatility: 130 mg/m^3 at 20°C; 420 mg/m^3 at 30° C.[5]
- Vapor pressure: 0.012 mm Hg at 20° C.

- Heat of vaporization: 55.7 cal/g at boiling point.
- Flash point: None.
- Decomposition temperature: Decomposes slowly at 60° C; decomposes completely at 242° C with the formation of hydrobromic acid and dicyanostilbene.[5]
- Hydrolysis: Very slow; forms complex condensation products during hydrolysis.

i. (U) Methods of Dissemination. Grenades, candles.

j. (U) Use. For harrassment of troops and to deny terrain to enemy by contaminating the soil; for training and riot control.

k. (U) Physiological Effect. Severe lacrimation, nose irritation, acute pain in forehead, burning sensation of mucous membrane.

l. (U) Decontamination. A 20% alcoholic sodium hydroxide spray is effective but may damage material. Clothing can be decontaminated by boiling or steam.

m. (U) Protection Required. Protective mask.

n. (U) Storage. Slowly decomposes. Can be stored only in glass-, porcelain-, lead-, or enamel-lined containers. Vigorous corrosive action on all common metals except lead.

o. (U) Toxicity. LCt_{50} is approximately 8000 to 11,000 mg-min/m^3, but a lethal concentration cannot be obtained under field conditions. The ICt_{50} is about 30 mg-min/m^3.[8]

p. (U) Persistence. Depends upon the method of dissemination and the weather. Heavily splashed liquid persists 1 to 2 days under average weather conditions. Extremely persistent in soil.

q. (U) Historical.

- 1881: First prepared by Reinger in Germany by brominating benzyl cyanide.
- 1914: Manufacture in industry started.
- 1918: Introduced by French, also used simultaneously by United States.

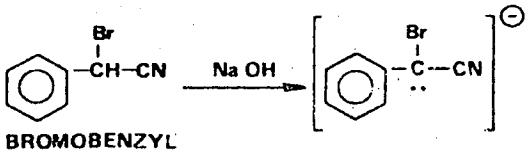
r. (C) Detection.

(1) (C) US Detectors.[12,21,22]

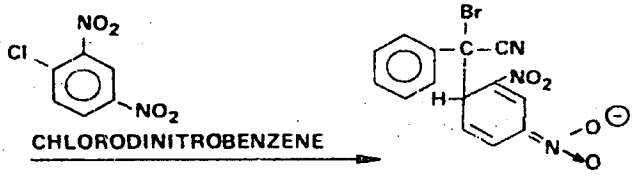
- (b)(1)

(2) (C) Chemical reactions.

(a) (U) DNB test (for carbanion).



BROMOBENZYL CYANIDE



CHLORODINITROBENZENE → RED-PURPLE COLORED COMPLEX

Neg. 513125

(b) (U) CK test--BBC produces a yellow to orange color. Reaction unknown.

(c) (U) (b)(1)

(b)(1)

3. (C) Chloroacetophenone

a. (U) Code or Alternate Designations.

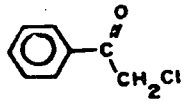
- United States--CN, Mace, and CNC (mixture of CN and chloroform, 30:70). (U)[8,57]
- United Kingdom--CN. (U)

- Germany--T-Stoff. (U)
- USSR--KhAF. (U)
- (b)(1) (C)

b. (U) Class. Riot control, lacrimator.

c. (U) Chemical Name. α-Chloroacetophenone.

d. (U) Formula. C_8H_7ClO



Neg. 513126

e. (U) Molecular Weight. 154.59.

f. (U) Alternate Chemical Names.

- Phenacylchloride.
- Phenylchloromethylketone.

g. (U) Raw Materials.

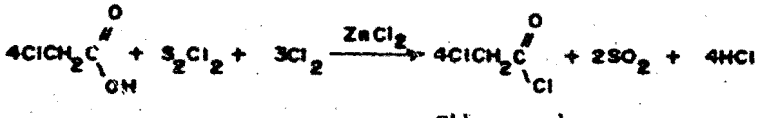
- Acetic acid (CH_3COOH).
- Chlorine (Cl_2).
- Sulfur monochloride (S_2Cl_2).
- Benzene (C_6H_6).

h. (U) Method of Manufacture.[2]

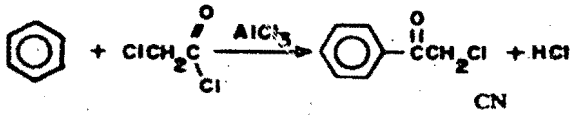
$CH_3COOH + Cl_2 \longrightarrow ClCH_2C(=O)OH + HCl$

Neg. 513127

Monochloroacetic acid



Chloroacetyl chloride



Reg. 513177

i. (U) Physical and Chemical Properties.

- Odor: Odor of apple blossoms in low concentrations.
- Physical state and color: Colorless crystalline solid.
- Boiling point: 244° to 245° C.
- Melting point: 54° to 56°C.
- Solubility: Soluble in chloroform, Chloropicrin, ethylene dichloride, chloroacetone and other organic solvents; insoluble in water.
- Vapor density (relative to air): 5.2.
- Specific gravity: 1.26 at 55° C (liq).
  1.32 at 15° C (solid).
- Volatility: 30 mg/m^3 at 0° C; 105 mg/m^3 at 20° C.
- Vapor pressure: 0.0054 mm Hg at 20° C; 0.158 mm Hg at 55° C.
- Heat of vaporization: 98 cal/g.

- Flash point: High enough not to interfere with military use.
- Decomposition temperature: Stable to boiling point.
- Hydrolysis: Not readily hydrolyzed, but the rate of hydrolysis is accelerated in the presence of alkali. The products of hydrolysis are HCl and hydroxymethylphenylketone.[11]

j. (U) Method of Dissemination. Artillery and mortar shells, pellets mechanical dispersers, candles and grenades as burning mixtures, and special cartridges fired from a pistol or riot gun.[5,57] (CNC may be disseminated by spray tanks, mortar shells, bombs, and grenades.)[8]

k. (U) Use. To harass the enemy troops; in mixtures, as riot control and training agents.

l. (U) Physiological Effects. CN causes lacrimation and irritates th upper respiratory passages. In higher concentrations, the agent produces burning and itching sensations especially on moist parts of the body. It is rapidly detoxified in the body.[8]

m. (U) Decontamination.[6] Hot soapy water, hot sodium carbonate (washing soda), hot sodium hydroxide. Aeration is sufficient in the field

n. (U) Protection Required. Protective mask.

o. (U) Storage. Stable in storage.

p. (U) Toxicity.[5] ICt_{50} is about 80 mg-min/m^3. LCt_{50} by inhalation for 10-min exposure is 11,000 mg-min/m^3 for smoke or aerosol.

q. (U) Historical.

- 1869: Discovered by German chemist, Graebe.
- 1919-1920: Suitable process for manufacture worked out by United States.[21]

r. (U) Detection.

(1) (U) Detectors.

(a) (U) USSR. (b)(1)

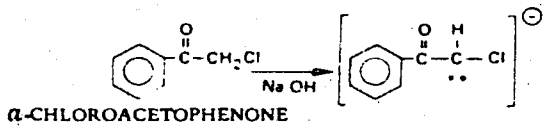
(b)(1)

(b) (U) US.[12,21]

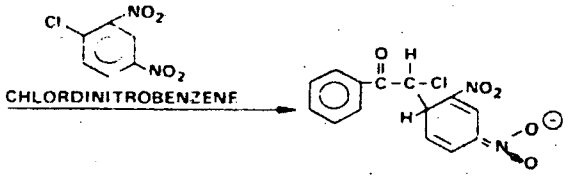
- Two green band tube (DNB test) in M19 kit. Sensitivity, about 2 mg/m^3.
- Blue band tube (DB3-NH_4OH test) in M19 kit. Sensitivity, about 2 mg/m^3.
- Blue band tube (DB3-NaOH test) in M19 kit. Minimum detectable range, 50 to 100 mg/m^3.
- Blue band tube (DB3-SO_3 test) in M19 kit.

(2) (U) Chemical reactions.

(a) (U) DNB test (for carbanion).



α-CHLOROACETOPHENONE



CHLORDINITROBENZENE

RED-PURPLE COLORED COMPLEX

(b) (U) DB3-NaOH test--CN produces a blue color. Reaction is unknown.

(c) (U) DB3-SO_3 test--CN produces an orange color. Reaction is unknown.

(d) (U) DB3-NH_4OH test--CN produces a blue or purple-blue color. Reaction is unknown.

4. Chloropicrin

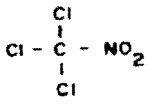
a. (U) Code or Alternate Designations.

- United States--PS.
- United Kingdom--NC, Vomiting gas, PS, G-8, PG (mixture with Phosgene).
- Germany--KLOP (mixture with Chlorine), Green Cross (mixture with DP).[11]
- France--Aquinite.
- USSR--Klorpikrin.

b. (U) Class. Riot Control--lacrimator, lung irritant.

c. (U) Chemical Name. Trichloronitromethane.

d. (U) Formula. Cl_3CNO_2.



e. (U) Molecular Weight. 164.39.

f. (U) Alternate Chemical Names.

- Nitrochloroform.
- Trichloropicromethane.

g. (U) Raw Materials.

- Nitromethane (CH_3NO_2).
- Chloride of lime ($CaOCl_2$).
- Chlorine (Cl_2).
- Calcium picrate ($[C_6H_2(NO_2)_3O]_2Ca$).

- Chloroform ($CHCl_3$).
- Calcium hypochlorite $Ca(OCl)_2$.
- Nitric acid (HNO_3).
- Hydrochloric acid (HCl).
- Trichloroethylene ($ClCHCCl_2$).
- Acetone [$(CH_3)_2CO$].
- Trichloroacetaldehyde (Cl_3CCHO).
- Sodium hypochlorite (NaOCl).
- Picric acid [$C_6H_2(NO_2)_3OH$].
- Sodium hydroxide (NaOH).

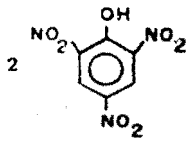
h. (U) Method of Manufacture.[2]

- French Method:

$$HNO_3 + 3HCl \longrightarrow NOCl + Cl_2 + 2H_2O$$

$$(CH_3)_2CO + NOCl + 8Cl_2 + 4H_2O \longrightarrow \underset{\text{Chloropicrin}}{Cl_3CNO_2} + 2CO_2 + 14HCl$$

- German Method:

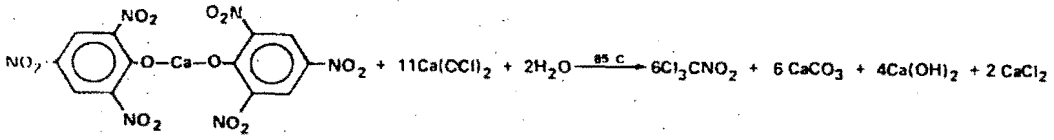


$$2 + 22\,Ca(OCl)_2 \longrightarrow 6Cl_3CNO_2 + 6CaCO_3 + 3Ca(OH)_2 + 13CaCl_2$$

- Romanian Method:

$$CH_3NO_2 + 3Cl_2 \xrightarrow{CuCl_2} Cl_3CNO_2 + 3HCl$$

- US Method:



- Other Methods:

Method A:

$$CHCl_3 + HNO_3 \longrightarrow Cl_3CNO_2 + H_2O$$

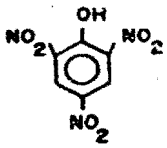
Method B:

$$ClCHCCl_2 + HNO_3 \longrightarrow Cl_3CNO_2 + HCHO$$

Method C:

$$Cl_3CCHO + HNO_3 \longrightarrow Cl_3CNO_2 + CO + H_2O$$

Method D:



$$+ 11Cl_2 + 5H_2O \xrightarrow{0-5°C} 3Cl_3CNO_2 + 3CO_2 + 13HCl$$

Note: 913158

Method E:

$$CH_3NO_2 + NaOCl + NaOH + 2Cl_2 \longrightarrow Cl_3CNO_2 + 2NaCl + 2H_2O$$

Method F:

$$CH_3NO_2 + 3NaOH + 3Cl_2 \longrightarrow Cl_3CNO_2 + 3NaCl + 3H_2O$$

i. (U) Physical and Chemical Properties.

- Odor: Intense stinging odor.
- Physical state and color: Colorless oily liquid.
- Boiling point: 112° C.
- Melting point: -69° C.
- Solubility: Soluble in organophosphorus compounds, mustards, Phosgene, Diphosgene, Chlorine, chloroform, carbon disulfide, benzene, and alcohol; insoluble in water.[11]
- Vapor density (relative to air): 5.6.
- Specific gravity (liq): 1.66.
- Volatility: 165,000 mg/m^3 at 20° C.
- Vapor pressure: 18.3 mm Hg at 20° C.

j. (U) Method of Dissemination. Aerial bombs, as a spray (alone or mixed with Phosgene), mixed with chloroacetophenone in artillery shells, mixed with 70% chlorine for cloud gas attacks (Yellow Star Gas).

k. (U) Use. In cloud gas attacks for harassment, terrain denial, and to produce casualties; in mixtures, as a riot control agent; and as an insecticide.

1. (U) Physiological Effect. Lacrimation and irritation of nose and throat; causes lung irritation as concentration increases; nausea and vomiting. Liquid Chloropicrin cause skin lesions.[11]

m. (U) Decontamination. Alcoholic or water solution of sodium sulfite.

n. (U) Protection Required. Protective masks.

o. (U) Storage. Stable for long periods in steel cylinders.

p. (U) Toxicity. Lowest irritant concentration for 10-min exposure is 9.0 mg-min/m^3. LCt_{50} by inhalation is 2000 mg-min/m^3.

q. (U) Persistence. Summer--1 hr in the open and 4 hr in the woods. Winter--12 hr in the open and 1 week in the woods.

r. (U) Historical.

- 1848: Discovered by English chemist, Stenhouse.
- 1916: Used by USSR, subsequently used by both Germans and Allies.

s. (U) Detection.[21]

(1) (C) Detectors.

- [redacted] (b)(1)
-
-

(2) (U) Chemical reactions. DB3-SO_3 Test--PS produces a red-purple color. Reaction is unknown.[21]

5. (C-NFD) CS

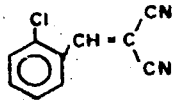
a. (U) Code or Alternate Designations.

- United States--EA 1779.
- United Kingdom--T 792.
- France--CB.[68]

b. (U) Class. Riot control--Lacrimator, sternutator.

c. (U) Chemical Name. Ortho-chlorobenzalmalononitrile.

d. (U) Formula. $C_{10}H_5ClN_2$



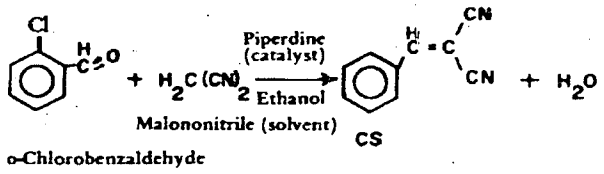
e. (U) Molecular Weight. 188.5.

f. (U) Alternate Chemical Name. o-Chlorobenzylidene malononitrile.

g. (U) Raw Materials.

- o-Chlorobenzaldehyde [$Cl(C_6H_4)CHO$].
- Malononitrile [$CH_2(CN)_2$].

h. (U) Method of Manufacture.[72]



i. (U) Physical and Chemical Properties.

- Odor: Pepper-like.
- Physical state and color: White crystalline powder.
- Boiling point: 310° to 315° C.
- Melting point: 93° to 96.5° C.
- Solubility: Soluble in hexane, methylene chloride; insoluble in water and ethanol.

- Specific gravity: 1.30.
- Volatility: 0.71 mg/m^3 at 25° C.[8]
- Heat of vaporization: 18.2 Kcal/mole.[69]
- Heat of sublimation: 25.6 Kcal/mole.
- Flash point: 197° C.
- Hydrolysis: Rate of hydrolysis is determined by rate of dissolution. Dissolved CS has a half-life of about 45 min. Solid CS in water hydrolyzes very slowly. Hydrolysis is fast in alkaline water containing detergents (half-life at pH 10 is less than 1 min).[69]

j. (U) Method of Dissemination.[6] Candles, aerosol cloud of finely divided particles, bursting and burning type grenades, vehicular and aircraft aerosol generators, aerial bomblets, mortar and artillery cartridges, or special cartridges fired from a pistol or riot gun.[6,8,57] CS can be disseminated in three forms: "CS", CS-1 and CS-2. "CS" is a pure crystalline material used in pyrotechnic munitions and is dispersed thermally to create an aerosol. CS-1 is a micropulverized mixture (particle diameter, 3 to 10 μ) of 96% raw CS and 4% silica aerogel. The aerogel reduces agglomeration. CS-2 consists of 93% to 96% micropulverized CS and 4% to 7% of a silicone-treated aerogel(silica-hexamethyldisilazane or hydrophobic-treated Cab-O-Sil). The silicone-treated aerogel prolongs the effectiveness of the agent in terrain-denial applications by preventing agglomeration, increasing flowability, and markedly increasing the agent's hydrophobicity. CS-1 and CS-2 are used in bursting-type munitions and bulk riot-control agent dispensers.[69]

k. (U) Use. CS, in its three forms, is used to control riots and mobs in major police actions. The agent is used to neutralize enemy forces when intermingled with civilians and nonlethal effects are desired. It is also used as a training agent.

l. (U) Physiological Effects. CS produces immediate effects even in low concentrations; "safe distance" and "no effect" concentrations of CS were given as 0.01 mg/m^3 and 0.004 mg/m^3, respectively.[70] The agent cloud causes severe burning sensation in the eyes with copious tears, coughing, difficulty in breathing, and tightness of the chest. The eyes close involuntarily, the nose runs, and there is a stinging sensation on moist skin, as well as dizziness or swimming of head. Heavy concentrations will

cause nausea and vomiting. Effects last 5 to 10 min after the affected individual is removed to fresh air. During this time, such personnel are incapable of effective action. Its rate of detoxification in the body is quite rapid.[8]

m. (U) Decontamination. Personnel should find fresh air, face the wind, and avoid rubbing the eyes. Area decontamination is not necessary. Personnel may shower after leaving the contaminated atmosphere but this action should be delayed for at least 6 hr if there is any particulate matter still on the skin, to avoid the stinging, itching, and reddening which could result from contact with water. A 1% sodium bicarbonate solution can be used to wash the eyes. A 10% monomethanolamine in water plus detergent or a 5% sodium bisulfite solution can be used as decontaminants.[6]

n. (U) Protection Required. Protective mask and ordinary field clothing fastened at neck, wrists, and ankles will give complete protection.

o. (U) Storage. Stable in storage; very slight action on steel.

p. (C-NFD) Toxicity. (b)(1)

(b)(1)

q. (U) Persistence. CS and CS-1 are nonpersistent. CS-2 is considered persistent.[71]

r. (U) Historical.

- 1928: Synthesized by B. B. Corson and R. W. Stoughton in United Kingdom.
- 1959: Designated United States Army standard riot control agent.

6. (C) Excelsior

a. (U) Code or Alternate Designations.

- United States--Excelsior.
- United Kingdom--Arsacridine.
- Germany--Excelsior, Ex.

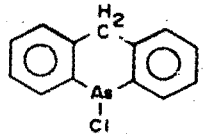
NO FOREIGN DISSEM

b. (U) Class. Riot control--lacrimator, sternutator.

c. (U) Chemical Name. 10-Chloro-9,10-dihydroarsacridine.

d. (U) Formula. $C_{13}H_{10}AsCl$

Neg. 513130



e. (U) Molecular Weight. 276.59.

f. (U) Alternate Chemical Names.

- 5-Chloro-5, 10-dihydroacridarsine.
- Arsacridine chloride.

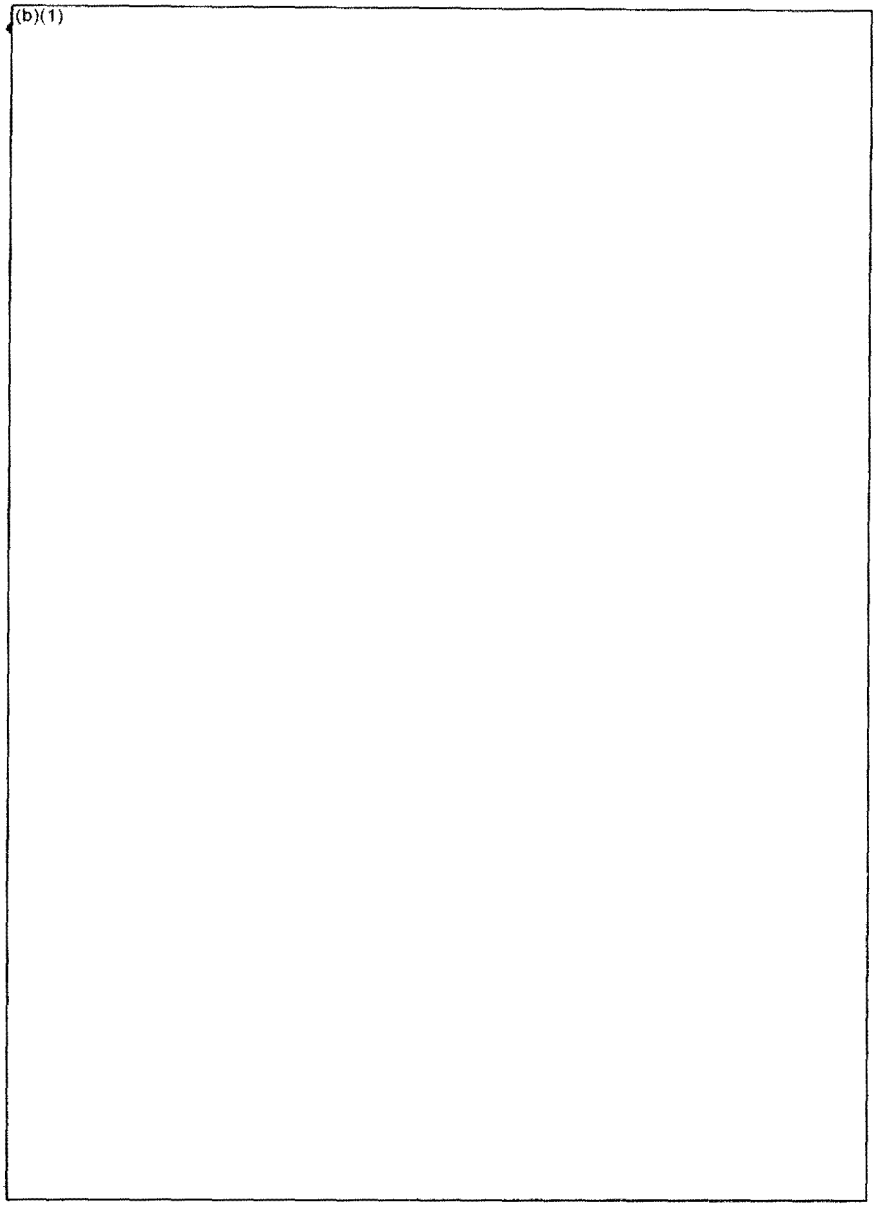
g. (~~C~~) Raw Materials.

(b)(1)

NO FOREIGN DISSEM

h. (C) Method of Manufacture.

(b)(1)



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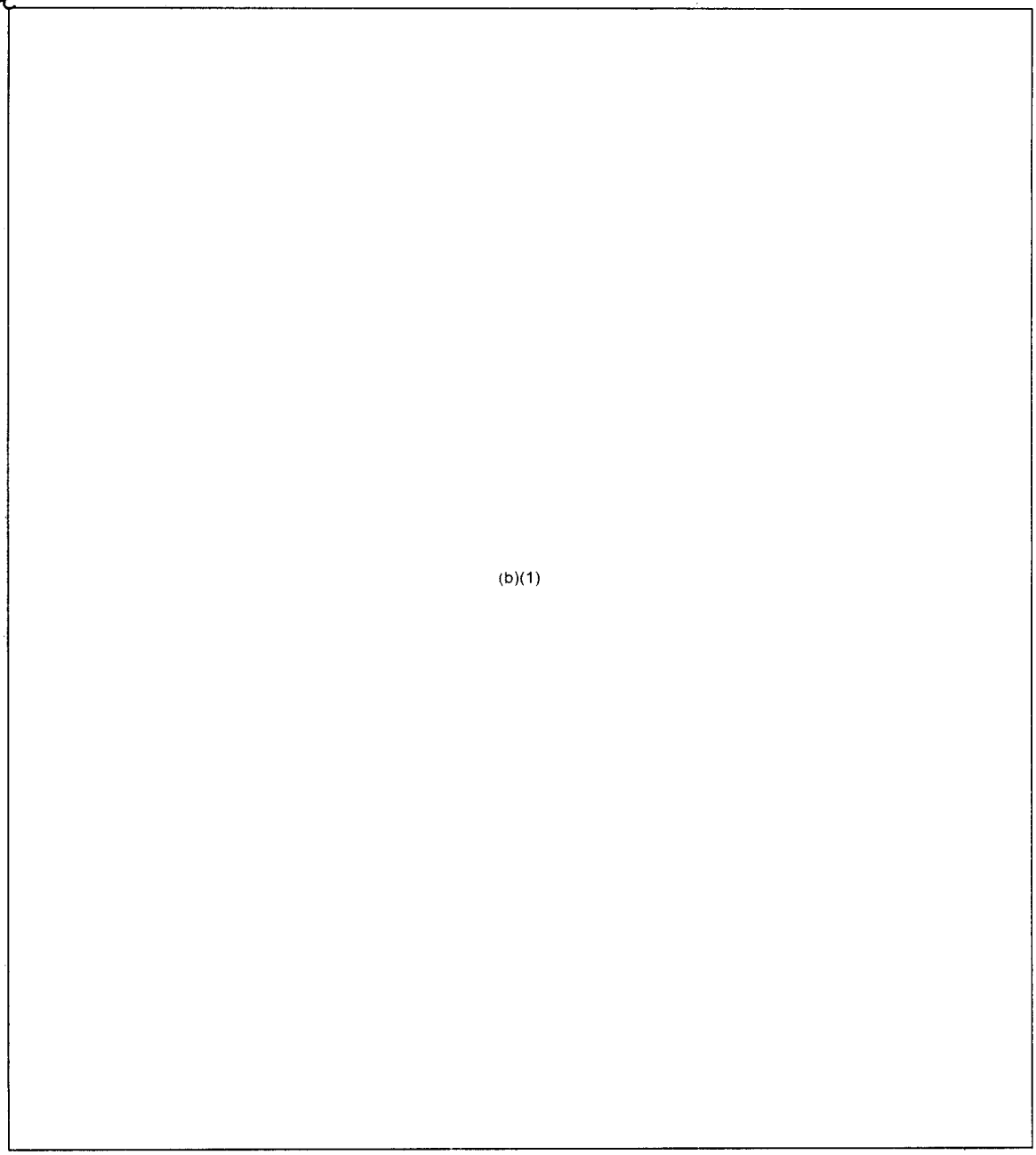


(b)(1)

i. (C) Physical and Chemical Properties.

- (b)(1)
- (b)(1)

i. (C) Method of Dissemination. (b)(1) (b)(1)

k. (U) Use. Riot control.

l. (C) Physiological Effect. (b)(1)

(b)(1)

m. (U) Decontamination. Caustic solutions.

n. (U) Protection Required. Protective mask.

o. (C) Storage. (b)(1) (b)(1)

p. (C) Toxicity. (b)(1) (b)(1)

q. (C) Historical. (b)(1)

7. ~~(C)~~ Experimental Agents

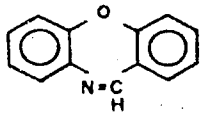
a. (C) EA 3547.

(1) (C) Code or alternate designations. (b)(1) (b)(1)

(2) (U) Class. Riot control agent.

(3) (U) Chemical name. Dibenz-(b,f)-1,4-oxazepine.

(4) (U) Formula. $C_{13}H_9NO$



(5) (U) Molecular weight. 122.17.[73]

(6) (C) Raw materials.[74]

- (b)(1)

(7) (C) Method of manufacture.[74]

(b)(1)

(8) (C) Physical and chemical properties.[73]

- (b)(1)

(9) (C) Use. (b)(1) (b)(1)

(10) (C) Physiological effects.[70,75-77] (b)(1)

(b)(1)

(11) (U) Decontamination. Not known.

(12) (C) Storage. (b)(1) (b)(1)

(13) (C) Toxicity. (b)(1) (b)(1)

b. (C) EA 4923.

(1) (U) Code or alternate designations. None.

(2) (U) Class. Riot control--irritant.

(3) (C) Chemical name. (b)(1)

(4) (C) Formula. (b)(1) (b)(1)

(5) (C) Molecular weight.

(6) (C) Physical and chemical properties.[73]

- (b)(1)

(7) (C) Use. (b)(1)

(8) (U) Physiological effects. Causes burning sensation in eyes, shortness of breath, and runny nose. Almost impossible to keep eyes open. Blurry vision and difficulty in focusing also results. Recovery occurs 12 min after being removed to fresh air.[73]

(9) (U) Decontamination. Not known.

(10) (C) Storage. (b)(1)

(b)(1)

(11) (U) Toxicity.[73,79,80]

(a) (U) By intravenous route, the LD_{50} in mice is greater than 20 mg/kg and the median effective dose (ED_{50}) is 1.8 mg/kg; the LD_{50} of a dog is five times greater than that of the mouse. The LCt_{50}'s for the rat and dog by the inhalation route are 184,000 and 63,000 mg-min/m^3, respectively.

(b) (U) The 1,3,7 isomers have been prepared and studied for their effects on rabbit's eyes (UK). The 1-isomer is a very strong irritant, but its effects are temporary and no adverse effects on the eye or tissue surrounding the eye are noticeable. The 3-isomer is non-irritating, but the 7-isomer produces permanent and irreversible damage to the eye (blindness) and to the tissue surrounding the eye.

Section VI.

VOMITING AGENTS

1. (U) General

a. Vomiting agents are used in combat operations as well as for mob and riot control. Under field conditions, vomiting agents cause great discomfort to their victims; when released indoors they may cause serious illness or death.

b. The act of vomiting is a complex series of movements which are controlled by a center located near the medulla.

2. (U) Adamsite

a. (U) Code or Alternate Designations.

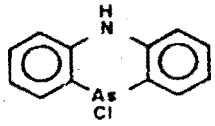
(b)(1)

(c)

b. (U) Class. Vomiting agent, lung irritant, sternutator.

c. (U) Chemical Name. 10-Chloro-5,10-dihydrophenarsazine.

d. (U) Formula. $C_{12}H_9AsClN$



e. (U) Molecular Weight. 277.57.

f. (U) Alternate Chemical Names.

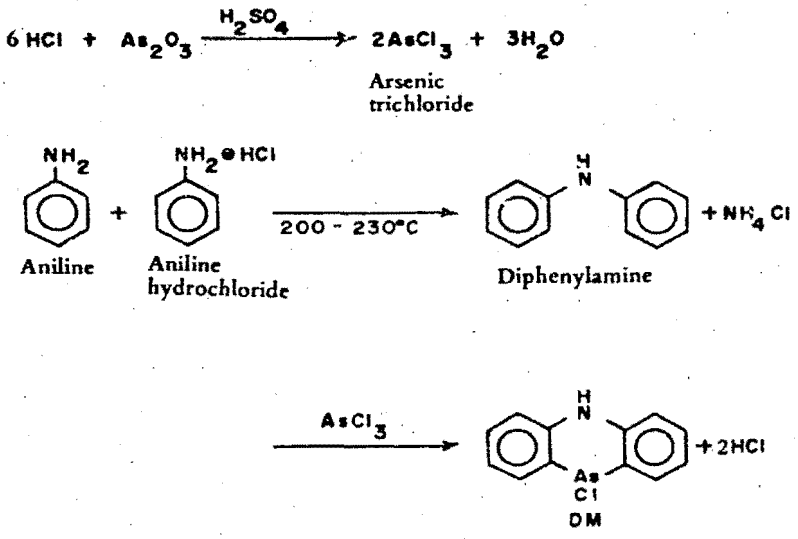
- Diphenylamine chloroarsine.
- Phenarsazine chloride.
- 5-Aza-10-arsenanthracene chloride.
- 10-Chloro-5,10-dihydroarsacridine.

g. (U) Raw Materials.

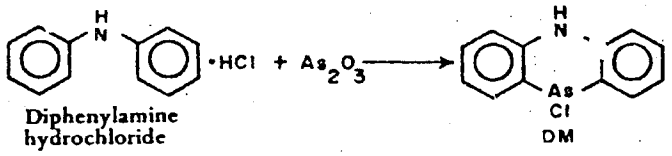
- Hydrochloric acid (HCl).
- Aniline hydrochloride ($C_6H_5NH_2 \cdot HCl$).
- Arsenious trioxide (As_2O_3).
- Diphenylamine hydrochloride [$(C_6H_5)_2NH \cdot HCl$].
- Aniline ($C_6H_5NH_2$).

h. (U) Method of Manufacture.

- US Method:



- Italian Method:



i. (U) Equipment. Large steam-jacketed kettle fitted with an agitator and reflux condenser.

j. (U) Physical and Chemical Properties.

- Odor: Faint aromatic.
- Color: Commercial (CW) grade, brownish green crystalline solid; pure, yellow crystalline solid.
- Boiling point: 410° C with decomposition.
- Melting point: 195° C.
- Solubility: Soluble in furfural and acetone; slightly soluble in common organic solvents; insoluble in water. Not readily soluble in any of the liquid CW agents.
- Specific gravity: 1.65.
- Volatility: 0.02 mg/m^3.
- Vapor pressure: Very low.
- Heat of vaporization: 54.8 cal/g.
- Hydrolysis: In aerosol form, hydrolyzes rapidly to diphenylarsenious oxide and HCl.

k. (U) Method of Dissemination. Candles, grenades.

l. (U) Use. DM is used to produce temporary casualties, or is mixed with Chloroacetophenone for use as a riot control agent and for military training purposes. DM and Chloroacetophenone also may be added to smoke mixtures to produce nauseating and lacrimatory effects.

m. (U) Physiological Effects. The first symptoms are a burning sensation in nose and throat, eye irritation, severe headache, violent sneezing, coughing, acute pain and tightness in the chest, nausea and vomiting. The symptoms appear more slowly, but last longer, than those of DA. (See Diphenylchloroarsine.) The rate of action is very high, and the effects may last up to 3 hr. In low doses, it is detoxified quite rapidly.[8]

n. (U) Decontamination.[6] Bleaching powder or DS-2 is used in enclosed areas. No decontaminant required in open fields.

o. (U) Protection Required. Protective mask.

p. (U) Storage. DM is stable in steel containers if pure. The agent corrodes iron, bronze, and brass.

q. (U) Toxicity. ICt_{50} is 22 mg-min/m^3 for 1 min. LCt_{50} is about 15,000 mg-min/m^3.

r. (U) Persistence. For candles, 10 min in the open for both summer and winter.

s. (U) Historical.

- 1915: Prepared by Weiland in Germany.
- 1918: Prepared independently by Adams in United States. Method of manufacture was greatly simplified and perfected by Contardi and Fernaroli in Italy.

t. (C) Detection.

(1) (C) Detectors.

(a) (C) USSR.[13] (b)(1) (b)(1) (b)(1)

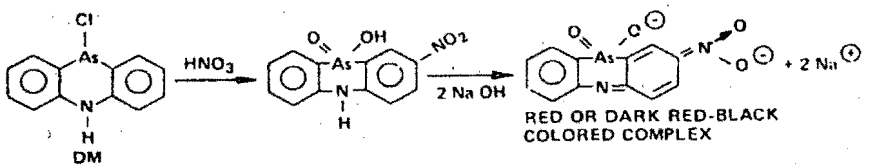
(b) (U) US.[12,21]

- DM test in M19 kit. Sensitivity, 0.2 mg/m^3.
- DBT-Benzene test in M19 kit. Sensitivity, 1.0 mg/m^3.

(c) (U) PRC.[81] Detector Kit, Model 1950? Two white band tube to produce a red color. Sensitivity, 0.1 mg/m^3.

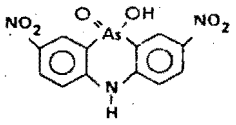
(2) (U) Chemical reactions.[21]

(a) (U) DM test.



RED OR DARK RED-BLACK COLORED COMPLEX

Note: In high concentrations of DM, a yellow color may be produced.



YELLOW COLORED COMPLEX

NcR. 513140

(b) (U) DBT-Benzene test--DM, as well as DA and DC, produces a tan, light orange-brown, or yellow-orange color. Chemical reaction is unknown.

Note--PD produces a pink-red color.

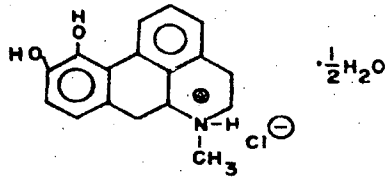
3. (U) Apomorphine Hydrochloride

a. Alternate Code or Designation. None.

b. Class. Vomiting agent.

c. Chemical Name. Apomorphinium chloride.

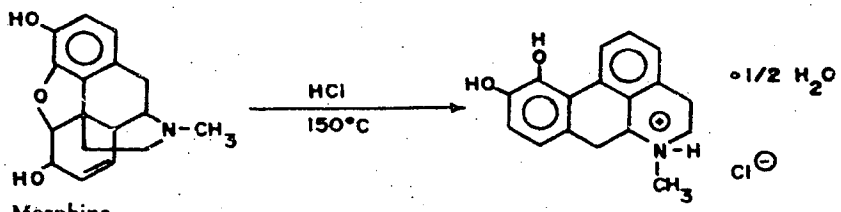
d. Formula. $C_{17}H_{17}NO_2 \cdot HCl \cdot \frac{1}{2} H_2O$



e. Molecular Weight. 312.80.

f. Raw Materials. Morphine, obtained from Papaver somniferum (opium poppy) by extraction.

g. Method of Manufacture.



Morphine

Apomorphine hydrochloride

h. Equipment. Standard chemical processing equipment.

i. Physical and Chemical Properties.

- Odor: Odorless.
- Physical state and color: White or grayish white crystals or powder, gradually acquires a green color on exposure to light and air.

- Melting point: 200° to 210° C.
- Solubility: Slightly soluble in water and alcohol (one gm dissolves in 50 ml of water or 50 ml of alcohol). Very slightly soluble in chloroform and ether.

j. Method of Dissemination. Aerosol.

k. Use. Incapacitating agent.

l. Physiological Effects. Its analgesic properties are diminished as compared with morphine; its emetic action is caused by a stimulating effect on the medulla. The agent may also cause considerable depression and excitation.

m. Protection Required. Protective mask.

n. Storage. Store away from light and air.

o. Toxicity. Subcutaneous doses of 6 to 7 mg will cause emesis. The latent period after subcutaneous injection is 3 to 10 min. It is also effective when inhaled as an aerosol. Doses over 100 mg/man may be fatal.[4]

4. (U) Diphenyl Chloroarsine

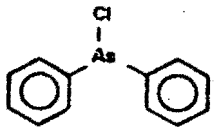
a. Code or Alternate Designations.

- United States--DA.
- United Kingdom--DA.
- Germany--Clark I.
- USSR--DIK, Klark-1.

b. Class. Vomiting agent, lung irritant, sternutator.

c. Chemical Name. Diphenyl chloroarsine.

d. Formula. $(C_6H_5)_2AsCl$.



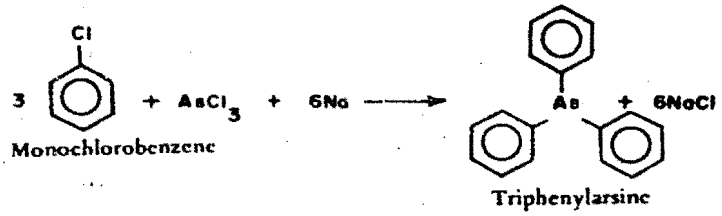
e. Molecular Weight. 264.5.

f. Raw Materials.

- Monochlorobenzene (C_6H_5Cl).
- Hydrochloric acid (HCl).
- Arsenic trichloride ($AsCl_3$).
- Sodium arsenite (Na_3AsO_3).
- Sodium (Na).
- Sodium hydroxide (NaOH).
- Aniline ($C_6H_5NH_2$).
- Sulfur dioxide (SO_2).
- Nitrous acid (HNO_2).

g. Methods of Manufacture.

- US Method:

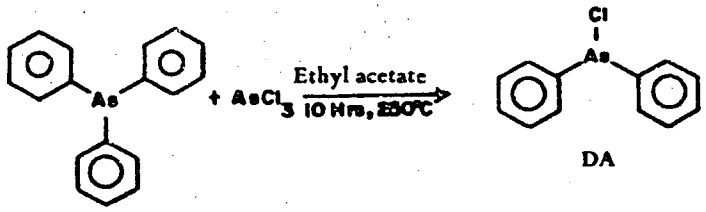


Monochlorobenzene

Triphenylarsine

Original

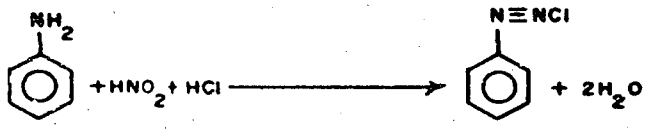
ST-HB-03-18-74



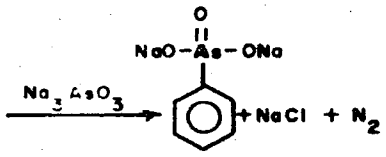
DA

Neg. 513145

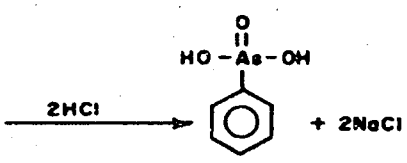
- German Method:



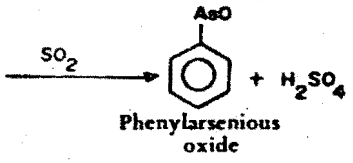
Benzene-diazonium chloride



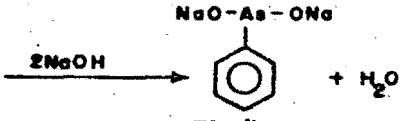
Disodium phenyl arsenite



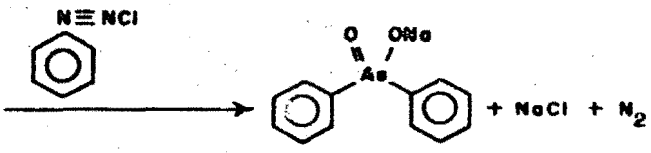
Phenylarsonic acid



Phenylarsenious oxide

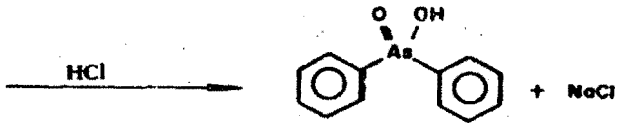


Disodium phenylarsenic oxide

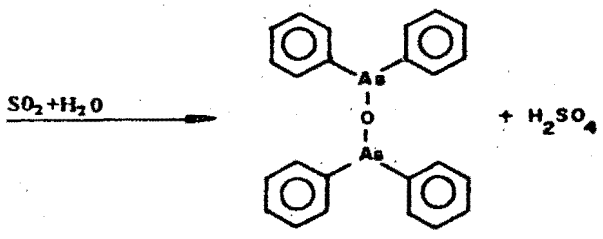


Sodium oxydiphenylarsenious oxide

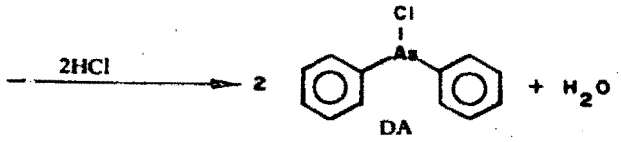
Neg. 513146



Diphenylarsenious oxide



Bis-diphenylarsenious oxide



h. Physical and Chemical Properties.

- Odor: None.
- Physical state and color: White crystalline solid; crude material may be liquid.
- Boiling point: 383° C with decomposition.
- Melting point: 39° to 40° C.
- Solubility: Soluble in acetone, ethanol, chloroform and Chloropicrin; insoluble in water.
- Specific gravity: 1.4.
- Vapor pressure: 0.0016 mm Hg at 20° C.[8]
- Volatility: 7.2 mg/m at 20° C.[8]
- Hydrolysis: Decomposes in water.

i. Method of Dissemination. Burning-type munitions (grenades and candles).

j. Use. Training and riot control purposes, and as a toxic smoke for harassment of enemy troops.

k. Physiological Effect. In minimum concentrations, DA causes great irritation to upper respiratory tract, sensitive peripheral nerves, eyes, and skin. When present in stronger concentrations, or inhaled in weaker concentrations for a long time, the agent attacks the deeper respiratory passages. DA causes a tickling sensation in the nose, followed by sneezing, with a flow of viscous mucous; irritation spreads down throat, and coughing and choking ensues. Headache, especially in the forehead, increases in intensity until it becomes almost unbearable; also, there is a feeling of pressure in the ears and pains in the jaws, teeth, and chest, shortness of

breath, and nausea with vomiting. The victim has an unsteady gait, dizziness, weakness in the legs, and a trembling all over the body. The effects appear in about 3 or 4 min after exposure to the agent. After 15 min in uncontaminated air, symptoms gradually disappear and recovery generally is complete in from 1 to 2 hr.

l. Decontamination.[6] Caustic solutions, DS-2 are used in enclosed spaces. No decontaminant is required in field.

m. Protection Required. Protective mask.

n. Storage. Agent DA decomposes slowly, but is quite stable when pure. The agent is very corrosive to steel.

o. Toxicity. ID_{50} for a 10-min exposure is 12 mg-min/m^3; LCt_{50} by inhalation of aerosol is 15,000 mg-min/m^3.

p. Persistence. For both summer and winter, 5 min by HE detonation and 10 min by candle dissemination.

q. Historical.

- 1881: Discovered by Michaelis and La Coste.
- 1918: Used by Germans in artillery shells (14 million were loaded; found to be ineffective). Solutions gave poor dispersions. When DA is mixed with high explosives, the explosion compresses the particles rather than blowing them apart. Allies later showed it could be dispersed effectively as a toxic smoke.

r. Detection. US--DBT-Benzene test in M19 kit to produce a tan, light brown or yellow-orange color. Reaction is unknown.[21]

5. (U) Diphenyl Cyanoarsine

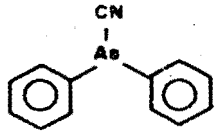
a. Code or Alternate Designations.

- United States--DC, CDA.
- United Kingdom--DC.
- Germany--Clark II.

b. Class. Vomiting agent, lung irritant, sternutator.

c. Chemical Name. Diphenyl cyanoarsine.

d. Formula. $(C_6H_5)_2AsCN$



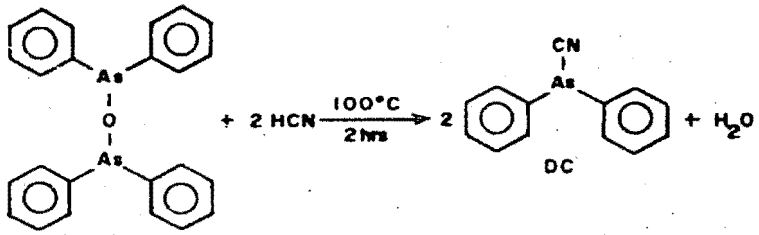
e. Molecular Weight. 255.0.

f. Raw Materials.

- Diphenylarsenious oxide $[((C_6H_5)_2As)_2O]$.
- Silver cyanide (AgCN).
- Hydrocyanic acid (HCN).
- Mercury cyanide (HgCN).
- Diphenyl chloroarsine $[(C_6H_5)_2AsCl]$.
- Potassium cyanide (KCN).
- Diphenylarsenious sulfide $[((C_6H_5)_2As)_2S]$.

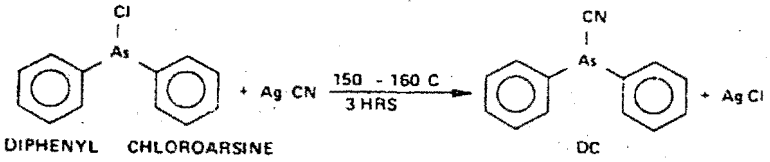
g. Method of Manufacture.

- Method A:

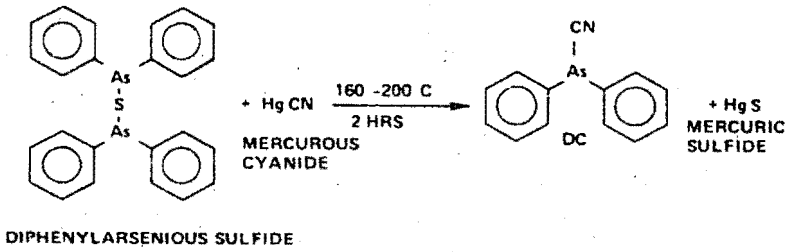


Diphenylarsenious oxide

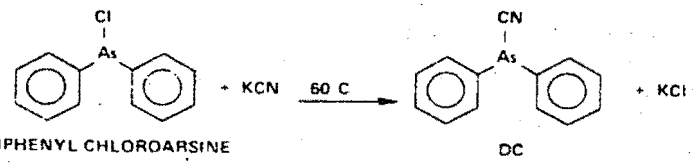
- Method B:



- Method C:



- German Method:



h. Physical and Chemical Properties.

- Odor: Garlic and bitter almonds.
- Physical state and color: Colorless crystalline solid.
- Boiling point: 290° C.

- Melting point: 31.5° C.
- Solubility: Soluble in chloroform and other organic solvents; insoluble in water.
- Vapor density (relative to air): 8.8.
- Specific gravity: 1.45.
- Heat of vaporization: 79.3 cal/g.[8]
- Vapor pressure: 4.7×10^{-5} mm Hg at 20° C.[8]
- Hydrolysis: Hydrolyzes slowly to hydrogen cyanide and diphenylarsenious oxide.[8]

i. Methods of Dissemination. Grenades, smoke candles.

j. Use. For general harassment of troops, and for training and riot control purposes.

k. Physiological Effects. DC causes irritation of eyes, running nose, sneezing, coughing, severe headache, acute pain in chest, nausea and vomiting. For moderate concentrations, its effects last about 30 min after individual leaves contaminated atmosphere; at higher concentrations, its effects may last up to several hr. It is rapidly detoxified in the body.[8]

l. Decontamination.[6] DS-2, caustic solutions (sodium hyroxide, sodium carbonate, sodium bicarbonate, or ammonia). No decontaminants are required in the field.

m. Protection Required. Protective mask.

n. Storage. DC is stable at all ordinary temperatures, but very corrosive on iron and steel.

o. Toxicity.[5] ID_{50} is 30 mg-min/m^3 for 30 sec exposure and 20 mg-min/m^3 for 5 min exposure. LCt_{50} is 10,000 mg-min/m^3; it is almost impossible to build up a lethal concentration in a practicable length of time.

p. Persistence. For both summer and winter, 5 min by HE detonation and 10 min by candle dissemination.

q. Historical.

- First prepared by Sturniolo and Bellinzone in Italy.
- 1918: Developed and adapted by Germans as an improvement over DA. (Physiologically more active than DA.) Considered the strongest of all irritant compounds used in World War I.

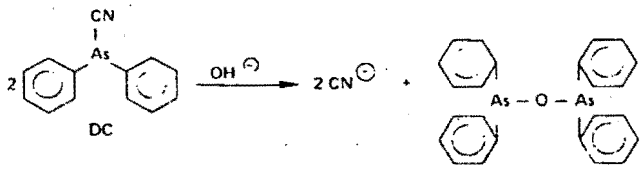
r. Detection.

(1) US Detectors.[12,21]

- White band sampling tube (Pyrazolone test using appropriate reagents) in M19 kit.
- Red band tube (Tetra-Base test) in M19 kit. Minimum detectable range, 0.1 to 10 mg/m^3.
- Prussian Blue test in M19 kit. Sensitivity, about 40 mg/m^3.
- DBT-Benzene test in M19 kit. Sensitivity, about 1 mg/m^3.

(2) Chemical reactions.[21]

- Prussian Blue test (for cyanide ion).



For the reaction of cyanide ion in the Prussian Blue Test, see AC.

- Pyrazolone test--DC produces a red-purple color. See AC for chemical reaction.

- Tetra-Base test--As it decomposes, DC produces a light to deep blue color. See AC for chemical reaction.

- DBT-Benzene test--DC produces a tan, light orange-brown, or yellow-orange color. Chemical reaction is unknown.

Section VII.

INCAPACITANTS

1. (U) General

a. (U) In recent years, a new concept of chemical warfare has developed which proposes the use of agents that are incapacitating rather than lethal for certain military operations. The advantage of the incapacitating agent lies in its ability to inactivate both civilian and military personnel for a relatively short period of time with very few, if any, fatalities. In areas with friendly populations, the use of these agents may prove advantageous.

b. (U) Incapacitating agents must fill the basic requirements common to all chemical agents: reasonable cost of manufacture from readily available materials; a high degree of stability in storage as well as during and after dissemination; routes of entry into the body that are compatible with present delivery systems; a relatively short time interval between exposure to the agent and the onset of desired effects. In addition, the difference between the effective and lethal doses of an agent must be wide enough to guarantee the spontaneous recovery of the victims with no after effects, and the agent must cause a disability that is visible to the eye and predictable.

c. (U) The incapacitant may be distinguished from the irritant (riot control agent) by its delayed onset of symptoms and its persistence for a period greatly exceeding that of exposure. Most of the incapacitating agents may be categorized according to their ability to alter or disrupt the nervous system:

(1) (U) Psychochemicals. These compounds (usually indole, tryptamine, or piperidine derivatives) may be described as psychotropic, psychotogenic, psychotomimetic, or hallucinogenic. The effects produced may include visual and aural hallucinations; a sense of unreality; and changes in mood, behavior, performance, memory, attitude, concentration, perception, and thought processes. Representative agents of this group are BZ, Benactyzine, and Lysergic Acid Diethylamide.

(2) (U) Paralyzants. Agents that interrupt nerve impulse transmission at the skeletal neuromuscular junction (for example, curare) and those that block transmission in autonomic ganglia (for example, hexamethonium) are found in this group.

d. (U) Some physical irritants may be considered as incapacitants. Representative of this group are the active principles of poison ivy which produce a delayed onset of symptoms with a persistent effect.

e. (U) (b)(1)

(b)(1)

2. (U) Benactyzine

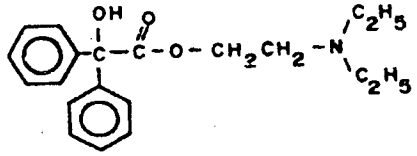
a. Code or Alternate Designations.

- United States--WIN 5606, Suavitil, Phobex.
- United Kingdom--Lucidil, Nutinal, Suavitil.
- France--Parasan.
- Sweden--Suavitil.
- Italy--Beatilina.
- USSR--IEM-22, Amizyl, Diazyl.
- Romania--Nervatil.

b. Class. Incapacitating agent.

c. Chemical Name. 2-Diethylaminoethyl benzilate.

d. Formula. $C_{20}H_{25}NO_3$



Neg. 513153

e. Molecular Weight. 327.4.

f. Alternate Chemical Names.

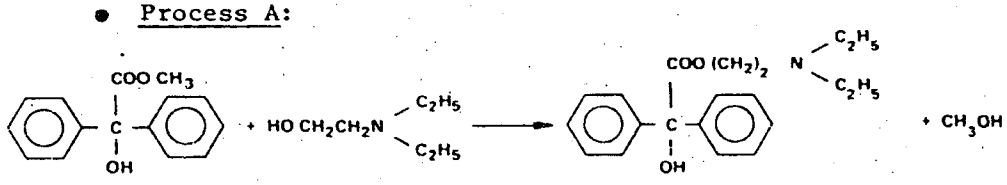
- Benzilic acid β-diethylaminoethyl ester.
- β-Diethylaminoethyl benzilate.
- 2-Diethylaminoethyl diphenylglycolate.

g. Raw Materials.

- 2-Diethylaminoethanol ($C_6H_{15}NO$).
- Benzilic acid ($C_{14}H_{12}O_3$).
- β-Chloroethyl-N,N-diethylamine ($C_6H_{14}ClN$).

h. Method of Manufacture.[12]

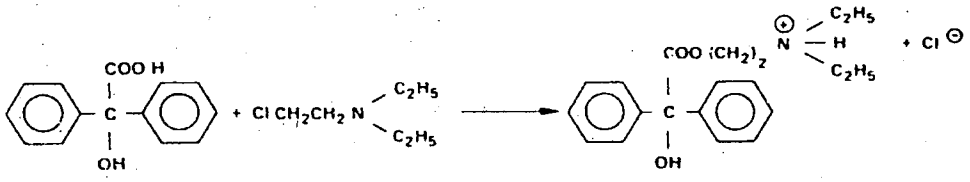
- Process A:



METHYL BENZILATE 2-DIETHLAMINOETHANOL BENACTYZINE

Neg. 513164

- Process B:



BENZILIC ACID β - CHLOROETHYL - N, N - DIETHYLAMINE BENACTYZINE HYDROCHLORIDE

Neg. 513165

i. Equipment. Standard chemical processing equipment.

j. Physical and Chemical Properties.

- Physical state and color: Hydrochloride is a white crystalline solid.

- Boiling point: 149° to 151° C at 0.01 mm Hg.
- Melting point: 51° C. Hydrochloride: 177° to 178° C.[3]
- Solubility: Hydrochloride is soluble in water (14.9 g per 100 ml at 25° C) and in alcohol; very slightly soluble in ether.[3]

k. Use. Incapacitating agent; medically, as a tranquilizer, sedative, hypnotic, antispasmodic, antihistamine, anesthetic.

l. Physiological Effects. Benactyzine, a cholinergic blocking agent, depresses function of subcortical formation and affects muscarine-cholinoreactive structures. Conditioned reflexes are disrupted to cause optical hallucinations, confused speech and incoherent thinking. Other symptoms are agitation, ataxia, blurred consciousness and partial amnesia of single events.

m. Toxicity (in man). An oral dose of 8 mg causes lassitude, sleepiness, and apathy. A 40 to 70 mg dose produces the psychotic effects within 15 to 20 min after intake. Psychosis reaches maximum after 2 to 3 hr and the effects last for 5 to 6 hr. Doses up to 90 mg may be given without fatalities.

n. Historical.

- 1936: Patented by Swiss Firm "CIBA."
- 1938: Horenstein and Pahlacke in Germany.
- 1946: US pat. 2,394,770, Hill and Holmes (American Cyanamide).

3. ~~(C)~~ BZ

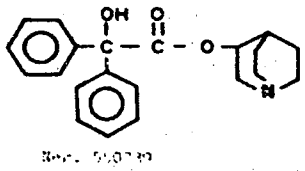
a. (C) Code or Alternate Designations.

- (b)(1) (C)
-

b. (U) Class. Incapacitating agent.

c. (U) Chemical name. 3-Quinuclidinyl benzilate.

d. (U) Formula. $C_{12}H_{23}NO_3$



e. (U) Molecular Weight. 337.41.

f. (C) Raw Materials.

- (b)(1)

g. (C) Method of Manufacture.[2]

(b)(1)

ST-HB-03-18-74

Original

(b)(1)

h. (U) Equipment. Standard chemical processing equipment.

i. (C) Physical and Chemical Properties.

(b)(1)

j. (C) Method of Dissemination. (b)(1)

(b)(1)

k. (U) Use. Incapacitating agent. Its principal drawback is the unpredictability of its effects on troops in the field.

l. (C) Physiological Effects. (b)(1)

(b)(1)

m. (C) Therapy. (b)(1)

(b)(1)

n. (U) Decontamination.[6] Hot soapy water.

o. (U) Protection Required. Gas mask against inhalation.

p. (C) Storage. (b)(1)

(b)(1)

q. (U) Persistence. Persistent.

r. (C) Toxicity.[4]

(1) (C) (b)(1)

(b)(1)

(2) (C) (b)(1)

(b)(1)

s. (C) Historical. (b)(1)

(b)(1)

t. (U) Detection.

(1) (C) US detectors.[12 21]

- (b)(1)

(2) (C)

-

(b)(1)

4. (U) Lysergic Acid Diethylamide

a. Code or Alternate Designations.

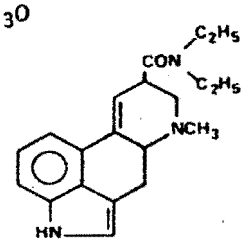
- LSD.
- LDS-25 (tartrate salt).
- Delysid.
- United States — EA 1729.

b. Class. Incapacitating agent.

c. Chemical Names.

- D-Lysergic acid diethylamide.
- 9,10-Didehydro-N,N-diethyl-6-methylergoline-8β-carboxamide.

d. Formula. $C_{20}H_{25}N_3O$



D-LYSERGIC ACID DIETHYLAMIDE

e. Molecular Weight. 323.42.

f. Raw Materials.

(1) Natural Source: Lysergic acid ($C_{16}H_{16}N_2O_2$) from ergot.

(2) Synthesis:

- N-Benzoyl-3-(β-carboxyethyl)-dihydroindole ($C_{18}H_{17}NO_3$).
- Thionyl chloride ($SOCl_2$).
- Diazomethane (CH_2N_2).
- Aluminum chloride ($AlCl_3$).
- Hydrazine (N_2H_4).
- Bromine (Br).
- Nitrous acid (HNO_2).
- Sodium methoxide ($NaOCH_3$).
- Diethylamine $(C_2H_5)_2NH$.
- Sodium brominehydride (NaBrH).
- Trifluoroacetate anhydride $(CF_3CO)_2O$.
- Sodium cyanide (NaCN).
- Sulfur trioxide (SO_3).
- Methanol (CH_3OH).

Original

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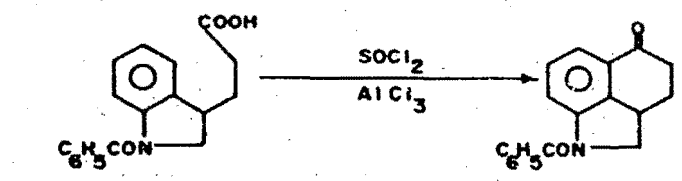
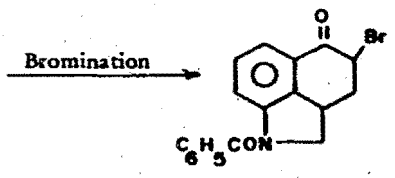
g. Method of Synthesis. [1] [2]

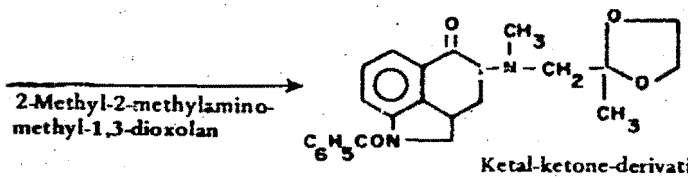


N-Benzoyl-3-(β-carboxyethyl) dihydroindole

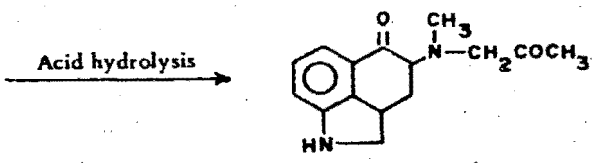
N-Benzoyl-5-keto-1,2,2a,3,4,5-hexahydrobenzindole



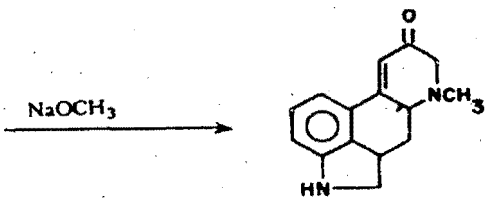
4-Bromo-derivative



Ketal-ketone-derivative

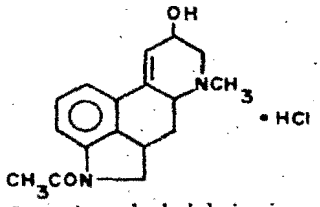


Diketone derivative



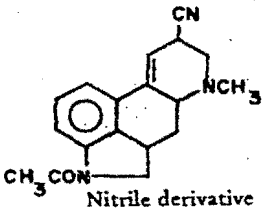
Tetracyclic ketone derivative

Acetylation
then reduction
with NaBrH



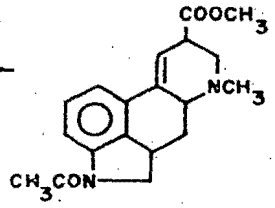
Secondary alcohol derivative

$SOCl_2$ in liquid S
then NaCN in
liquid HCN



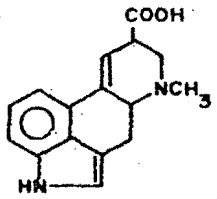
Nitrile derivative

CH_3OH



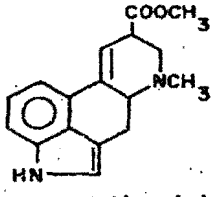
Methyl ester derivative

Alkaline hydrolysis
then dehydrogenation
with inactivated
Raney nickel



DL-Lysergic acid

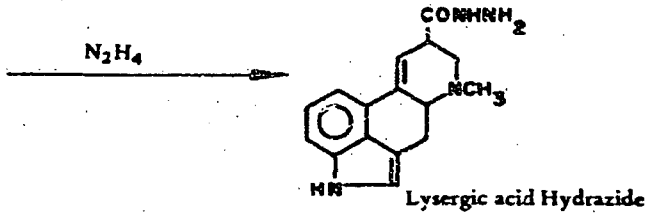
CH_2N_2
Esterification



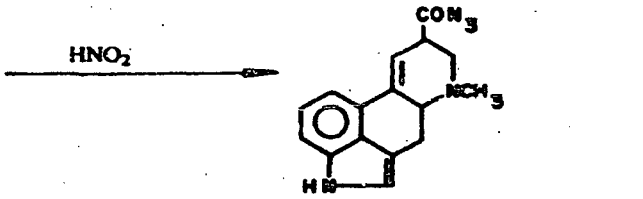
Lysergic acid methyl ester

Original

ST-HB-03-18-74

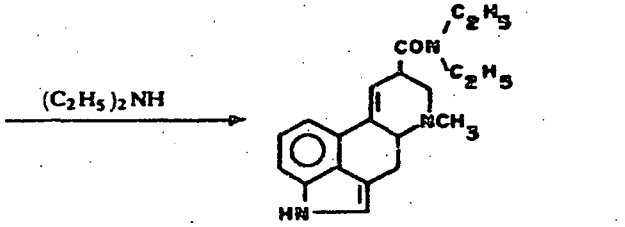


Lysergic acid Hydrazide



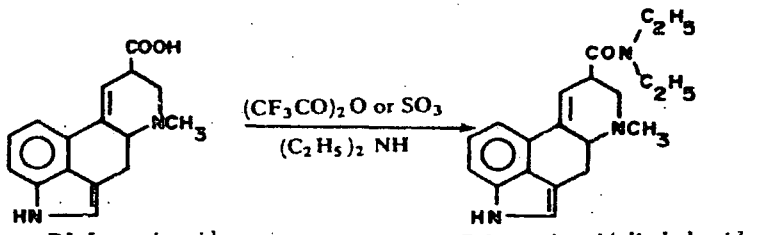
Lysergic acid Azide

Ser. 513158



D-Lysergic acid diethylamide

Alternate route on conversion of Lysergic Acid to LSD:



DL-Lysergic acid

D-Lysergic acid diethylamide

Ser. 513159

h. Equipment. Standard chemical processing equipment.

i. Physical and Chemical Properties.

- Physical state and color: Crystalline colorless solid.
- Melting point: 80° to 85° C, with decomposition.[11]
- Solubility: Insoluble in water; its salt (for example, tartrate) is soluble in water.

j. Methods of Dissemination. Aerosols, ingestion with food and water.

k. Use. Incapacitating agent.

l. Physiological Effects. Aerosols are absorbed rapidly through the mucous membrane. The same amount of LSD gives same reaction by oral or inhalation routes, but by inhalation, onset of symptoms is faster and the ion, shorter. The onset of symptoms also increases with the dos with larger doses intensifying and prolonging the effects. LSD causes disturbed visual perception, distortion of shapes and objects, hallucinations of color and geometric patterns as well as sound; and difficulty in concentration, making decisions, and communication. There is also a loss of time sense, dulling of senses of taste, smell, and touch. Reactions range from tenseness to panic and from friendliness to aggressiveness. Ingestion by normal human subjects produces temporary psychic changes simulating a schizophrenic state alternating between euphoria and depression, and including illusions and hallucinations, withdrawal from reality, and a sense of "lightness." A dose becomes effective in 5 to 10 min, and effects may last from 4 hr to several days. Insomnia may last 16 hr.

m. Therapy. Chlorpromazine; Frenquel (4-piperidylbenzhydrol), dibenzylamine, or barbiturates (Amytal).

n. Decontamination. Unknown.

o. Protection Required. Gas mask for protection against aerosol inhalation.

p. Storage. Stable in crystalline dry form; water solutions are stabilized with tartaric acid.

q. Persistence. Persistent.

r. Toxicity. There is a very wide margin of safety between incapacitating and lethal doses. ICt_{50} is 55 mg-min/m^3 with an inhalation rate of 15 liters/min for a 70-kg man. The effective oral dose is 1 µg/kg or about 70 µg/man.

s. History.

- 1943: Partial synthesis by Stoll and Hofmann.
- 1956: US pat. 2,736,728, Pioch (Eli Lilly & Co.).
- 1956: US pat. 2,774,763, Garbrecht (Eli Lilly & Co.).
- 1964: US pat. 3,141,887, Patelli, Bernardi (Farmitalia).

t. Detection. Unknown.

5. (U) Sernyl

a. (U) Code or Alternate Designations.

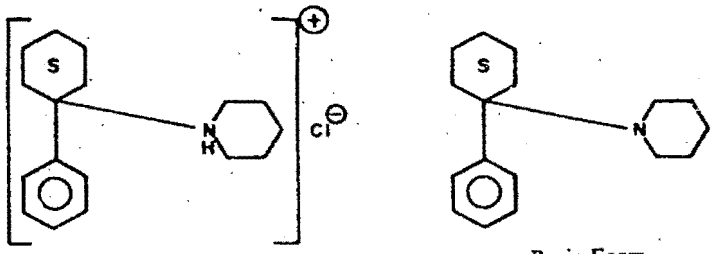
- (b)(1)

b. (U) Class. Incapacitating agent.

c. (U) Chemical Names.

- 1-Phenyl-1-piperidylcyclohexane hydrochloride (Acidic form)
- 1-Phenyl-1-piperidylcyclohexane (Basic form).

d. (U) Formula. Acidic form - $C_{17}H_{26}ClN$. Basic form - $C_{17}H_{25}N$.



Acidic Form Basic Form

e. (U) Molecular Weight.

- Acidic form — 279.66.
- Basic form — 243.20.

f. (U) Alternate Chemical Names.

- Phencyclidine hydrochloride (Acidic form).
- Phencyclidine (Basic form).

g. (U) Raw Materials and Method of Manufacture. Commercial process, not divulged by manufacturer.

h. (U) Equipment. Standard chemical processing equipment.

i. (U) Physical and Chemical Properties of Acid Form.

- Physical state and color: White or colorless crystalline powder.
- Melting point: 220° to 226° C with decomposition.
- Solubility: Soluble in water, alcohol, aniline, cresol, and methylene chloride; insoluble in ether, cyclohexane, toluene, and acetone.
- Vapor pressure: Less than 0.5 μ at 60° C.

j. (U) Physical and Chemical Properties of Basic Form.

- Physical state and color: White or colorless crystalline powder.

- Boiling point: 340° C.
- Melting point: 46.3° C.
- Solubility: Soluble in lipids, toluene, methanol, methylene choloride, and other organic solvents; insoluble in water.

k. (U) Method of Dissemination. Liquid splashed in eyes or on skin, ingestion with food or water, aerosols.

l. (U) Use. Incapacitant; originally developed as an anesthetic.

m. (U) Physiological Effects.

(1) (C) (b)(1)

(b)(1)

(2) (U) By the oral route, a 5 to 10 mg dose brings on effects similar to alcohol intoxication. Distance vision is blurred and the subjects give the impression that they are unable to think and that time is standing still. A 10 mg dose brings on vertigo and ataxia. The effects after a 5 mg dose last about 8 hr and for a 10 mg dose about 13 to 14 hr, with the peak occurring 2 to 4 hr after ingestion.

(3) (U) Intravenous injection of Sernyl results in mydriasis, ataxia, weakness, prostration, tonic and clonic convulsions, and death if the dose is large enough. A 0.1 mg/kg dose produces a "don't care" attitude. A dose of 0.25 mg/kg brings on anesthesia for 5 hr; subjects exhibit hallucinations, and even mania, upon emergence from the anesthesia. A 10 mg dose causes hallucinations, marked agitation, and maniacal excitement. For a 10 to 15 mg dose, catatonic stupor with cessation of reaction to painful stimuli results. The duration of these effects is dependent on age. In older subjects, both male and female, the effects last 1 to 2 hr and gradually disappear, leaving the subjects pain free and in a state of euphoria. In males, the stupor is followed in 15 to 20 min by noisy, restless, and violent delirium which, in some cases, requires forceful restraint for periods of up to 3 hr. Some complain of distorted vision and unpleasant hallucinations. The females are usually in a happily drunken state and require no restraint. A state of amnesia lasts for 3 to 4 hr after injection.

(4) (C) (b)(1)

(b)(1)

n. (U) Therapy. Unknown.

o. (U) Protection Required. Protective mask against aerosols and eye contamination.

p. (C) Storage. (b)(1)

(b)(1)

q. (U) Persistence. Persistent.

r. (C) Toxicity. (b)(1)

(b)(1)

s. (U) History.

- 1960: Brit. pat. 836,083 (Parke, Davis & Co.).
- 1963: US pat. 3,097,136 (Parke, Davis & Co.).

6. (C) Experimental Agents (Glycolates)[30,84-86,126]

(b)(1)

b. Chemical Name, Formula, and Molecular Weight.

(b)(1)

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Original

(b)(1)

c. Physical and Chemical Properties.[30,84-86]

(b)(1)

* A=the hydrochloride, B=the free base.
** A melting point of 68° to 70° C was determined for a highly purified sample of EA 3580B. This is an unconfirmed observation.

(CONFIDENTIAL)

d. Toxicities and Physiological Data*. 30,84-87

a

(b)(1)

a

e. Therapy. (b)(1)

(b)(1)

(b)(1)

Section VIII.

AGENT MIXTURES

1. (U) General

Chemical warfare agents are mixed in order to change certain properties--such as boiling point, freezing point, volatility, viscosity, stability, toxicity, aerosol characteristics--and for greater effectiveness.

2. (C) HT

(b)(1)

3. (C) HQ

(b)(1)

4. (C) HL

(b)(1)

a. (U) Properties of HL Mixture (37:63). The ratio of H and L may be varied to obtain desired properties. A mixture of 37% H and 63% L gave the lowest possible freezing point for use in cold weather operations or as a high altitude spray. This HL mixture freezes at -14° C. At 20° C, the mixture has a vapor pressure of 0.248 mm Hg and a volatility of 2,730 mg/m^3. It has a satisfactory storage stability in lacquered steel containers. The LCt_{50} of HL is about 1500 $mg\text{-}min/m^3$ by inhalation and above 10,000 $mg\text{-}min/m^3$ by skin absorption; the ICt_{50} is about 200 $mg\text{-}min/m^3$ (eye injury) and 1500 to 2000 $mg\text{-}min/m^3$ (skin absorption).[8]

b. (C) (b)(1)

(b)(1)

*See Appendix IV.

(b)(1)

5. (C) GB-Phosgene Oxime-Kerosene

(b)(1)

6. (C) GB-VE

(b)(1)

7. (C) GA-Phosgene Oxime

(b)(1)

8. (U) CNS[8]

CNS, containing 23% Chloroacetophenone, 38.4% Chloropicrin, and 38.4% of chloroform; acts as a vomiting agent, a choking agent, and a tear agent. It also may cause nausea, colic, and diarrhea. The lacrimatory effects of CNS are no greater than CN in chloroform. The mixture has a vapor density (compared with air) of about 5.0, a specific gravity of 1.47 at 20° C, and a volatility of 100,000 mg/m at 20° C. CNS has an LCt_{50} of 11,400 mg-min/m^3 and an ICt_{50} of 60 mg-min/m^3.

9. (U) CNB

CNB is a mixture of CN, carbon tetrachloride, and benzene (10:45:45). It has been replaced by CNS. Since this mixture has a lower concentration of CN than CNS, it is a more satisfactory training agent. The mixture has a vapor density (compared with air) of about 4 and a specific gravity of 1.14 at 20° C. It is a powerful lacrimator.[8]

10. (C) Experimental Agent Mixtures

(b)(1)

(b)(1)

b. (U) Thickened Agents. Various polymeric materials, such as the methacrylic resins, have been suggested as thickeners to improve the dissemination characteristics of CW agents.[11]

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Section IX.

PLANT AND ANIMAL POISONS

1. (U) General

a. The study of naturally occurring poisons as possible CW agents has attracted considerable attention since World War II. Among the natural poisons can be found substances with extremely potent lethal and incapacitating properties. Much of the research and development in this field has been devoted to the medical and public health aspects of poisoning. For the same reasons and because of the potential usefulness of natural poisons in a CW-agent program, the military establishments in many countries also have developed a strong interest in these substances.

b. Some natural poisons are far more lethal, by several orders of magnitude, than any of the current array of synthetic CW agents, and some natural poisons can be utilized effectively as incapacitants.

c. Toxins sometimes refer to any poisonous material derived from a living organism. In this text, the toxins will be considered as a specific class of poisons that are distinct by virtue of their proteinaceous nature, high molecular weight, and usually, antigenicity. The products from natural sources will include the toad poisons, bacterial toxins, marine poisons, and plant alkaloids as well as snake and insect venoms. Toxicity data on many natural poisons are given in Appendix II. The term "alkaloid" refers to the large group of organic, basic, and physiologically active components found in plants.

2. (U) Batrachotoxin

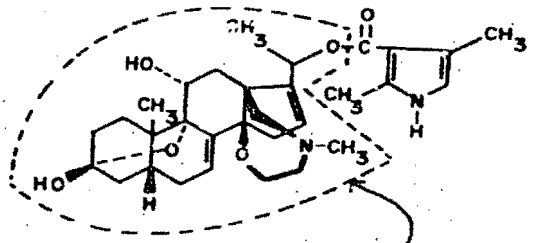
a. Code or Alternate Designations.

- Kokoi'.
- Kokoa' venom.
- Kokei venom.
- Kokŏi venom.

b. Class. Frog venom, steroidal compound.

c. Chemical Name. 20α ester of 3α, 9α-epoxy-14β,8(18-epoxyethano-N-methylimino)-5β-pregna-7, 16-diene-3β, 11α, 20α triol with 2,4-dimethylpyrrole-3-carboxylic acid.

d. Formula. $C_{31}H_{42}N_2O_6$.[93-95]



Apparent Molecular Ion ($C_{24}H_{33}NO_4$)

e. Molecular Weight.

- 399.2 (apparent molecular ion).
- 538.3 (Batrachotoxin).

f. Method of Preparation. The venom is a secretion from the skin of the South American "Kokei" frog, Phyllobates bicolor; it is extracted with methanol. (About 20 µg Batrachotoxin is obtained from each frog.)

g. Physical and Chemical Properties.

- Physical state and color: Colorless, crystalline solid.
- Solubility: Soluble in alcohol, chloroform, and methylene chloride. Slightly soluble in NaCl solution, and CO_2 saturated water. Insoluble in water and ether.

h. Method of Dissemination. Must penetrate the skin to be effective (possibly, flechettes).

i. Use. Lethal agent.

j. Physiological Effects. Venom irreversibly blocks transmission of neuromuscular junctions, acts strongly on the central nervous system, and paralyzes the muscles and heart. Symptoms include violent convulsions, powerful contractions over the entire body, salivation, choking, labored

breathing, collapse, and death. With a high intravenous dose, death occurs within seconds accompanied by complete muscular rigidity. Venom has no effect on intact skin.

k. Therapy. None known.

l. Toxicity. LD_{50} is 2 µg/kg for mice.[95]

m. Historical. First described by Arango in Columbia in 1869. Used by Choco Indians as arrow poison or darts for blowguns; venom was collected on dart tips by impaling the frog alive on a stick and holding it over an open fire until the venom oozed from the skin.

3. (C) Botulinum Toxin

a. (U) Code or Alternate Designations.

- Botulism
- "Sausage Poisoning"
- Referred to by the various types of toxin (A,B,C,D, E, or F)
- XR

b. (U) Class. Lethal high-molecular-weight bacterial exotoxin.

c. (U) Chemical Name and Formula. Botulinum toxins are simple proteins elaborated by Clostridium botulinum. Precisely how the amino acids are arranged to produce such high toxicity to man and animals constitutes one of the most challenging, unsolved problems in molecular biology.

d. (U) Source of Material. The toxin is produced by anaerobic spore-forming bacteria. To date, six types have been identified, each of which produces a distinctive type of toxin with designations A, B, C, D, E, and F.

(1) (U) Type A - Present in home-canned fruit and vegetables, meat, and fish. Principally affects man and chickens and is found in Western United States, Soviet Ukraine, United Kingdom, and Canada.

(2) (U) Type B - Present in prepared meats, especially pork products, salmon eggs, and liver paste. Principally affects man, horses,

cattle, and is found in France, Canada, Norway, Eastern United States, USSR, and Sweden.

(3) (U) Type C - Present in fly larvae, rotting vegetation, ponds and marshes, toxic forage, carrion, and pork liver. Principally affects aquatic wild birds, cattle, horses, mink, and man. Man appears relatively resistant to toxin taken by mouth. Found in Western United States, Canada, South America, South Africa, Australia, Western Europe, and USSR.

(4) (U) Type D - Present in carrion. Principally affects cattle and man. Man appears relatively resistant to toxin taken by mouth. Found in South Africa and Australia.

(5) (U) Type E - Present in uncooked fish and marine mammals, smoked white fish, dried whale blubber, dried seal meat and flippers, and salmon eggs. Also found in canned fish. Principally affects man. Found in Northern Japan, British Columbia, Labrador, Alaska, Great Lakes region of United States and Canada, Sweden, Denmark, USSR, Poland, and Norway.

(6) (U) Type F - Present in homemade liver paste (Denmark), home-processed venison jerky (California), marine sediments (California and Oregon), salmon (Columbia River), crabs (York River, Virginia), river mud (Eastern North Dakota), and fish (Atchafalaya River, Louisiana). Apparently sparsely distributed in nature. Principally affects man.

e. (U) Methods of Preparation and Purification.[96,97]

(1) (U) Preparation. Several factors influence botulinum toxin production in bacterial cultures (temperatures, salt and sugar concentrations, pH, and substrate), and these factors vary with the type of botulinum toxin. Organism types A through E may be cultured in media described in the following respective articles:

- Type A - Duff, J. T., et al., "Studies on Immunity to Toxins of Clostridium botulinum: I. A Simplified Procedure for Isolation of Type A Toxin," J. Bacteriol. 73 (1957), pp 42-47.
- Type B - Duff, J. T., et al., "Studies on Immunity to Toxins of Clostridium botulinum: II. Production and Purification of Type B Toxin and Toxoid," J. Bacteriol., 73 (1957), pp 597-601.

- Type C - Cardella, M. A., et al., "Studies on Immunity to Toxins of Clostridium botulinum: IV. Production and Purification of Type C Toxin for Conversion to Toxoid," J. Bacteriol. 75 (1958), pp 360-365.

- Type D - Cardella, M. A., et al., "Production and Purification of Clostridium botulinum Type D Toxin for Conversion to Toxoid," Bacteriol. Proc. (1957), p 97.

- Type E - Gordon, M., et al., "Studies on Immunity to Toxins of Clostridium botulinum: III. Preparation, Purification, and Detoxification of Type E Toxin," J. Bacteriol. 74 (1957), pp 533-538.

- Type F - Cultured in the same medium as Type E at 30° C.

(2) (U) Purification. After the various toxins are produced, the following general procedures for extraction and purification are used:

- Type A - Precipitation with acid at pH 3.5, extraction of toxin in 0.075 M calcium chloride at pH 5, acid precipitation at pH 3.7, precipitation with 15% ethanol at -5° C, and crystallization from 0.9 M ammonium sulfate.

- Type B - Precipitation with acid at pH 3.5, extraction of toxin at pH 5, reprecipitation with acid at pH 4, reprecipitation with acid at pH 5.

- Type C - Precipitation from culture in 25% ethanol at -5° C, extraction of toxin with 0.005 M $CaCl_2$ at pH 5, reprecipitation with 15% ethanol at -5° C.

- Type D - Precipitation with 25% ethanol at -5° C, extraction of toxin with 0.075 M $CaCl_2$ at pH 6.5, reprecipitation with 10% ethanol at -5° C.

- Type E - Treat culture with 0.1% trypsin at pH 6.0 for 2 hr at 37° C, precipitate toxin with 25% ethanol at -5° C.

- Type F - Culture supernatant centrifuged at 3000 rpm for 30 min at 3° C. Filtered through Sephadex gel G-100 and G-200.

f. (U) Equipment. Standard laboratory equipment.

g. (U) Physical, Chemical, and Immunological Properties. All types of botulinum toxin possess hemagglutinating properties and can be destroyed or detoxified with nitrous acid, strong alkali, many oxidizing agents, formaldehyde, dilute ethanol solution, and by heat (boiling for 5 to 10 min). These toxins are not destroyed by stomach acids, trypsin, or pepsin. In cold stagnant water, they are stable for a week; in food, they may persist for a long time provided air is excluded.[98] The several types of toxin are also chemically and antigenically distinct:

(1) (U) Type A - Simple protein. Crystalline white needles. Molecular weight, approximately 900,000. Produces a specific antibody. Toxicity destroyed by photooxidation in presence of methylene blue and by boiling.

(2) (U) Type B - Simple protein. Amorphous solid. Molecular weight, approximately 60,000. Nonproteolytic. Produces specific antibody.

(3) (U) Type C - Simple protein. Amorphous solid. Molecular weight undetermined. Produces specific antibody. More heat resistant than types A or B.

(4) (U) Type D - Simple protein. Amorphous solid. Molecular weight, approximately 900,000. Strongly proteolytic.

(5) (U) Type E - Simple protein. Amorphous solid. Molecular weight, approximately 19,000. Toxin is resistant to diffused light and destroyed in 40 hr by direct sunlight. More easily destroyed by heat than types A or B. Resistant to cold.

(6) (U) Type F - Simple protein. Molecular weight is approximately 140,000. Partly resembles Type E toxin; not antigenically related to Types A, B, C, or D. Heat labile. Storage at 4° C for 3 months completely inactivates it. Elevated temperatures hasten destruction of toxin. Has marked proteolytic properties. Actively digests forcemeat and egg white, coagulates milk, and liquifies gelatin to release hydrogen sulfide. Possesses saccharolytic properties, forming acid and gas in fermentation of starch, glucose, and other sugars. Toxin formation is greatest in liver broth containing boiled forcemeat. Not activated by trypsin.

h. (U) Method of Dissemination. Aerosol spray, small caliber projectile, ingestion of food or water.

i. (U) Use. Lethal agent.

j. (U) Physiological Effects.

(1) (U) General effects. The botulinum toxin is a neurotoxin that acts principally by paralyzing the cholinergic synapse (junction) of the peripheral nerves leading to muscles; it interferes with the release of acetylcholine, which acts as a chemical mediator of the impulse to the muscle. The inactivation is irreversible. The toxin is distributed throughout the body by the blood stream and acts on the individual motor nerve terminals. Death results from respiratory paralysis. The several types of toxin have similar modes of action on susceptible animal species, but show different patterns of reactivity toward the various animal species. Symptoms generally appear within 12 to 36 hr. Incubation periods may range from 2 hr to 10 days. First signs of poisoning are: malaise, weakness, headache, dizziness, visual disturbances (fogginess, blurred and double vision, dilation of pupils, no reaction to light), disturbances in swallowing and speech (paralysis of tongue, pharynx and soft palate), dry throat and mouth, progressive weakness of muscles of neck, and ataxic gait. Pulse is generally fast, temperature is normal or subnormal. Muscular paresis of stomach and intestines causes constipation. There is progressive respiratory paralysis. Victims generally do not complain of pain. Headache and transient colic normally are observed only at the beginning. Duration of attack varies, but is generally 4 to 6 days. Unless specific treatment is instituted, death can occur as early as the second and third day. In untreated cases that survive, recovery may take months. Before the introduction of the antitoxins, lethality averaged 40% to 50%.

(2) (U) Type-specific effects.

- Type A - Most common type. Very potent with rapid time of onset. Highest mortality rate, with death occurring on second or third day. Abdominal distention also noted.
- Type B - Approximately same toxicity as A. Incubation from 2 to 60 hr. Death may occur on second or third day. Symptoms are: nausea, vomiting, shortness of breath, depressed temperature, and fast pulse; no cramps or diarrhea.
- Type C - Very high toxicity, with death occurring on second or third day. Leg weakness, diarrhea, prostration, and "limberneck" are noted. Type is rare in humans.

- Type D - Least toxic of series. Rare in humans.
- Type E - Highly toxic. Short incubation period. Symptoms appear within 4 to 6 hr and include nausea, vomiting, abdominal distention, fever, and urinary retention. Death may occur within 24 hr.
- Type F - Comparatively rare. Symptoms appear within 24 hr if large amounts are ingested and within 3 days for smaller doses. Symptoms include unsteady gait progressing to severe weakness, palatal paralysis, drooping eyelids, double vision, and impairment of speech.

k. (U) Therapy. Polyvalent antisera (Types A, B, C, D, and E) are available, either for use as a prophylaxis or a therapeutic. Early massive treatment by injection with type-specific botulinum antisera may bring about recovery; the time lag between ingestion and appearance of symptoms (usually 6 to 48 hr) makes diagnosis difficult and delays treatment.

l. (U) Storage. The toxins are relatively unstable in the pure state. A more stable preparation, however, is a partially purified toxin that had been spray-dried and stored in the cold.

m. (C) Toxicities.

(1) (U) LD_{50} intraperitoneally in mice.[96]

Toxin	µg/mouse	Estimated purity of preparation (%)	Form
Type A	2.7×10^{-5}	>98	crystalline
Type B	2.7×10^{-5}	>98	amorphous
Type C	1.4×10^{-4}	?	amorphous
Type D	1.3×10^{-5}	about 90	amorphous
Type E	1.7×10^{-4}	>90	amorphous

(UNCLASSIFIED)

(b)(1)

(CONFIDENTIAL)

n. (U) Historical. The microorganisms were discovered and identified by Van Ermengen in 1895 (Belgium). The various types of botulinum toxin were discovered in the following sequence.

- Type A - Leuchs in 1910 (Germany).
- Type B - Leuchs in 1910 (Germany).
- Type C - Bengston (United States) and Seddon (Australia) in 1922.
- Type D - Thieles and Robinson in 1927 (South Africa).
- Type E - Gunnison, Cummings, and Myer in 1936 (United States); Kusknir in 1934 (USSR).
- Type F - Moeller and Scheibel in 1958 (Denmark).

o. (U) Detection and Identification. "Phagocytic" inhibition test, hemagglutination test, neutralization test using specific antitoxins, and ring precipitation test.

4. (U) Bufotenine

a. Code or Alternate Designations.

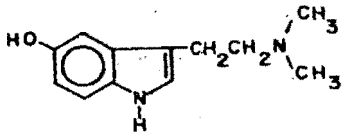
- Nopo.
- Mappine.
- Ch'an Su.
- Cohoba.

b. Chemical Name. 5-Hydroxy-N,N,-dimethyltryptamine.

c. Alternate Chemical Names.

- 3-(2-dimethylaminoethyl)indole-5-ol.
- 3-(2-dimethylaminoethyl)-5-indolol.
- 5-hydroxy-N-dimethyltryptamine.
- N,N-dimethylserotonin.
- 3-(β-dimethylaminoethyl)-5-hydroxyindole.

d. Formula. $C_{12}H_{16}N_2O$



e. Molecular Weight. 204.26.

f. Raw Materials.

(1) Natural sources.

- Toad (Bufo vulgaris Laur).
- Seeds of leguminous shrubs (Piptadenia peregrina and Piptadenia macrocarpa).

- Mushrooms (Amanita mappa, Amanita pantherina and Amanita muscaris).

(2) Synthesis.

- Aluminum chloride ($AlCl_3$).
- 2,5-Dimethoxybenzylcyanide ($C_{10}H_{11}NO_2$).
- N,N-Dimethylaminoethylchloride ($ClCH_2CH_2N(CH_3)_2$).
- Sodamide ($NaNH_2$).
- 5-Benzyloxyindole ($C_{15}H_{13}NO$).
- 5-Ethoxyindole ($C_{10}H_{11}NO$).
- Chloroacetonitrile ($ClCH_2CH$).
- Oxalyl chloride $(COCl)_2$.
- Dimethylamine $[(CH_3)_2NH]$.

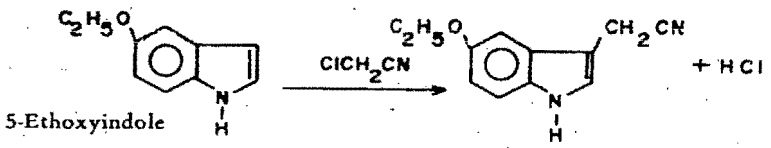
g. Method of Manufacture.

(1) Natural sources.

- Dried preparation of dermal glandular secretion from Bufo vulgaris Laur.
- Ground seeds of Piptadenia peregrina and Piptadenia macrocarpa.
- Extracts from mushrooms Amanita mappa, Amanita pantherina, and Amanita muscaria.

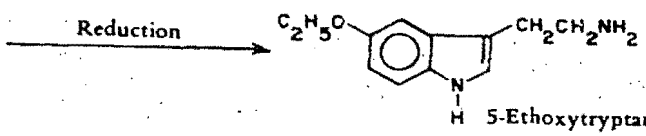
(2) Synthesis.

- Method A.

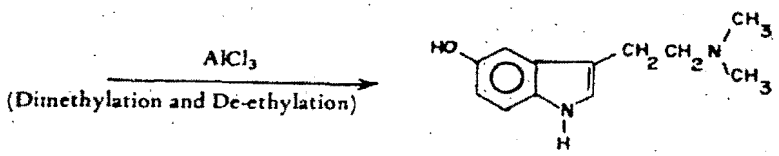


5-Ethoxyindole

5-Ethoxyindole-3-acetonitrile

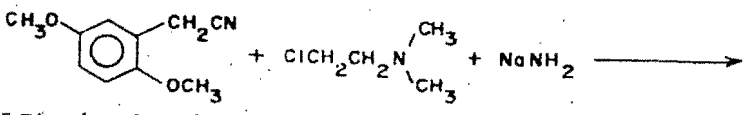


5-Ethoxytryptamine

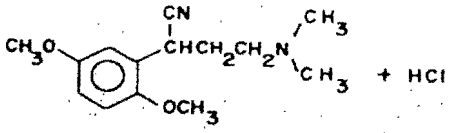


BUFOTENINE

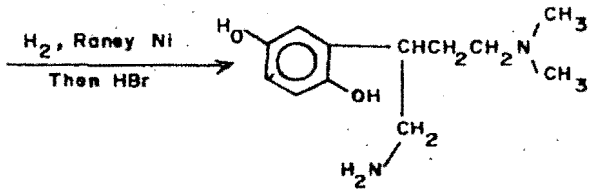
- Method B.



2,5-Dimethoxybenzyl cyanide



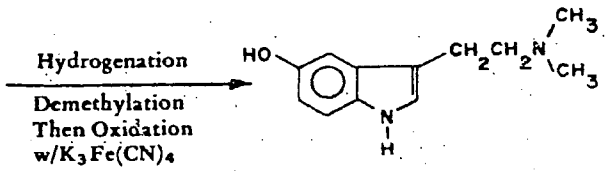
1-(2,5-Dimethoxyphenyl)-3-dimethylaminopropylcyanide



1-Dimethylamino-3-(2,5-dihydroxyphenyl)-4-butylamine

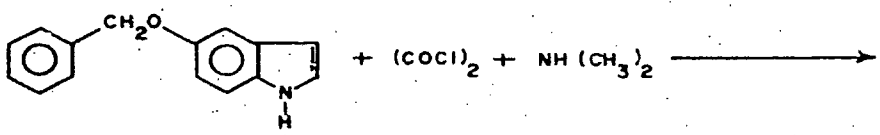
Original

ST-HB-03-18-74

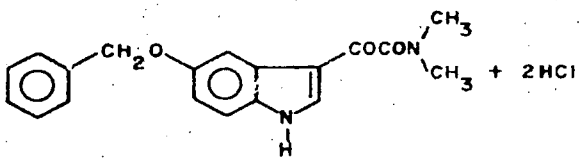


BUFOTENINE

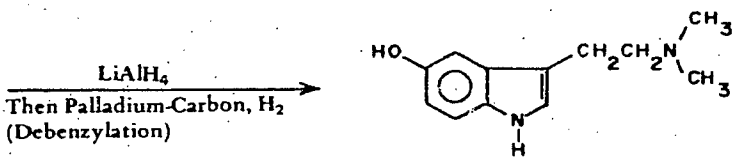
- Method C.



5-Benzyloxyindole



Glyoxyldimethylamide



BUFOTENINE

h. Equipment. Standard chemical processing equipment.

i. Physical and Chemical Properties.

- Physical state and color: Stout prisms.
- Boiling point: 320° C at 0.1 mm Hg.
- Melting point: 146° to 147° C.[3]
- Solubility: Freely soluble in alcohol, soluble in dilute acids and alkali, slightly soluble in ether, insoluble in water.[3]

j. Method of Dissemination. Ingestion.

k. Use. Incapacitant; hallucinogen.

l. Physiological Effects. The face changes to a peculiar shade of purple, the color of eggplant. The compound produces visual hallucinations of both color and shape, and alters time and space perception. A transient rise in blood pressure along with bronchial constriction and chest discomfort results. Bufotenine exerts a central paralytic effect on the motor centers of the nervous system to produce myosis and saliva flow.[11]

m. Therapy. Emetics and atropine; artificial respiration, if necessary.

n. Toxicity. Intravenous injection of 8 to 16 mg of bufotenine in human volunteers produced primary visual disturbances, alteration of time and space perception, and a sensation of intense itching.

o. Historical.

- 1934: Isolated from toads by Wieland in Germany.
- 1935: Synthesized by Hoskins and Shimodaira in Japan.
- 1949: Synthesized by Bovet in Italy.
- 1954: Isolated from toadstools by Wieland and Motzel in Germany.

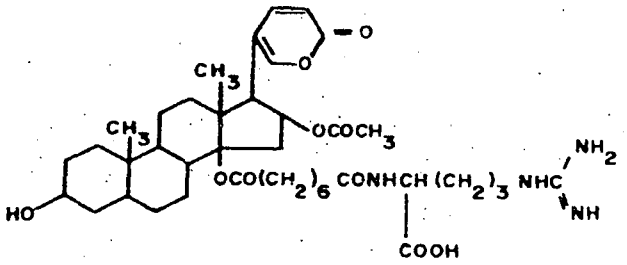
5. (U) Bufotoxin

a. Code or Alternate Designations. Vulgarobufotoxin.

b. Class. Steroidal compound, toad venom.

c. Chemical Name. C_{14} ester of bufotolin with suberylarganine.

d. Formula. $C_{40}H_{60}N_4O_{10}$



e. Molecular Weight. 756.91.

f. Method of Preparation. The principal toxin of the venom of the common European toad, Bufo vulgaris, obtained from the secretions of the granular glands. A steroidal conjugate of suberylarginine.

g. Physical and Chemical Properties.

- Physical state: Needle-like crystals with a bitter, nauseating taste.
- Solubility: Freely soluble in methanol and pyridine; slightly soluble in absolute alcohol; insoluble in water, acetone, chloroform, petroleum, and ether.
- Decomposition temperature: 205° C.

h. Physiological Effects. Bufotoxin has an effect on the central nervous system similar to LSD. The toxin causes hallucinations, respiratory paralysis, muscle tremors, and weakness and has an anesthetic action. The toxin also has actions similar to digitalis and cocaine.

i. Method of Dissemination. Ingestion.

j. Use. Hallucinogen, lethal agent.

k. Toxicity. LD_{50} in cat is 0.39 mg/kg, intravenously.

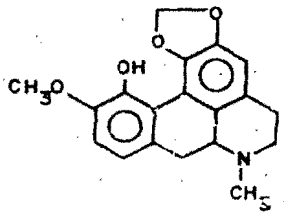
l. Historical. 1922: Isolated and structure determined by Wieland in Germany.

6. (U) Bulbocapnine

a. Code or Alternate Designations. None.

b. Class. Incapacitating agent.

c. Formula. $C_{19}H_{19}NO_4$.



Neg. 513167

d. Molecular Weight. 325.35.

e. Raw Materials.

(1) Natural sources.

- Corydalis cava L. (Bulbous birthwort).
- Corydalis bulboso (Dutchman's breeches).

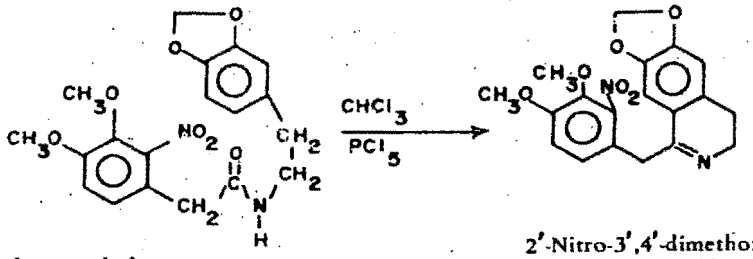
(2) Synthesis.

- 2'-Nitro-3',4'-dimethoxyphenylaceto-B-3,4-dimethylenedioxy-phenylethylamide.
- Methyl iodide (CH_3I).
- Phosphorus pentachloride (PCl_5).
- Chloroform ($CHCl_3$).

f. Method of Manufacture.

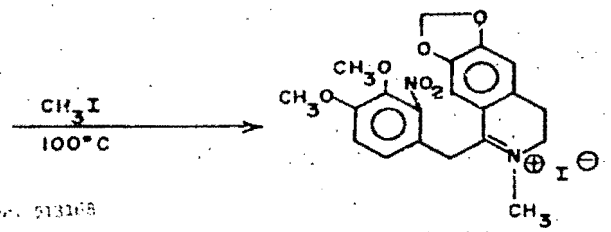
(1) Natural sources. Extraction and crystallization from the tubers of Corydalis cava(L.) and Corydalis bulboso.

(2) Synthesis.

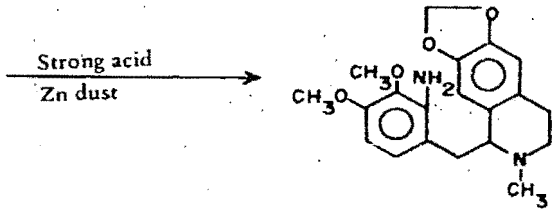


2'-Nitro-3',4'-dimethoxyphenylaceto-β-3, 4-methylenedioxyphenylethylamide

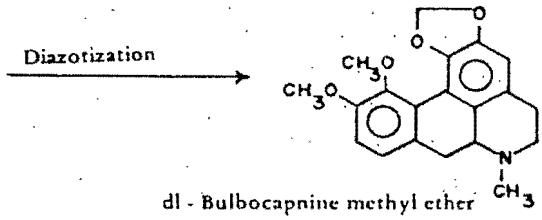
2'-Nitro-3',4'-dimethoxy-6,7-methylenedioxy-l-benzyl-3, 4-dihydroisoquinoline



Methiodide Derivative



2'-Amino-3',4-dimethoxy-6,7-methylenedioxy-l-benzyl-2-methyltetrahydroisoquinoline



dl - Bulbocapnine methyl ether

Hydroxylation → d-Bulbocapnine

g. Equipment. Standard chemical processing equipment.

h. Physical and Chemical Properties.

- Physical state and color: Crystalline powder.
- Melting point: 201-203° C.
- Solubility: Soluble in alcohol and chloroform; insoluble in water.

i. Use. Incapacitating agent; the hydrochloride used medically for muscle tremors.

j. Physiological Effects. Symptoms include catalepsy, negativism, vegetative derangement, hyperkinesis, salivation and vomiting. Intravenous injection produces catatonia. For light doses (1 to 2 mg), drowsiness sets in; for medium doses, catalepsy and negativism; and for large doses, apoplexy and rigidity. Massive doses in man of 200-500 mg produce sluggishness, lack of movement, assumption of abnormal positions with body, mental lassitude, prolonged fixation of relatively unimportant points, and mental catalepsy.

k. Toxicity. LD_{50} for mice 195 mg/kg, subcutaneously. ID for man is 3.0 to 7.0 mg/kg (route of administration unknown).

l. Historical. 1928: Synthesized by Gulland and Haworth in United Kingdom.

7. (U) Curare

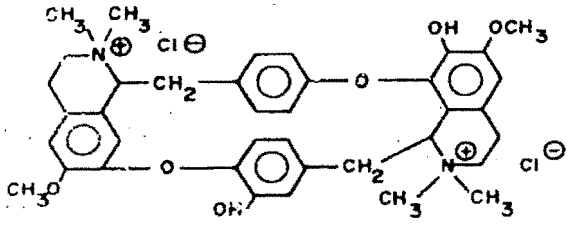
a. Code or Alternate Designations.

- D-Tubocurarine chloride.
- Intocostrin-T.
- Tabadil.
- Delacurarine.
- Durarin "Asta".
- Pariera Brava.
- Tubarine.

b. Class. Neurotropic agent.

c. Chemical Name. Curare is a crude dried extract containing a number of alkaloids which exert curariform effects as well as substances which have a toxic action on the blood vessels and a histamine-like action. The crystallized alkaloid isolated from the crude curare was designated as D-tubocurarine, which has a bis-benzylisoquinoline structure with quaternary nitrogen atoms.

d. Formula. $C_{38}H_{44}Cl_2N_2O_6$.



D-tubocurarine chloride

e. Molecular Weight. 695.67.

f. Raw Materials. From the plant, Chondodendron tomentosum.

g. Method of Manufacture. Tubocurarine is extracted with water from freshly gathered stems and bark of the plant, Chondodendron tomentosum.

The aqueous extract is concentrated to a brownish-black syrupy paste which is autoclaved and then evaporated to dryness. The residue is extracted with an aqueous solution of tartaric acid and the extracts treated with excess lead subacetate. The precipitated lead salts are separated and the filtrate, after removal of soluble lead as its sulfide, is made slightly alkaline and extracted with chloroform to remove other alkaloids. The chloroform-extracted water solution is acidified to pH 3 with H_2SO_4 and then treated with picric acid. The insoluble picrate is separated, purified by recrystallization from a mixture of acetone and ethanol, and then converted to tubocurarine chloride by treatment with dilute HCl in the presence of toluene. Tubocurarine is crystallized from the aqueous acid layer by chilling.

h. Equipment. Standard chemical processing equipment.

i. Physical and Chemical Properties.

- Odor: Odorless.
- Physical state and color: Yellowish white to grayish white, hexagonal and pentagonal microplatelet crystals.
- Decomposition temperature: Anhydrous material decomposes 274° to 275° C.
- Solubility: Soluble in water, forming supersaturated solutions readily; takes up water in moist atmosphere to form pentahydrate. Soluble in alcohol; insoluble in chloroform, ether, and acetone.

j. Methods of Dissemination. Undetermined; possibly flechettes.

k. Use. Lethal, and a possible incapacitating agent; muscle relaxant (effective dose is 10 to 15 mg/man).

l. Physiological Effects. The principal effect of the drug is a total suppression of the skeletal musculature to produce paralysis. The paralysis results from the disturbance of nervous transmissions from the motor nerve. D-tubocurarine chloride increases the threshold of sensitivity of cholino-reactive systems of muscle fibers to acetylcholine and weakens conduction in the autonomic ganglia. Depression effects and bronchospasm also occur due to the release of histamine caused by the agent. Initially, slight dizziness, difficulty in speaking and weakness occur. Later, the fingers and toes become difficult to move--eventually the victim is unable to move at all--and the facial and diaphragmatic muscles tend to relax. Peak effect occurs 3 to 5 min after IV injection,

and the duration of action is about 20 to 40 min.[99] Death is caused by hypoxia as the result of respiratory paralysis. Life usually can be saved by artificial respiration because the duration of action of tubocurarine is relatively brief.

m. Therapy.[99,100] Neostigmine, tensilon (edrophonium bromide), physostigmine, and artificial respiration or oxygen. Paralytic effects of large doses of tubocurarine are enhanced by neostigmine and physostigmine.

n. Decontamination. Decomposed by heat.

o. Storage. Store away from air and moisture.

p. Persistence. Persistent.

q. Toxicity.[99,101] Lethal dose is given as approximately 50 mg/man, evidently by the injection route, since tubocurarine is inactive by the oral route unless taken in massive doses. Total respiratory paralysis takes 7 to 10 min from time of injection. LD_{50} of tubocurarine in rabbits, intravenously, is 0.223 mg/kg; LD_{50} of curare in rabbits, intravenously, is 1.3 mg/kg.

r. Historical.

- 1935: Extracted by King in United States.
- 1946: Isolated from Chondodendron tomentosum by Dutcher.
- 1948: Chemical structure determined by King.
- 1963: Stereochemistry by Hultin.

8. (U) Harmine

a. Code or Alternate Designations.

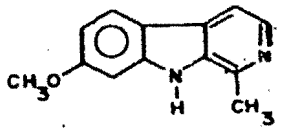
- Ayahausca.
- Banisterine.
- Caapi.
- Leucoharmine.

- Telepathine.
- Yage'.

b. Class. Plant poison—incapacitating agent.

c. Chemical Name. 1-Methyl-7-methoxy-9H-pyrido[3,4-b] indole. 1-Methyl-7-methoxy-B-carboline.

d. Formula. $C_{13}H_{12}N_2O$



e. Molecular Weight. 212.25.

f. Raw Materials.

(1) Natural sources. Seeds and roots of Penganum harmala L. [wild rue, and the wood of Banisteriopsis caapi (ayahausca)].

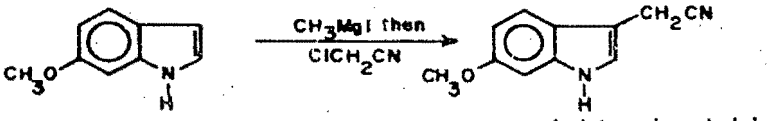
(2) Synthetic.[2]

- 6-Methoxyindole (C_9H_9NO).
- Chloroacetonitrile ($ClCH_2CN$).
- Methyl magnesium iodide (CH_3MgI).
- Sodium (Na).
- Ethanol (C_2H_5OH).
- Sulfuric acid (H_2SO_4).
- Acetic acid (CH_3COOH).
- Maleic acid ($C_4H_4O_4$).
- 6-Methoxytryptamine ($C_{11}H_{14}N_2O$).
- Acetic annydride ($CH_3CO-O-OCCH_3$) or Ac_2O.

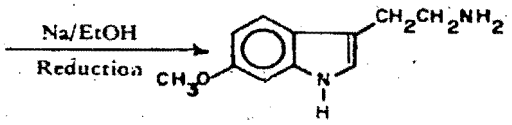
- Phosphorus pentoxide (P_2O_5).
- 6-Methoxytryptophan ($C_{12}H_{14}N_2O_3$).
- Acetaldehyde (C_2H_4O).

g. Method of Manufacture.

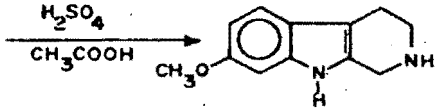
- Method A.



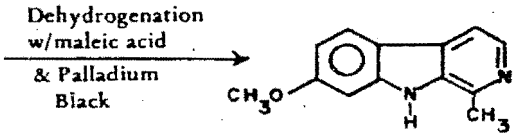
6-Methoxyindole 3-Cyanomethyl-6-methoxyindole



3-Ethylamino-6-methoxyindole

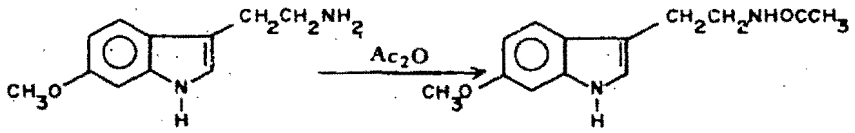


1,2,3,4-Tetrahydroharmine

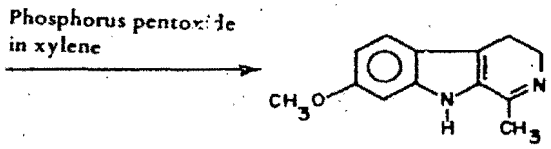


Harmine

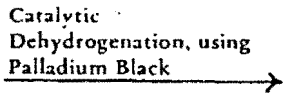
- Method B.



6-Methoxytryptamine

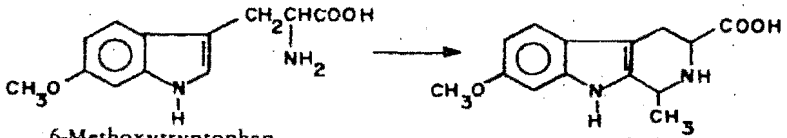


Harmaline



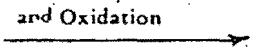
Harmine

- Method C.



6-Methoxytryptophan

1,2,3,4-Tetrahydroharmine-3-carboxylic acid



Harmine

h. Equipment. Standard chemical processing equipment.

i. Physical and Chemical Properties.

- Physical state and color: Slender orthorhombic prisms.
- Boiling point: Sublimes.
- Melting point: 261° C with decomposition.
- Solubility: Soluble in alcohol, ether, chloroform; insoluble in water. Hydrochloride is soluble in hot water.

j. Method of Dissemination. Unknown.

k. Use. Incapacitation.

l. Physiological Effects. Harmine increases arterial pressure, intensifies respiration, lowers bodily temperature and causes shivering. Harmine has central relaxing, hypnotic, spasmolytic, anesthetic and semi-narcosis effects. In large doses, harmine produces hallucinations and other psychotic disorders similar to those produced by Mescaline. An intravenous dose of 0.2 gm produces vomiting, paleness, shivering, ataxia, dizziness, booming in ears, and psychic depression.

m. Toxicity. MLD is 200 mg/kg in rats, subcutaneously. ID for man is 2.9 mg/kg, intravenously.

n. Historical. 1927: Synthesized by Manske, Perkin, Robinson in United Kingdom.

9. (U) Mescaline

a. Code or Alternate Designations.

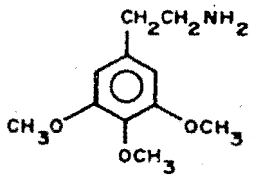
- Mezcaline.
- Mescal Buttons.
- Peyote.
- Peyotl.

- Anhalonium.
- Pellotine.
- Lophophora.

b. Class. Incapacitating agent.

c. Chemical Name. 2(3,4,5-Trimethoxyphenyl)ethylamine.

d. Formula. $C_{11}H_{17}NO_3$.



Nor. 513174

e. Molecular Weight. 211.25.

f. Raw Materials.

(1) Natural sources. Flowering heads of dumpling cactus, Anhalonium lewinii (Lophophora williamsii).

(2) Synthesis.

- 3,4,5-Trimethoxybenzoyl chloride ($C_{10}H_{11}O_4Cl$).
- Nitromethane (CH_3NO_2).
- 3,4,5-Trimethoxybenzoic acid ($C_{10}H_{12}O_5$).
- Acetic acid (AcOH).
- Potassium cyanide (KCN).
- Diazomethane (CH_2N_2).
- Silver nitrate ($AgNO_3$).
- Ammonia (NH_3).

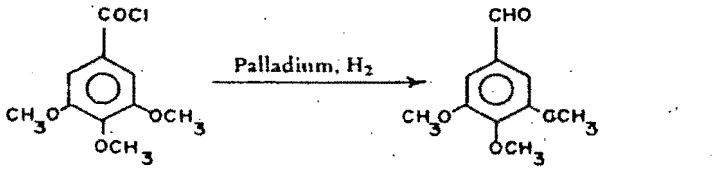
- Silver oxide (Ag_2O).
- Methanol (CH_3OH).
- Potassium hydroxide (KOH).
- Thionyl chloride ($SOCl_2$).

g. Method of Manufacture.

(1) Natural sources. Extraction from flowering heads (mescal buttons) of cactus.

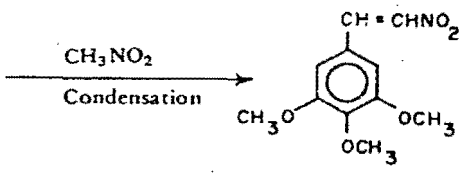
(2) Synthesis.

- Method A.

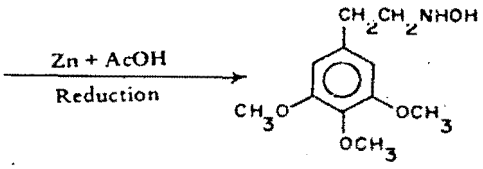


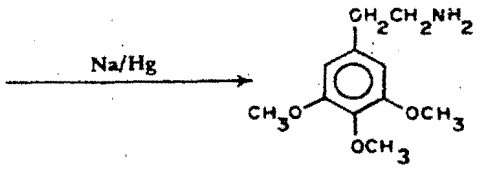
3,4,5-Trimethoxybenzoyl chloride

3,4,5-Trimethoxybenzaldehyde



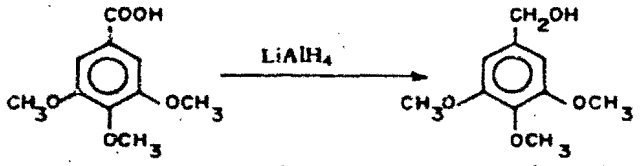
β-Nitro-3,4,5-trimethoxystyrene





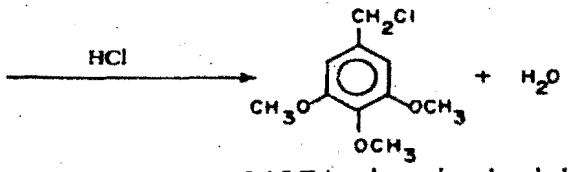
Mescaline

- Method B.

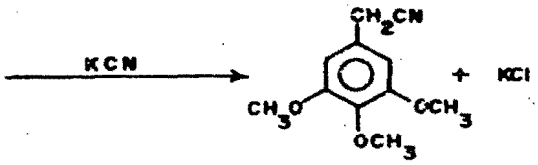


3,4,5-Trimethoxybenzoic acid

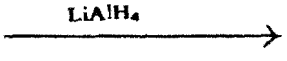
3,4,5-Trimethoxyphenyl-methanol



3,4,5-Trimethoxyphenylmethyl chloride

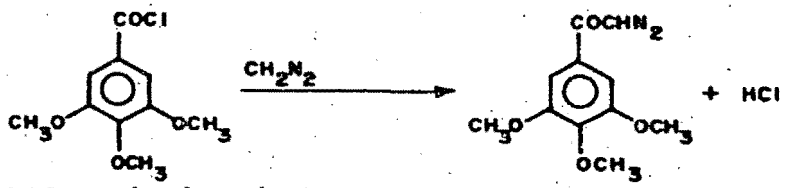


3,4,5-Trimethoxyphenylmethylcyanide



Mescaline

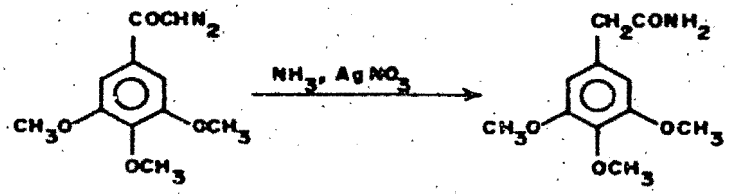
- Method C.



3,4,5-Trimethoxybenzoyl chloride

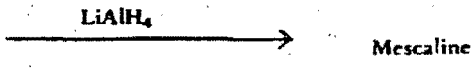
3,4,5-Trimethoxyphenyldiazomethyl-ketone

Route 1:



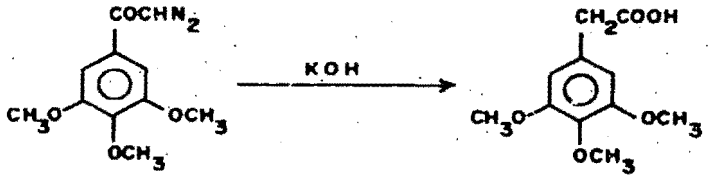
Neg. 513178

3,4,5-Trimethoxyphenylacetamide



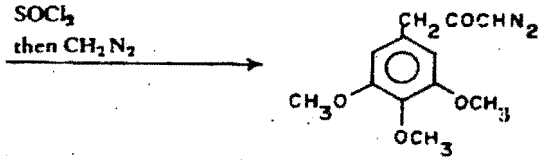
Mescaline

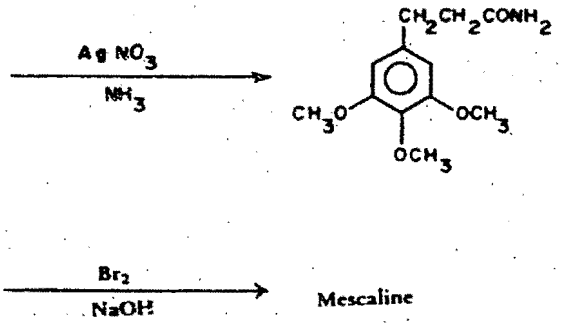
Route 2:



Neg. 513179

3,4,5-Trimethoxyphenylacetic acid





h. Equipment. Standard chemical processing equipment.

i. Physical and Chemical Properties.

- Physical state: Mescaline is crystalline when pure.[11]
- Boiling point: 180° C at 12 mm Hg.
- Melting point: 35° to 36° C. It melts to a colorless oily liquid.[11]
- Solubility: Soluble in alcohol, chloroform and benzene; slightly soluble in water; insoluble in ether.

j. Method of Dissemination. By ingestion with food or water.

k. Use. Incapacitant, hallucinogen.

l. Physiological Effects. Mescaline induces visual and auditory hallucinations, modifies consciousness, disrupts bodily functions, and causes a disappearance of conditioned reflexes. The compound is readily absorbed in the gastrointestinal tract, and the symptoms usually appear within one-half hour. Other symptoms include: mydriasis, difficulty in breathing, nausea, heavy salivation, intense hunger, sharpened hearing and sense of touch, sensitivity to odors, and loss of sense of time and space.

m. Therapy. Chlorpromazine or reserpine, Frenquel (4-piperidyl-benzhydrol derivative).

n. Decontamination. Unknown.

o. Storage. Store away from air.

p. Persistence. Persistent.

q. Toxicity. Oral dose effects appear in 2 to 3 hr and last for 12 or more hr. A 0.1 to 0.2 g dose produces optical phenomena, intense color perception, euphoria, hypomanical conditions; with a 0.3 to 0.5 g dose, euphoria recedes and perception is dulled; a 0.5 g dose shows full clinical effect, hallucinations; more than a 0.5 g dose may be fatal with death resulting from circulatory failure and respiratory paralysis. ID is 1.4 to 7.0 mg/kg, orally, in man.

r. Historical.

- Used by Aztec Indians in religious ceremonies for centuries.
- 1560: Effects first discribed in a book by Francisean Monk Bernardino de Shagun in Spain.
- 1886: Plant described by Lewin in Germany.
- 1896: Active material isolated and structure determined by Heffter in Germany.
- 1919: Synthesized by Späth in Germany.

10. (U) Murexine

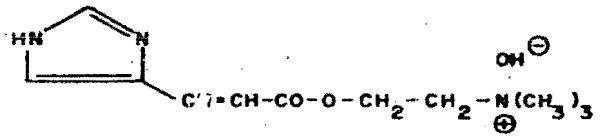
a. Code or Alternate Designations. Purperine.

b. Class. Neurotoxin, snail poison.

c. Chemical Names.

- β(4-Imidazolyl)acrylylcholine.
- Urocanylcholine.

d. Formula. $C_{11}H_{19}N_3O_3$



e. Molecular Weight. 241.29.

f. Method of Preparation. Poison is secreted from the hypobranchial glands of certain gastropods of the family Muricidae (purple snail), Murex trunculus, and other related species of mollusks. The material is extracted with alcohol.

g. Physical and Chemical Properties.

- Melting point: (Hydrochloride) 219° to 221° C with decomposition.
- The compound is unstable in acid and alkaline media. The base is instantly hydrolyzed by water and the chlorides are extremely hygroscopic. Although a choline ester, Murexine is not hydrolyzed by cholinesterase.

h. Physiological Effects. Murexine has an intense nicotinic action. The compound paralyzes skeletal muscles, and death results from asphyxia, followed by fibrillary contractions in nearly all muscles.

i. Toxicity. LD_{100} of oxalate salt in white mice is 300 mg/kg, subcutaneously, and 15 to 30 mg/kg, intravenously.

j. History.

- 1953: Structure determination, Erspamer, Benatr.
- 1960: US pat. 2,956,061, Pascini, Coda, (Societa Farmaceutici).

11. (U) Palytoxin

a. Code or Alternate Designations.

- "Limu make o Hana" (deadly seaweed of Hana).
- EA 3940.

b. Chemical Name. Unknown. Palytoxin contains no repetitive amino acid or sugar units.

c. Formula. Empirical formula $C_{30}H_{53}NO_{14}$.[84]

d. Molecular Weight.[84]

- Determined by ultracentrifuge: 1900 ± 100.
- Determined by mass spectrometry: 2604.

e. Raw Materials. Palytoxin is obtained from the coelenterate, Palythoa sp. (for example, P. vestitus).[102]

f. Method of Preparation. Palytoxin is extracted from Palythoa vestitus with ethanol and purified by chromatography.[84]

g. Physical and Chemical Properties.[84]

- Physical state and color: Clear to pale yellow, amorphous, hygroscopic solid.
- Melting point: No definite melting point, chars when heated to 300° C.
- Solubility: Very soluble in water; insoluble in water-free organic solvents.
- Other properties: Palytoxin is optically active with a specific rotation of +26° ±2° in water.

h. Use. Lethal agent.

i. Physiological Effects.[103] Symptoms occurring in mice in palytoxin poisoning are decreased locomotion, lowering of the anterior trunk, extension of fore limbs, paralysis of hind limbs, diarrhea, severe convulsions, dyspnea, and finally death from cardiac failure or respiratory collapse. Its cardiotoxic effects are due to vasoconstriction.

j. Storage.[84] Palytoxin is stable in aqueous solutions of pH 4.5 to 7.5 and in aqueous ethanol solutions. The toxin is rapidly destroyed in strong base, but less rapidly in strong acid.

k. Toxicity.[84] Except for the polypeptide and protein toxins, Palytoxin is the most toxic substance known. LD in mice is 0.15 µg/kg intravenously, and 0.4 µg/kg intraperitoneally. It is relatively nontoxic when given intragastrically or intrarectally.

l. Historical. Known as "Limu make o Hana" in Hawaiian legends. Used for poison on spear points. 1961: First collected and studied by Moore and Scheuer.

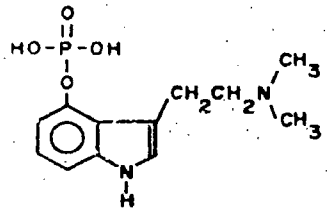
12. (U) Psilocybin

a. Code or Alternate Designations. Teonanacatl.

b. Class. Incapacitating agent.

c. Chemical Name. 3(2-Dimethylaminoethyl)-4-indolyl dihydrogen phosphate.

d. Formula. $C_{12}H_{17}N_2O_4P$.



e. Molecular Weight. 284.3.

f. Alternate Chemical Names.

- 3-[2-(Dimethylamino)ethyl] indole-4-ol dihydrogen phosphate ester.
- O-Phosphoryl-4-hydroxy-N,N-dimethyltryptamine.

g. Raw Material. Psilocybe mexicana (Mexican mushroom) and Strophania cubensis (found in Mexico and Thailand).

h. Method of Manufacture. By extraction of material from natural sources.

i. Physical and Chemical Properties.

- Melting point: Crystals from boiling water, mp 220° to 228° C; crystals from boiling methanol, mp 185° to 195° C.
- Solubility: Slightly soluble in boiling water and boiling methanol; very slightly soluble in ethanol; insoluble in chloroform and benzene.
- Hydrolysis: Conversion to the 4-hydroxyindole derivative (psilocin) by hydrolysis results in a compound slightly more potent than Psilocybin. Psilocin is an isomer of Bufotenine.

Original

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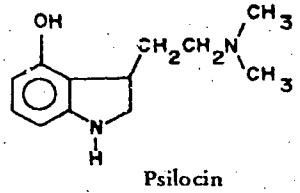


Psilocin

j. Use. Incapacitant.

k. Physiological Effects.[11] Psilocybin is converted to the more potent psilocin in the body. Typical symptoms are: sedative effects, mydriasis, tachycardia, shortness of breath, hyperthemia, hallucinations and a sense of unreality. A dose of 20 mg produces full hallucinogenic effect which lasts for about 5 hr. An oral dose of psilocybin acts within 20 to 30 min; intravenous effects appear within minutes. Psilocybin acts more rapidly than mescaline and is 100 times stronger.

l. Therapy. Psychotic action of psilocybin can be stopped with chlorpromazine.

m. Toxicity. Lethal dose for humans is not known; doses up to 70 mg have been taken without permanent effects. In man, 20 mg (orally) produce hallucinogenic effects.

n. Historical.

- 1953-1955: Plant described by French botanist, (fnu) Heim, and fungus grown under laboratory conditions by associate, (fnu) Wasson.
- 1958: Pure substance isolated and the structure determined by (fnu) Hoffman in Switzerland.
- 1960: German pat. 1,087,321 to Sandoz.
- 1963: US pat. 3,075,992 to Sandoz.

13. (U) Ricin

a. Code or Alternate Designations.

- Palma cristi.
- "W".

b. Class. Phytotoxin, toxic albumin, protoplasmic poison.

c. Chemical Name and Formula. Not determined.

d. Raw Material. Castor beans, Ricinus sanguineus L. or R. communis L. Euphorbiaceae.

e. Method of Preparation. True protein, extracted from oil cake residue after processing castor beans, Ricinus sanguineus L. or Ricinus communis L. Euphorbiaceae. Toxin is not present in the oil. The castor bean is crushed and extracted. The crude extract is then subjected to acid treatment for separating the acid-soluble ricin from insoluble extraneous matter followed by precipitation with sodium sulfate in a neutral solution. These steps are repeated several times and, finally, the purified ricin is skimmed off from a slurry prepared with carbon tetrachloride.[104]

f. Physical and Chemical Properties.

- Physical state and color: White amorphous powder.
- Solubility: Soluble in water.
- Other properties: Stable in aqueous solution only up to 60° to 75° C; in solid form, it is stable up to 100° to 110° C. Toxin is destroyed in digestive tract.

g. Method of Dissemination. Ingestion, inhalation of dust.

h. Use. Lethal agent.

i. Physiological Effects. Ricin acts as a proteolytic enzyme. Temperature greatly affects the action of the toxin: higher temperatures cause relative increases in toxicity. Action is partly local-gastroenteric, and partly central paralysis of respiratory and vasometer centers. Local inflammation may occur, especially if the compound comes in contact with the eyes or the dust enters the respiratory tract. There is no direct action on muscles or nerves. Ricin produces agglutination of red blood cells with embolic obstruction of smaller blood vessels. Symptoms include nausea, persistent vomiting, headache, colic, sometimes bloody diarrhea, thirst, emaciation, weak and rapid pulse, cold sweat, collapse, and convulsions. Symptoms occur about 12 to 18 hr and sometimes several days after poisoning. There may be bleeding from the lungs and mucous membrane. Death may occur in 6 to 8 days either from convulsions or from exhaustion, with a fatality rate of about 6%. Small particles in cuts, eyes, or nose may prove fatal.

j. Therapy. Antitoxin. Treatment is symptomatic.

k. Toxicity. LD_{100} is 0.6 µg/kg for dogs, intramuscularly; LD_{50} is 0.05 µg/kg for rabbits, intravenously; and LD_{100} for man is 150 to 200 mg, orally, and 200 mg, intravenously.[4]

l. Historical.

- 1889: Poisonous action shown by (fnu) Stillmark.
- 1962: Patent 3,060,165, indicating a use as CW agent, issued to US Dept of Army (Craig et al.).
- 1964: Separation and properties of crystalline Ricin D determined by Ishiguro et al. in Japan.

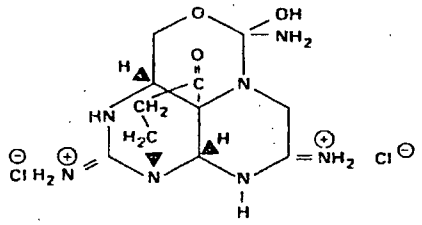
14. (U) Saxitoxin

a. Code or Alternate Designations.

- PSP.
- Parlytic shellfish poison.
- Mussel poison.

b. Class. Neurotoxin.

c. Formula.[105] $C_{10}H_{17}N_7O_4 \cdot 2HCl$



Neg. 51104 Saxitoxin dihydrochloride

d. Molecular Weight. 372.

e. Raw Materials. The sources of this poison are the Alaskan butter clam, Saxidomus giganteus, and the California ocean mussel, Mytilus californianus, both of which feed on toxic plankton such as the dinoflagellate, Gonyaulax catenella. The poison contained in the dinoflagellate

is concentrated in the digestive gland of the mussels; the mussels continue to be toxic to humans for at least 3 weeks after the dinoflagellate is no longer present in the water. The butter clam concentrates this or a similar poison in its siphon, where the toxicity is retained for years.

f. Method of Preparation.

(1) Preparation from shellfish. Minced clam or mussel meat is boiled in 0.1 N hydrochloric acid, cooled, pH adjusted to between 4.0 and 4.5, and distilled water added. Clarified supernatant liquid contains the toxin.

(2) Preparation from Gonyaulax catenella.[106] The organism can be cultured in sterile sea water supplemented with small amounts of salts in 2-liter flasks. After about 17 days at 13° C, the cell count reaches about 30,000/ml. The cells are filtered and lysed with dilute HCl. The extract is then processed through carboxylic acid ion exchange resins and acid-washed alumina.

g. Physical and Chemical Properties.

- Physical state and color: Dihydrochloride salt is a white crystalline solid.
- Solubility: Very soluble in water, methanol, and to some extent in ethanol; insoluble in all lipid solvents.[107] The crystalline material is hygroscopic.

h. Method of Dissemination. Ingestion or injection, aerosolization.

i. Use. Lethal agent.

j. Physiological Effects. Saxitoxin produces widespread effects on the cardiovascular and respiratory systems, blocks nerve conduction, and paralyzes muscular contraction. Fundamental cause of death is respiratory failure. The poison acts directly on the muscle; it also has a central effect in paralyzing the medullary respiratory center. The poison does not have to be digested to be effective. Numbness of lips, tongue, and throat are noted before poisoned material is swallowed. Symptoms also include muscular weakness of limbs, slow and shallow respiration, lowered blood pressure, and brief convulsions. Final breaths are weak and gasping, and heart continues to beat for some time after breathing stops. Tolerance for the poison varies greatly among individuals.

k. Therapy. None known.

l. Storage. Stable for years in dry state or in acid solution; the solution must be refrigerated.

m. Toxicity. LD_{50} is 2 to 7 µg/kg for cats and rabbits, intravenously; 1.0 µg/kg for mice, intraperitoneally; and is 115 to 300 mouse units* for monkeys.

n. Historical.

- 1937: Identified by Sommer et al.
- 1957: Poison isolated by Schantz.
- 1960: Formula proposed by Schantz.

o. Detection. Only current method is death response in mice.

15. (U) Scopolamine Hydrobromide

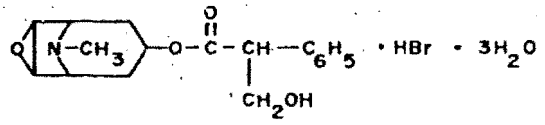
a. Code or Alternate Designations.

- Hyoscine hydrobromide.
- Scopos.

b. Class. Alkaloid, cholinolytic substance, hypnotic, plant poison.

c. Chemical Name. 6,7-Epoxytropine tropate.

d. Formula. $C_{17}H_{21}NO_4 \cdot HBr \cdot 3H_2O$



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*A mouse unit is defined as the amount of poison that will kill a 20 gm white mouse in 15 min when 1 ml of solution is injected intraperitoneally.

e. Molecular Weight. 438.32.

f. Method of Preparation. Extraction of levorotatory isomer from Solanaceae, especially Datura metel and Scopola carniolica, followed by bromination.

g. Physical and Chemical Properties.

- Physical state and color: Colorless, transparent crystals, or fine crystalline powder.
- Melting point: 195° C (anhydrous). Slightly efflorescent in dry air.
- Solubility: Soluble in water and alcohol; slightly soluble in chloroform; insoluble in ether.
- Other properties: Deteriorates if exposed to light.

h. Use. The drug is a hypnotic, sedative, central nervous system depressant, prophylaxis in motion sickness, and enhances the analgesic effects of narcotics.

i. Physiological Effects. The drug may cause mental excitement and delirium. There is a sedative and depressant action on central nervous system. Scopolamine has a stronger (muscarinic) action than atropine on the iris and certain secretory glands, but has a weaker action than atropine on heart, intestine, and bronchial muscles. Therapeutic doses sometimes produce hallucinations or delirium.

j. Dosage. 0.3 to 0.75 mg/man, orally.

k. Toxicity. LD_{50} is 5900 mg/kg for mice subcutaneously.[108]

l. Storage. Store in orange glass containers, away from light.

m. History. 1919: Prepared by King.

16. (U) ~~(U) (FD)~~ Staphylococcal Enterotoxin B

a. (U) Code or Alternate Designations.

- United States - PG (formerly UC)[12]

- Enterotoxin B
- Staphylococcus aureus toxin

b. (U) Class. Incapacitant. It is a non-lethal high-molecular-weight bacterial exotoxin.[98]

c. (U) Chemical Name and Formula.[96,109] Staphylococcal enterotoxin B is a high-molecular-weight protein elaborated by Staphylococcus aureus. This exotoxin contains about 252 amino acid residues and exists as a very compact, unhydrated molecule over a wide pH range. The precise arrangement and sequence of the amino acids have not been determined, but the purification of enterotoxin B has progressed to a stage permitting a complete amino acid analysis and biophysical characterization of the molecule. It has one disulfide bridge, but no free sulfhydryl group. Glutamic acid is its N-terminal residue, and lysine is the C-terminal residue.

d. (U) Molecular Weight. 35,380.[109]

e. (U) Source of Material. Enterotoxin B is one of four types of serologically distinct enterotoxins (Types A, B, C, and D) produced by certain strains of the common bacterial species, Staphylococcus aureus. These toxins are associated with massive outbreaks of acute food poisoning. The two common antigenic types of enterotoxin, Types A and B, produce similar, if not identical, symptomatic manifestations when administered by the oral route, and differ apparently only with respect to the specific antibodies produced by the animal host. Type B has been studied most extensively.[4]

f. (C-NFD) Methods of Preparation.[12,110]

(1) (C-NFD) (b)(1)

(b)(1)

(2) (C-NFD) (b)(1)

(b)(1)

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g. (U) Equipment Used. 40-gal fermenters.

h. (U) Physical and Chemical Properties.[109,111]

- Color: White fluffy powder.
- Solubility: Hygroscopic; very soluble in water and salt solutions.
- Isoelectric point: about pH 8.6.
- Diffusion coefficient: $(D^{\circ}_{20,w}) = 7.72 \times 10^{-7}$ cm^2.
- Sedimentation coefficient: $(S_{20,w}) = 2.78$ S.
- Extinction coefficient: $(E^{1\%}_{1cm}) = 14.0$.
- Maximum absorption: 277 mμ.
- Other properties; Resistant to heat. Retains activity after heating at 99° C for 87 min and after warming at 60° C, pH 7.3, for 16 hr.

i. (U) Method of Dissemination. Aerosol spray (because of its relative stability, enterotoxin B is easier to disseminate in aerosol form than botulinum toxin), ingestion.

j. (U) Use. Incapacitant.

k. (U) Physiological Effects.

(1) (U) Produces incapacitation at dosages that are far below the lethal dose. Incapacitation may occur with sufficient violence and persistence to immobilize a subject completely for several hours. Death rarely occurs in otherwise normal humans, but a few fatalities have been recorded.[98]

(2) (U) Ingestion of poison causes salivation, followed by nausea, vomiting, retching, abdominal cramps, and watery diarrhea. Fever and respiratory effects are absent. Symptoms appear in 1 to 6 hr following

ingestion of enterotoxin. The incubation period is influenced by dose and resistance of individual. Small amounts of toxin produce illness for about 24 hr; larger doses may produce incapacitation lasting several days. Although enterotoxin is believed to evoke its characteristic response in cats and monkeys by stimulating the vagal and sympathetic nerves, the nature of the inciting stimulus in the gut remains obscure.[4]

(3) (U) Intoxication by respiratory challenge is characterized by high fever, malaise, muscle and chest pains, headache, cough, nausea, and loss of appetite. Vomiting and diarrhea do not result. Onset of illness is abrupt, occurring within 2 to 8 hr after exposure; peak response time is given as 9 to 15 hr. The duration of action is 30 to 56 hr.[4,98]

l. (U) Therapy. Monkeys, repeatedly given enterotoxin B orally, became resistant to 200 times the minimum emetic dose of the toxin. Although no antitoxin was demonstrable in sera, it was believed to be responsible for the animal's resistance to the toxin. The immunizing capacity of enterotoxin B in humans is yet to be fully evaluated. Enterotoxin B has been treated with formalin to produce toxoid for the purpose of inducing active immunization.[98,111]

m. (U) Storage. Freeze-dried enterotoxin B, stored with a dessicant such as silica gel at 4° C for over 1 year, showed no loss in biological activity. The toxin is also stable to pH changes and can withstand temperatures of boiling water for 30 min.[98]

n. (C) Toxicity (in µg/kg).[4]

(b)(1)

(CONFIDENTIAL)

(b)(1)

o. (U) Persistence. Destroyed in soil in less than 2 hr; persists longer on surfaces such as painted wood or aluminum, especially out of sunlight.

p. (U) Detection. The preferred methods for the detection of enterotoxin are Oudin's single diffusion tube and the quantitative precipitin test. Other methods include Ouchterlony diffusion plates, hemagglutination inhibition, reversed passive hemagglutination, microlatex bead agglutination, and immunofluorescence.[111]

17. ~~(C)~~ (U) Tetrahydrocannabinol[4,84,112-114]

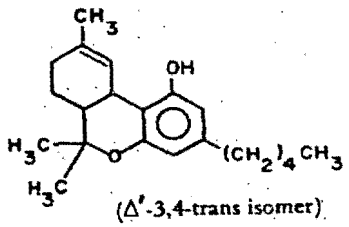
a. (U) Code or Alternate Designations.

- Cannabis.
- EA 1476 (United States).
- Hashish.
- Anasha.
- Karas (charas).
- Bhang.
- Dogga.
- Kif.
- Marijuana.
- THC.
- "Pot".
- Marihuana.

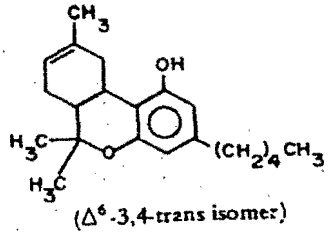
b. (U) Class. Incapacitating agent.

c. (U) Chemical Names. Mixture of Δ^1-3,4-tetrahydrocannabinol and Δ^6-3,4-tetrahydrocannabinol isomers.

d. (U) Formula. $C_{21}H_{30}O_2$

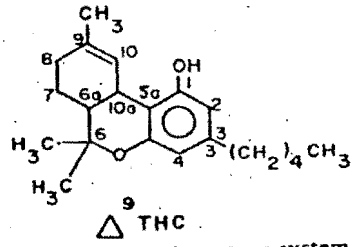


(Δ^1-3,4-trans isomer)



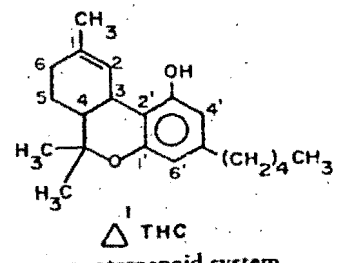
(Δ^6-3,4-trans isomer)

Two numbering systems are commonly used in the literature for naming THC-type compounds—the "pyran-type compound" numbering system and the monoterpenoid numbering system:



Δ^9 THC

pyran-type system



Δ^1 THC

monoterpenoid system

This handbook uses the monoterpenoid system.

e. (U) Molecular Weight. 314.5.

f. (U) Raw Materials.

(1) (U) Natural sources. Active constituents of dried flower tops of Cannabis sativa L. (India hemp). This hemp plant includes old name of C. indica Lam.

(2) (U) Synthesis.

- Citral ($C_{10}H_{16}O$).
- Methyl magnesium iodide (CH_3MgI).
- Lithium derivative olivetol dimethyl ether ($C_{13}H_{20}O_2Li$).

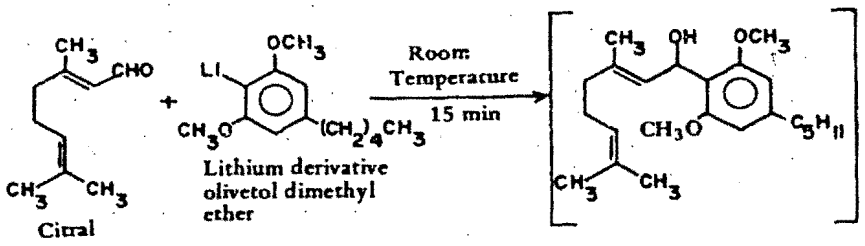
- Olivetol ($C_{11}H_{15}O_2$).
- *p*-Toluenesulfonyl chloride ($C_7H_7ClO_2S$).
- Boron trifluoride etherate [$(C_2H_5)_2O{\cdot}BF_3$].

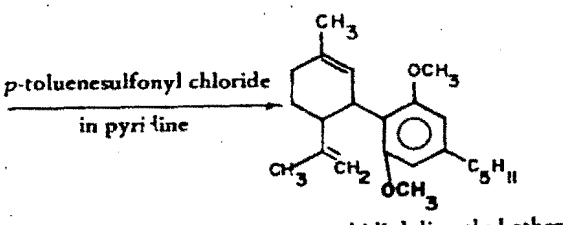
g. (U) Method of Manufacture.

(1) (U) Natural sources. Extraction from dried flower tops of Cannabis sativa L. Derived from "red oil" constant boiling fraction from petroleum ether extract. The major constituent found in nature is the Δ^1 isomer.

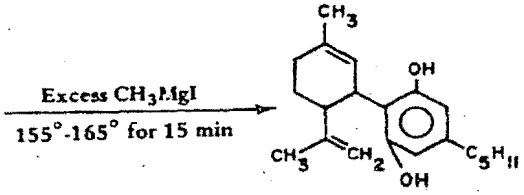
(2) (U) Synthesis.

(a) (U) Δ^1-isomer.[68]

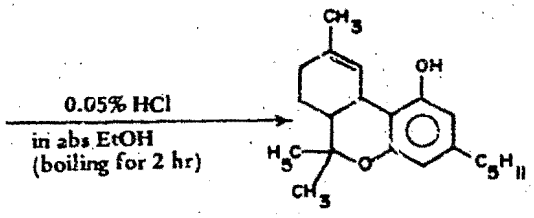




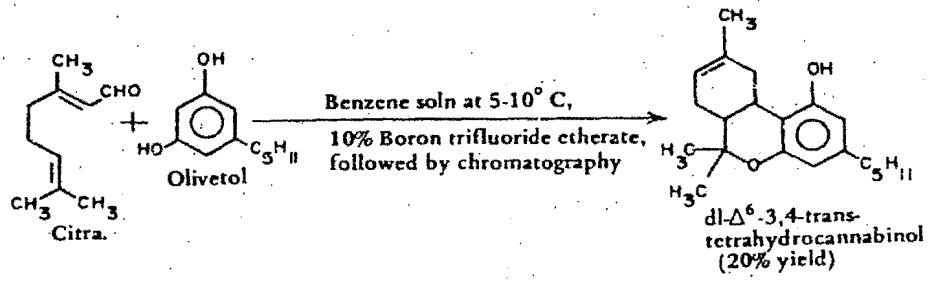
d,l-cannabidiol dimethyl ether



d,l-cannabidiol



(b) (U) Δ⁶-trans isomer.[113]



The product is identical to the natural Δ⁶-trans isomer isolated from hemp in all respects (nmr, ultraviolet, and infrared) except for optical activity. Note: A synthetic Δ³-trans isomer, which is not found in nature, was prepared. This compound possessed the physiological activity of marihuana.

h. (U) Equipment. Standard chemical processing equipment.

i. (U) Physical and Chemical Properties.

- Physical state and color: Colored crystalline or viscous resin oil. Discolored by light and oxygen.
- Boiling point: 185° C at 0.05 mm Hg.
- Melting point: 76° to 77° C.
- Other properties: Heat or acid treatment converts the Δ¹ isomer to the Δ⁶ isomer.

j. (U) Method of Dissemination. Aerosol.

k. (U) Use. Incapacitant.

1. (U) Physiological Effects. Tetrahydrocannabinol induces euphoria, relaxation, colored dreams, hallucinations, and disturbs body functions. Large doses lead to mental confusion, apprehension, and temporary psychoses. The effects of THC last for 6 to 48 hr. Large doses may cause "suspended animation" for as long as 3 days. A dose of 0.5 to 1.0 mg causes fatigue, thirst, and headache. A dose of 1.5 to 3.0 mg causes postural hypotension, loss of vision on standing, weakness, giddiness, and a slowing of motor activity. A dose of 3.5 to 4.0 mg causes marked psychomotor retardation; subject is unwilling or incapable of standing, unable to concentrate, and suffers blurring of vision. For doses greater than 2.8 mg, the subject is incapable of performing regular activities. THC is not habit forming.

m. (U) Therapy. d-Amphetamine (15 mg) counteracts sedation and the indifference induced by the cannabinols.[8]

n. (U) Decontamination. Unknown.

o. (U) Protection Required. Protective mask against aerosols and smoke.

p. (U) Storage. Store away from light and air.

q. (U) Persistence. Persistent.

r. (U) Detection. Unknown.

s. (C) (b)(1)

(b)(1)

(b)(1)

t. (U) Historical.

- Effects of marijuana have been known for 3000 years.
- 1942: A tetrahydrocannabinol isolated in an impure form and a gross structure suggested by H. J. Wollner and associates.
- 1949: (b)(6) and associates studied various analogs of tetrahydrocannabinol.
- 1965: Structure determination and total synthesis by (b)(6) and associates in Israel.
- 1966: Acid isomerization of tetrahydrocannabinol by (b)(6) and associates in the United States.

18. (U) Tetrodotoxin

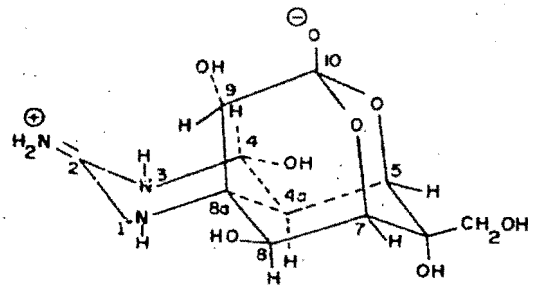
a. Code or Alternate Deisgnations.

- Fugu poison.
- Kai po.
- Puffer fish poison.
- Cutter poison.
- Tetraodon poison.
- Tarichatoxin.

b. Class. Nonprotein neurotoxin, fish poison.

c. Chemical Name. Aminoperhydroquinazoline derivative.

d. Formula. $C_{11}H_{17}N_3O_8$



Tetrodotoxin (zwitterion)

e. Molecular Weight. 319.3.

f. Method of Preparation. Obtained from organs (liver and ovaries) of the Japanese puffer fish, Spheroides rubripes, and from the embryos of the California newt, (salamander) Taricha torosa. The poison is extracted in boiling water.

g. Physical and Chemical Properties.

- Physical state and color: White crystalline solid. Crude material has a yellow color, and is tasteless.

- Solubility: Highly soluble in water and methanol; insoluble in most organic solvents.
- Melting point: Decomposes without melting; also decomposes at a pH less than 3 or greater than 7.[107]

h. Physiological Effects. Tetrodotoxin causes paralysis and blocks nerve impulses. In large doses, it depresses motor centers and blood pressure. First symptoms occur from 30 min to 4½ hr after ingestion. Poisoning is characterized by the rapid onset of symptoms: tingling or prickling sensation in fingers and toes gradually progressing to numbness; eyes do not react to light; pulse is slow; heartbeat faint; temperature drops; weakness; dizziness; pallor; and numbness of lips, tongue, and throat. Nausea, anxiety and vomiting are frequently seen. Heavy perspiration, increased salivation, pain on respiration, muscular weakness, and hypotension are often experienced. In severe poisoning, the victim may complain of "numbness all over," and a feeling of "floating in air." In fatal cases, severe respiratory distress, marked hypotension, cyanosis, paralysis, and small hemmorhages may develop. In most fatal cases, death occurs 6 to 24 hr after ingestion of the toxic fish.

i. Method of Dissemination. By ingestion or injection.

j. Use. Lethal agent.

k. Therapy. No known antidote; treatment is strictly symptomatic. Ingestion of large quantities of sodium bicarbonate is recommended.

l. Toxicity.[107]

(1) Mouse -- LD_{50} is 14 µg/kg, subcutaneously; 11 µg/kg, intraperitoneally; and 10 µg/kg, intravenously.

(2) Rat -- LD_{50} is 14 µg/kg, subcutaneously; 12 µg/kg, intraperitoneally; and 10 µg/kg, intravenously.

(3) Rabbit -- LD_{50} is 10 µg/kg, subcutaneously; and 2 µg/kg, intravenously.

(4) Cat -- MLD is 2 µg/kg, intravenously.

(5) Dog -- MLD is 15 µg/kg, subcutaneously.

m. Historical.

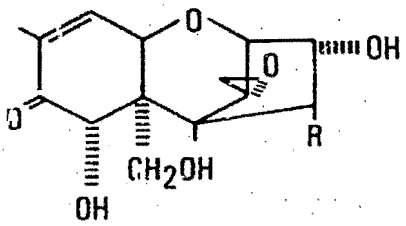
- 1909: Isolated from puffer fish by Tawara (Japan).
- 1964: Structure identified by Tsuda, Goto, Hirata (Japan).

★19. Trichothecenes (U)[192]

a. (U) Code or Alternate Designation (U). Yellow rain.

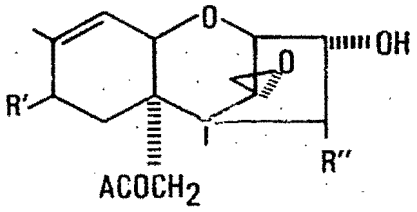
b. (U) Class (U). Nonprotein mycotoxin.

c. (U) Chemical Names and Formulas (U). The trichothecenes are a family of approximately 60 naturally occurring sesquiterpenoids. The basic ring system of the trichothecene mycotoxins is named trichothecane. All of the naturally occurring trichothecenes contain an olefinic bond at carbons 9 and 10, and are known as 12, 13-epoxytrichothecenes. The trichothecenes of most interest are:



NIVALENOL, R = OH

DEOXYNIVALENOL, R = H



T-2 TOXIN : R' = $O\overset{O}{\overset{\|}{C}}CH_2\,CH(CH_3)_2$; R'' = OAc

HT-2 TOXIN : R' = $O\overset{O}{\overset{\|}{C}}CH_2\,CH(CH_3)_2$; R'' = OH

DIACETOXYSCIRPENOL (DAS) : R' = H ; R'' = OAc

d. (U) Method of Preparation (U). The production of the various trichothecenes employs Fusarium species and depends upon the type of substrate, temperature, and duration of cultivation. T-2 toxin production is promoted by incubation at temperatures of 15°C or below. Most of the trichothecene-producing fungi are grown for toxin production at 24°C.

e. (U) Natural Occurrence (U). The main substrates on which trichothecenes are produced are cereals, leguminous crops, sweet potatoes, cabbage, and hay. Naturally occurring levels of trichothecenes are around 2 ppm; the largest quantity found to occur spontaneously was 71.5 ppm.

f. (U) Physical and Chemical Properties (U). The naturally occurring trichothecenes are colorless, crystalline, optically active solids. Impure preparations can be colored. Trichothecenes are generally soluble in alcohol, acetone, ethyl acetate, and chloroform. Only the highly hydroxylated derivatives have significant water solubility. They do not absorb strongly

in the UV, do not fluoresce, and are difficult to separate from complex biological mixtures. The trichothecenes are stable in solution and may be stored as a solid for years at room temperature with no loss of activity. Heating for 1 hour at 100°C also produces no decrease in activity.

g. (U) Physiological Effects (U). They produce headaches, chills, nausea, vomiting, vertigo, and visual disturbances. Trichothecenes cause alimentary toxic aleukia, the symptoms of which include vomiting, skin inflammation, multiple hemorrhaging, diarrhea, and leukopenia. Rapid onset of vomiting along with severe itching and tingling of the skin are characteristics of trichothecene intoxication.

h. (U) Detoxification (U). This can be accomplished with strong mineral acid.

i. (U) Method of Dissemination (U). Dissemination can be by rockets, or by spray tanks, mortars, and/or artillery shells.

j. (U) Use (U). Lethal agent, terrorizing agent.

k. (U) Therapy (U). Opiates help reduce the fluid loss in adults.

l. (U) Toxicity (U). In general, the LD_{50}'s in laboratory animals range from 0.1 mg/kg to > 1000 mg/kg.

(1) (U) LD_{50} intraperitoneally in mice:

Toxin	mg/kg
T-2	5.2
HT-2	9.0
DAS	23.0
Nivalenol	4.1
Deoxynivalenol	70.0

(2) (U) Toxicity of T-2 in cats:

- The LD_{50} is 0.5 mg/kg, subcutaneously
- The ED_{50} for vomiting is 0.1 mg/kg subcutaneously
- The ED_{50} for skin irritation is 0.1 - 0.9 mg/kg

m. (U) Historical (U).

- In 1944, many Soviet citizens were killed by trichothecene-contaminated grain
- In 1946, the first trichothecenes were isolated (Brian and McGowan)

Section X.

SCREENING SMOKES

1. (U) General[5]

a. Screening smokes are used to conceal all types of troop movements and installations in combat zones and rear areas. The obscuring action of the smoke is due to the reflection and refraction of the light rays striking the particles comprising the smoke. The optimum particle size has an equivalent diameter of one micron (10^{-4} cm).

b. There are several factors which affect the life or persistency of a smoke. Water vapor plays an important role by improving the effectiveness of most smokes, either by hydrolysis or by hydrating hygroscopic smoke particles to effective size.[8] Wind, convection currents, and ambient temperature also have strong effects on smoke characteristics.

c. Smoke may be generated by mechanical or thermal techniques, or by a combination of these techniques.

2. (U) Berger Mixture

a. Code or Alternate Designations. None.

b. Class. Smoke agent.

c. Chemical Name. Zinc smoke.

d. Raw Materials and Composition.

- Finely divided metallic zinc (Zn)--25%.
- Kieselguhr (absorbent)--5%.
- Carbon tetrachloride (CCl_4)--50%.
- Zinc oxide (ZnO)--20%.
- Igniting composition (iron dust, potassium permanganate, and match head).

e. Physical and Chemical Properties. The mixture is a smooth dough-like paste. It is chemically inert and entirely harmless until ignited; it could not be fired even if hit by projectiles. Upon ignition, the zinc reacts with carbon tetrachloride to produce zinc chloride, carbon, and heat (1200° C); the heat evaporates the zinc chloride to form a dense cloud of light gray smoke. A disadvantage of this smoke mixture is the high temperature produced by the reaction with resulting spark dispersion that can cause fires.

f. Methods of Dissemination. Smoke candles only, because mixture is too slow in igniting for smoke grenades, artillery shells, or airplane bombs. To prepare the smoke candles, three pounds of the pasty mixture are pressed into a can about the size of a large tomato can, and then covered with a layer of igniting material.

g. Physiological Effect. None.

h. Decontamination. Not necessary.

i. Protection Required. There is no physiological action which requires protection in a normal encounter; however, under prolonged exposure a protective mask should be worn because the zinc chloride may produce toxic effects.

j. Storage. The mixture can be stored for long periods without deterioration; occupies small storage space; and is easy to transport, handle and operate.

k. Toxicity. Lowest irritant concentration is 100 mg-min/m^3.

l. Total Obscuring Power. (See glossary) 256 m^2/kg (1250 ft^2/lb).

m. Historical. Prepared by the French chemist Berger.

3. (U) BM Mixture

a. Code or Alternate Designations. None.

b. Class. Smoke agent.

c. Chemical Name. Zinc smoke.

d. Raw Materials and Composition.

(1) Standard Mixture:

- Sodium chlorate ($NaClO_3$)--9.3%.
- Zinc dust (Zn)--35.4%.
- Ammonium chloride (NH_4Cl)--5.4%.
- Carbon tetrachloride (CCl_4)--41.6%.
- Magnesium carbonate ($MgCO_3$)--8.3%.

(2) Fast Mixture:

- Sodium chlorate ($NaClO_3$)--24.9%.
- Zinc dust (Zn)--30.2%.
- Zinc oxide (ZnO)--9.8%.
- Carbon tetrachloride (CCl_4)--35.1%.

(3) Starter Mixture #1:

- Zinc dust (Zn)--63.1%.
- Zinc oxide (ZnO)--16.2%.
- Powdered sulfur (S)--20.7%.

(4) Starter Mixture #2:

- Powdered iron (Fe)--46.6%.
- Potassium permanganate ($KMnO_4$)--53.4%.

e. Physical and Chemical Properties. The mixture produces a dense white smoke with better handling qualities than Berger Mixture. It is less easily dissipated or disturbed by air currents.

f. Method of Dissemination.

(1) Smoke candles, grenades, floating pots for naval use.

(2) The pastelike Standard and Fast mixtures are packed into the munition and covered with both starter mixtures. Starter mixture #2 receives the flash from the igniting match head, burns through the igniting cup and ignites starter mixture #1, which starts the reaction.

g. Physiological Effect. None.

h. Decontamination. Not necessary.

i. Protection Required. None necessary.

j. Storage. Stable for long periods if container is airtight.

k. Total Obscuring Power. 286 m^2/kg (1400 ft^2/lb).

l. Historical. 1917: US improvement of original Berger Mixture, prepared by Bureau of Mines personnel.

4. (U) British Type S Mixture

a. Code or Alternate Designations. None.

b. Class. Smoke agent.

c. Chemical Name. None.

d. Raw Materials and Composition.

(1) Smoke Torch, Mark I, Type S:

- Potassium nitrate (KNO_3)--45%.
- Borax ($Na_2B_4O_7 \cdot 10H_2O$)--9%.
- Sulfur (S)--12%.
- Glue--4%.
- Pitch--30%.

(2) Smoke Candle, Mark II, Type S-1:

- Potassium nitrate (KNO_3)--40%.
- Borax ($Na_2B_4O_7 \cdot 10H_2O$)--8%.

- Sulfur (S)--14%.
- Coal dust--9%.
- Pitch (hard)--29%.

e. Physical and Chemical Properties. The mixture burns vigorously for about 3 min and generates a large volume of yellowish brown smoke due to incomplete combustion of solid carbon particles in the pitch. Screening properties are unreliable since smoke has a tendency to rise rapidly, break up, and leave gaps in the smoke screen. Nevertheless, the mixture is cheap, easily produced from readily available materials, and stable.

f. Method of Dissemination. Candles were used in large quantities through World War I by both British and American armies.

g. Physiological Effect. None.

h. Decontamination. Not necessary.

i. Protection Required. None necessary.

j. Storage. Stable in storage.

k. Total Obscuring Power. 94 m^2/kg (460 ft^2/lb).

l. Historical. First material used in World War I for the generation of artificial smoke on land.

5. (U) Crude Oil

a. Code or Alternate Designations. United States -- CO; Fog oil SGF1 and SGF2 (MIL-F112070H, screening smoke, Standard A).[12]

b. Class. Smoke agent.

c. Chemical Name. Mixture of paraffin hydrocarbons.

d. Physical and Chemical Properties of SGF2.[8]

- Flash point: 160° C.
- Ignition temperature: 207.2° C.

- Viscosity: 25 sec at 37.7° C. Below 0° C, a mixture of SGF2 oil and paraffin (wax)-free kerosene is used.
- Specific gravity: 0.8.
- Solubility: Soluble in gasoline and benzene.

e. Method of Dissemination. The Crude oil may be vaporized in a generator by heat from a fuel burner. When the vaporized smoke oil enters the cool surrounding air, the oil vapor is cooled so rapidly that only very small liquid droplets are able to form. The final smoke cloud, which appears to be white, is quite stable. However, oil that is partially burned results in the separation of solid particles of carbon which, at first, tend to float in air to produce a dense smoke; later, the carbon particles coagulate into flakes that quickly settle out and drop to the ground. This type of smoke has poor screening value. Other smokes, intermediate in character, are also in use. In these smokes, the solid carbon particles surround the liquid droplets and thus are prevented from coagulating into flakes. It is grayish black in color and is much more stable. Fifty-six grams of crude oil is said to produce 28 m^3 (1000 ft^3) of smoke at a cost of 8 cents.

f. Use. Used by all navies for smoke screens at sea; also used for smoke generation on land.

g. Physiological Effect. Slightly suffocating when dense. No other effects.

h. Decontamination. None necessary.

i. Storage. Very stable. It is not affected by humidity and is non-corrosive to material.

j. Persistence. Summer -- while source is operating and 5 min after.

k. Protection. Protective masks when exposed to high concentrations for prolonged periods.[8]

l. Total Obscuring Power. 41 m^2/kg (200 ft^2/lb).

m. Historical. 1915: First used by Germans in the Battle of Jutland. Produced by incomplete combustion of crude-oil fuel under boilers of naval ships, especially destroyers.

(U)

6. (C-NFD) HC Mixture

a. (U) Code or Alternate Designations. United States -- HC.

b. (U) Class. Smoke agent.

c. (U) Chemical Name. Zinc smoke.

d. (U) Composition.

- Hexachloroethane (Cl_3CCCl_3)--46.7%.
- Grained aluminum--6.7%.
- Zinc oxide (ZnO), absorbent--46.7%.

e. (C-NFD) Reaction.

(b)(1)

(b)(1)

f. (U) Physical and Chemical Properties. HC has a slightly acrid odor. Solid hexachloroethane is substituted for and found to be superior to carbon tetrachloride in Berger's Mixture. By reducing the aluminum content, but keeping the proportions of hexachloroethane and zinc oxide constant, the amount of carbon appearing in the smoke is reduced due to the formation of carbon monoxide. The zinc chloride rapidly absorbs moisture from air to form particles of effective size.

g. (U) Methods of Dissemination.[6]

(1) (U) Smoke candles, grenades, smoke pots, artillery and mortar shells, and aerial bombs.

NO FOREIGN DISSEM

(2) (U) A typical starter mixture is composed of silicon, potassium nitrate, charcoal, iron oxide, grained aluminum, cellulose nitrate, and acetone.

h. (U) Physiological Effect. Smoke has no physiological action, except that high concentrations of $ZnCl_2$, during prolonged exposure, may be toxic.

i. (U) Decontamination.[5] Water or alkaline solutions.

j. (U) Protection Required. Protective masks, when subjected to exceedingly high concentrations of $ZnCl_2$.

k. (U) Storage. Very stable during storage, if it has a total moisture content of 0.6% or less. Stable in steel drums.

l. (U) Historical. Produced in United States as an improvement over Berger Mixture.

7. (C) Radar and Infrared Screening Smokes[9,16]

(b)(1)

8. (U) Soviet Smoke Mixtures[115,116]

a. Anthracene Mixture.

(1) Code or alternate designations. None known.

(2) Class. Smoke agent (screening).

(3) Chemical name. Mixture.

(4) Composition.

- Potassium chlorate ($KClO_3$), an oxidizing agent--41.9%.

NO FOREIGN DISSEM

- Ammonium chloride (NH_4Cl), a coolant--40.2%.
- Crude anthracene [$(C_6H_4CH)_2$], the smoke agent--17.8%.
- Inert material--0.1%.

(5) Physical and chemical properties. The mixture is a yellow-brown to grayish-green solid which is very soluble in water.

(6) Method of dissemination.

(a) Smoke pots (for example: DM-11, DB-11, BDSh-5), smoke barrel (for example: DSh-100).

(b) The mixture is wet loaded into cans or drums in three layers, and will not burn if packed in one solid mass. When ignited, it burns for 6 1/2 to 10 min depending on the size of container and gives off a grayish to white smoke.

(c) The primer in these munitions consists of 41.5% lead thiocyanate, 49.6% potassium chlorate, and 8.9% inert binder. It is contained in a cardboard tube waterproofed with a red lacquer covering. A booster composed of black powder, potassium chlorate, shellac (rosin), and inert material is pressed into a yellow cylindrical pellet with a red cap.

(7) Use. Screening smoke.

(8) Therapy. Soviets have antismoke ampoules, containing a mixture of ethanol, chloroform, ether, and ammonia water, for relieving the effects of smoke irritation.[16]

(9) Storage. Reasonably stable, if kept dry and not subjected to rough handling.

b. Smoke Oil. The principal mixture is made of 70% inexpensive waste products of the petroleum industry and 30% fuel oil. It is disseminated in a generator to produce a stable black smoke with satisfactory screening properties. The smoke is non-irritating to humans, is not corrosive, and does not have storage, handling, and transport problems associated with liquid smoke agents.[16]

c. Miscellaneous Smoke Mixtures.

(1) Code or alternate designations. See below.

(2) Class. Smoke agent (screening).

(3) Chemical name. (Mixtures).

(4) Composition.

	Yershov		Samkov	Gorbev	English
	Mixture I	Mixture II	Mixture	Mixture	Mixture
Ammonium chloride	50%	40%	---	23%	---
Naphthalene	20	20	41%	---	---
Potassium chlorate	20	20	51	67	---
Potassium nitrate	---	10	---	3	40%
Birch charcoal	10	10	8	7	9
Petroleum coal tar	---	---	---	---	29
Sulfur	---	---	---	---	14
Borax	---	---	---	---	8

(5) Physical and chemical properties. The mixtures are dark solids of a rather primitive composition. The smoke produced has a slight concealing power and tends to settle out quickly with loss of effectiveness. Yershov Mixture No. II burns faster than Mixture No. I.

(6) Method of dissemination. Smoke candles.

(7) Storage. No information available, but it is believed to be reasonably stable during storage.

9. (U) Sulfur Trioxide-Chlorosulfonic Acid Mixture

a. Code or Alternate Designations.

- United States -- FS.
- United Kingdom -- CSAM.
- USSR -- S4.
- Germany -- Nebelsaure.

b. Class. Smoke agent.

c. Composition. 55% sulfur trioxide (SO_3) + 45% chlorosulfonic acid (SO_3HCl) solution.

d. Raw Materials.

- Sulfur dioxide (SO_2).
- Gaseous hydrogen chloride (HCl).
- Oxygen (O_2).
- Sponge platinum (Pt).

e. Method of Manufacture of Chlorosulfonic Acid.

$$2SO_2 + O_2 \xrightarrow[Pt]{400\text{-}450^\circ C} 2SO_3$$

$$SO_3 + HCl \longrightarrow SO_3HCl$$

f. Physical and Chemical Properties.

- Odor: Acrid.
- Physical state: Liquid.
- Specific gravity: 1.91 at 20° C.[8]
- Melting point: -30° C.

- Decomposition temperature: about 68° C.[8]
- Solubility: Soluble in strong sulfuric acid; reacts violently with water.
- Hydrolysis: Chlorosulfonic acid hydrolyzes instantaneously to form HCl and H_2SO_4; SO_3 adds water to form H_2SO_4.[8]

g. Method of Dissemination.[5,8] Cylinders under gas pressure, bombs, airplane spray tanks, artillery and mortar shells.

h. Physiological Effect. The liquid burns the skin like strong acid and the smoke causes a prickling sensation on skin. Prolonged exposure may cause severe irritation to eyes and respiratory tract.

i. Decontamination.[5,8] Wipe off liquid with dry cloth, and flush with large amounts of water. Alkali, in solid form or in solution, or hot soapy water may also be used.

j. Protection Required. None for ordinary smoke, protective mask for high concentrations, and rubber gloves for handling liquid.

k. Storage. Stable in steel containers if dry, using steel stoppers and asbestos gaskets; highly corrosive on metals and airplane fabrics.

l. Persistence. Only while container is operating.

m. Total Obscuring Power. 615 m^2/kg (3000 ft^2/lb).

10. (U) Sulfuric Anhydride

a. Code or Alternate Designations. None.

b. Class. Smoke agent.

c. Chemical Name. Sulfur trioxide.

d. Formula. SO_3

e. Raw Materials.

- Sulfur dioxide (SO_2).

- Oxygen (O_2).
- Sponge platinum (Pt) (catalyst).

f. Method of Manufacture.

$$2SO_2 + O_2 \xrightarrow[Pt]{400\text{-}500^\circ C} 2SO_3.$$

g. Physical and Chemical Properties.

- Physical state and color: Colorless liquid, or transparent solid.
- Odor: Acrid suffocating odor.
- Solubility: Soluble in phosphorus oxychloride ($POCl_3$) and in H_2SO_4.
- Boiling point: 45° C.
- Melting point: 16.8° C. Polymerizes spontaneously into an asbestoid crystalline mass of $(SO_3)_2$, which melts at 40° C into liquid commercial product.
- Specific gravity (liq.): 1.92.
- Specific gravity (solid): 2.3.

h. Method of Dissemination. Artillery shells, airplane spray.

i. Use. On contact with air it fumes vigorously and throws off dense white clouds composed of minute droplets of sulfuric and sulfurous acids.

j. Physiological Effect. Irritant effect on respiratory organs and skin. Causes a hacking cough, which is much aggravated in higher concentrations.

k. Decontamination. Cold water.

l. Protection Required. None necessary.

m. Storage. Stable, if dry.

n. Toxicity. Concentration of 0.010 mg/l causes a hacking cough.

o. Persistence. Winter and summer -- While container is operating.

p. Total Obscuring Power. 615 m^2/kg (3000 ft^2/lb).

11. (U) Sulfuryl Chloride

a. Code or Alternate Designations. None.

b. Class. Smoke agent.

c. Chemical Name. Sulfuryl chloride.

d. Formula. SO_2Cl_2

e. Molecular Weight. 134.98.

f. Raw Materials.

- Chlorosulfonic acid (SO_3HCl).
- Mercury salts (catalyst).

g. Method of Manufacture.

$$2SO_3HCl \xrightarrow[70°C]{Hg\ salts} H_2SO_4 + SO_2Cl_2.$$

h. Physical and Chemical Properties.

- Physical state and color: Colorless liquid with extremely pungent odor, turns yellow on prolonged standing.
- Boiling point: 69.1° C.
- Melting point: -54.1° C.
- Solubility: Miscible with benzene, toluene, ether, and glacial acetic acid; decomposes slowly in cold water but rapidly and vigorously in hot water with the formation of sulfuric and hydrochloric acids.

- Specific gravity: 1.67 at 20° C.
- Vapor density: Vapor is 4.6 times heavier than air.

i. Method of Dissemination. Howitzer and mortar shells.

j. Use. As a smoke agent.

k. Toxicity. None.

l. Physiological Effect. Vapors corrosive to skin and mucous membrane.

m. Decontamination. None necessary.

n. Protection Required. Protective mask if vapor concentration is heavy. Avoid contact with liquid.

o. Storage. Stable, if kept air free and dry; slightly corrosive to iron.

p. Historical. 1926: Prepared by Danneel in Germany and Durrans in United Kingdom.

12. (U) Titanium Tetrachloride

a. Code or Alternate Designations.

- United States -- FM.
- Germany -- F-Stoff.

b. Class. Smoke agent.

c. Chemical Name. Titanium tetrachloride.

d. Formula. $TiCl_4$

e. Molecular Weight. 189.71.

f. Raw Materials.

- Rutile (Titanium dioxide, TiO_2).

- 30% Carbon (C).
- Gaseous chlorine (Cl_2).

g. Method of Manufacture.

$$TiO_2 + 2C \xrightarrow{650°C} TiC + CO_2.$$

$$TiC + 2Cl_2 \xrightarrow{heat} TiCl_4 + C.$$

h. Equipment. Electric furnace.

i. Physical and Chemical Properties.

- Physical state and color: Colorless, highly refractive liquid, with acrid odor.
- Boiling point: 136° C.
- Freezing point: -25° C.
- Solubility: Soluble in ethylene dichloride and dilute HCl.
- Specific gravity: 1.7 at 20° C.[8]
- Hydrolysis: Reacts vigorously with moisture in air with the evolution of dense clouds of acrid white smoke. Hydrolysis products are solid $TiOCl_2$, HCl; some $Ti(OH)_4$ if sufficient water is present. The formation of solid products in airplane smoke tanks causes difficulty during dissemination because of orifice clogging.[8]

j. Methods of Dissemination. Artillery and mortar smoke shells, bombs, special munitions.

k. Physiological Effect. Smoke is irritating to the respiratory tract, and may burn skin due to the HCl resulting from hydrolysis.

l. Decontamination. Any alkali solid or solution.

m. Protection Required. Protective masks needed for heavy concentrations.

n. Storage. Stable, if dry and in steel containers.

o. Total Obscuring Power. 390 m^2/kg (1900 ft^2/lb).

p. Historical. Introduced by the Allies near the end of World War I as a substitute for tin and silicon tetrachlorides.

13. (U) White Phosphorus

a. Code or Alternate Designations.

- United States -- WP (MIL-C-215B, Screening smoke, Standard A). PWP is plasticized white phosphorus (MIL-P-337C, Screening smoke, Standard A).
- USSR -- R-4(?), KS (mixed with sulfur).

b. Class. Smoke agent.

c. Chemical Name. Phosphorus. (White or yellow).

d. Formula. P_4 (gas).

e. Molecular Weight. 123.9.

f. Raw Materials.

- Calcium phosphate [$Ca_3(PO_4)_2$].
- Silicon dioxide (SiO_2).
- Carbon.

g. Method of Manufacture.

$$Ca_3(PO_4)_2 + 3SiO_2 + 5C \longrightarrow 3CaSiO_3 + 5CO + 2P$$

h. Equipment. Electric furnace.

i. Physical and Chemical Properties.

- Physical state and color: White, waxy solid, turns yellow on contact with light.
- Odor: Odor of burning matches.
- Boiling point: 280° C.
- Melting point: 44° C.
- Solubility: Soluble in carbon disulfide, benzene, and ether.
- Density of solid: 1.8 g/cc at 20° C.
- Other properties: Chemically, WP is very active and combines readily with oxygen in air to form phosphorus pentoxide (P_2O_5), and in the presence of water, H_3PO_4.[8] The greater the surface exposed to air, the more rapid the reaction. Upon oxidation, phosphorus becomes luminous and in a few minutes bursts into vigorous flames that can only be quenched by complete submersion in water. Phosphorus is a better smoke producer, pound for pound, than any of the other known smokes. In use, it has some disadvantages: difficulties during storage and in handling, the bright flame that is produced upon burning, the need to dissolve WP in highly flammable and dangerous solvents when used as a spray, the tendency for WP to splinter readily into small particles which burn very rapidly, and its tendency to produce a pillaring effect.

j. Method of Dissemination.[6] Grenades (hand and rifle), artillery shells, mortars, aerial bombs, aerial spray, incendiary projectiles, rockets, incendiary flasks.

k. Use. As a smoke agent phosphorus may be used either dissolved in carbon disulfide (CS_2), or mixed with sublimed sulfur. It is effective as an antitank weapon.[12]

l. Physiological Effect. Solid particles burn flesh; vapor is very poisonous, but it oxidizes so rapidly as to be harmless in field concentrations. The smoke is relatively harmless.

m. Decontamination. None needed. $CuSO_4$ as well as dousing with water to stop burning of particles.

n. Protection Required. None needed against smoke; fireproof suits needed against burning particles.

o. Storage. Stable out of contact with oxygen. Stored under water in concrete tanks or in steel drums; should be stored in isolated areas away from the direct rays of the sun. Its low melting point sometimes causes WP to melt in stored munitions. To overcome its poor storage characteristics, plasticized WP was developed; it is formed by mixing WP in water with a viscous solution of synthetic rubber. The rubbery mass of plasticized WP is dispersed by an exploding munition to produce a smoke less prone to the pillaring effect observed with standard WP.[8]

p. Persistence. Winter and summer -- while container is operating.

q. Total Obscuring Power. 940 m^2/kg (4600 ft^2/lb).

Section XI.

FLAME AND INCENDIARY AGENTS[8,12]

1. (U) General

a. Flame agents are considered antipersonnel agents which cause lethal or incapacitating effects on target personnel by means of direct burn wounds, depletion of oxygen, carbon monoxide poisoning, heat, or a combination of these factors. Flame munitions include flamethrowers and firebombs.

b. Incendiary agents are considered antimateriel agents which generate sufficient heat to cause destructive thermal degradation or destructive combustion of target materiel. Incendiary munitions include bullets, mortars, artillery shells, bombs, and grenades.

c. In some cases, it is difficult to differentiate between flame (antipersonnel) and incendiary (antimateriel) agents because the effects may be a combination of both.

2. (U) ~~(U)~~ Flame/Incendiary Agents

(U) These agents are classified according to their composition: i.e., hydrocarbon fuels with or without thickeners, metal fuels, hydrocarbon-metal fuel combinations, and pyrophoric aluminum alkyls with thickeners. White phosphorus, which is primarily a screening smoke (Standard A) but may also be considered a flame and incendiary agent, is placed under pyrophoric fuels. Thickened fuels generally are used in mechanical and portable flamethrowers as well as in incendiary bombs; unthickened or less thickened fuels may be used in portable flamethrowers where thickened fuel is not available or in jungle operations where maximum range is not required.

a. (U) ~~(U)~~ US Standard and Non-standard Fuels.

(1) (U) Hydrocarbon fuels.

(a) (U) Incendiary oil: Iso (Standard A). Composed of gasoline and thickener M4 aluminum soap; it is field mixed. It is used in flamethrowers and firebombs.

(b) (U) Incendiary oil: NP2 (Standard A). Composed of gasoline and thickener M2 aluminum soap; it is field mixed. It is used in flamethrowers and firebombs.

(c) (U) Incendiary oil: NP (Standard B). Composed of gasoline and thickener M1 aluminum soap; it is field mixed. It is used in flamethrowers and firebombs.

(d) (U) Incendiary oil: 1M (Standard B). Polymer AE (isobutyl methacrylate) is added to a mixture of gasoline and other substances to form various 1M incendiary oil mixtures by plant mixing. An example of such a mixture is Type I incendiary oil containing polymer AE, stearic acid, calcium oxide, gasoline, and water (5:3:2:88.75:1.25).

(e) (U) Napalm B (Non-standard). Composed of gasoline (33%) polystyrene (46%), and benzene (21%). It is used in firebombs. It is unsuitable for cold weather employment.

(f) (U) Westco gel (Non-standard). Composed of hydrocarbon fuels thickened by in situ formation of sodium soap by the reaction of polyunsaturated fatty acids with aqueous NaOH. It is used in firebombs.

(2) ~~(C)~~ (U) Metal fuels.

(a) ~~(C)~~ (U) Magnesium incendiaries.

- (U) Magnesium metal. At its ignition temperature (623° C) it burns vigorously in air to produce temperatures of about 2000° C. Magnesium may be used in pure form, either solid or powdered. In massive form, magnesium is difficult to ignite, but this problem may be overcome by packing a hollow core in the bomb with thermate and an easily ignitable mixture.

- (b)(1)

(b)(1)

(b) (U) Thermite and thermate incendiaries.

- Thermite: TH1 (Standard B). Composed of ferric oxide (73%) and granular aluminum (27%). Used in incendiary bombs, particularly as a component in igniting compositions for magnesium bombs; ignites at approximately 1200° C and burns at approximately 2200° C. The fire may be smothered with dry graphite, sodium bicarbonate, sodium chloride, or dolomite mixtures. With various additives, it is used as a component in igniter compositions for magnesium bombs.

- Thermate: TH3 (Standard A). Composed of thermite (68.7%), barium nitrate (29.0%), sulfur (2.0%), and oil binder (0.3%). Used in incendiary bombs. TH3 was found to be superior to TH1 in incendiary magnesium bombs.

- Thermate: TH4 (Standard A). Composed of iron oxide (51%), barium nitrate (22%), aluminum (22%), and polyester resin (5%). Used in incendiary bombs.

(3) ~~(c)~~ Composite hydrocarbon-metal fuels.

(b)(1)

(b) (U) PT1 incendiary mixture (Standard B). A mixture composed of 49% Type C "goop," 3% petroleum oil extract, 10% coarse magnesium, 30% gasoline, 5% sodium nitrate, with 3% isobutyl methacrylate polymer (AE) as thickener. It is a soft, black, and homogeneous mixture that can be disseminated by the use of incendiary bombs. It is stable and flammable. The "goop" is a paste consisting of magneisum dust, magnesium oxide, carbon, some petroleum distillates, and asphalt.

(c) (U) PTV incendiary mixture (Standard A). An improved oil and metal incendiary. It is composed of 5.9% polybutadiene, 28% magnesium powder, 6% sodium nitrate, 60% gasoline, and 0.1% *p*-aminophenol. It can withstand an HE charge in an incendiary bomb whereas other gels have a tendency to break up after an explosion. The components of the mixture can be combined very simply and is adaptable to continuous mixing and loading.

(4) ~~(c)~~ Pyrophoric fuels.

(b)(1)

(b) (U) White phosphorus. See "Screening Smokes," sec X, para 13. The advantage of this agent as an incendiary material is its ability to ignite spontaneously, but it also has a relatively low combustion temperature (1000° C). Also employed for ignition of thickened hydrocarbon fuels in firebombs as in igniter, WP (Standard A).

b. (C) Experimental Flame/Incendiary Agents

(b)(1)

(2) (U) Flamex agent: Flame - explosion couple system--composed of a thickened hydrocarbon fuel containing solid oxidizer explosive (hydrazine nitrate) and a suspended solid explosive primer, which produces a predetermined burn period followed by an explosion.

(3) (U) Nitrile flame agent: A flame agent system--composed of acrylonitrile gelled with a terpolymer containing carboxylic acid groups reactive with an organic crosslinker compound, and produces an improved conductive heat flux.

(4) (U) Hypergolic fuel - oxidizer combinations: A binary flame agent system--consisting of selected thickened fuels and oxidizing agents capable of hypergolic reaction, and producing a high radiant heat flux. Fuels could be hydrazine or alkyl-borane compounds; oxidizers could be nitrogen tetroxide, tetranitromethane, or fuming nitric acid (RFNA, IRFNA, WFNA).

(5) (U) Composite oxygenated compound agent: An incendiary agent based on nitrocellulose - gelled alkoxyethanol compounds, of improved combustion efficiency compared to hydrocarbons, and containing suspended magnesium and aluminum, capable of producing very high temperatures and capable of damaging metal targets.

(6) (U) Composite metal - hydrocarbon slurry agents: Incendiary agents based on gelled hydrocarbon liquids--containing about 50% of metals such as lithium, boron, magnesium, aluminum, and metal hydrides such as LiH, which are especially effective against wooden targets.

(7) (U) Eutectic white phosphorus: Composed of a solution of P_2S_5 (45%) in white phosphorus (55%). Requires a polymeric thickener to improve dissemination efficiency.

c. (U) Molotov Cocktails.[119] Soviet incendiary flasks are filled with various incendiary mixtures including:

(1) (U) "KS mixture" (White Phosphorus in carbon disulfide). It is a viscous, oily, greenish-yellow liquid with the odor of rotten eggs. It is spontaneously flammable so it is often used without a fuze. However, in order to prevent any delayed ignition, pyrotechnic fuzes or chromyl chloride ampules are often added. Its combustion temperature is 800° to 1000° C, and it gives off white smoke.

(2) (U) Mixture No. 1. It is a mixture of mineral oils, and is dark brown in color. It has to be ignited before throwing. Ignition can be accomplished with matches, powder strips, primers, chromyl chloride ampules, or chlorate mixtures. Combustion temperature is 600° to 700° C.

(3) (U) Mixture No. 3. It is a viscous mixture of petroleum and benzene with an added thickener of ozokerite and diatomaceous earth. Concentrated sulfuric acid is often added; in this case, an ampule containing a potassium perchlorate igniter is used. Combustion temperature is 600° to 700° C.

(4) (U) Mixture No. 4. It consists of phosphorus in an organic solvent, such as gasoline. The gasoline is often thickened with OP-2, an aluminum salt of naphthenic acid. This mixture is self-igniting.

3. (U) Thickeners

(U) Thickeners are added to fuels to increase the range of flamethrowers, to impart slower burning properties, to give clinging qualities, and to cause flames to rebound off walls or other surfaces and to go around corners. They are used in all incendiary oil bombs as well as in flame weapons. More thickener is used in the incendiary oil bombs and mechanical flamethrowers than for portable flamethrowers. Peptizers are sometimes added to thickened fuels to facilitate the dispersal of thickener in the fuel at low temperatures.

a. (U) Standard Thickeners.

(1) (U) M1, Napalm aluminum soap (Standard B). Consisting of a mixed aluminum soap coprecipitated from a mixture of coconut oil, oleic, and naphthenic acids (50:25:25). The percentage of thickener used ranges from 2% for very thin fuels to 12% for the highest consistency likely to be required. Peptizer used is cresylic acid. Used in preparation of flamethrower fuels by Service Unit: M4A2.

(2) (U) M2, Napalm aluminum soap (Standard A for Air Force). Consisting of an intimate mixture of 95% M1 thickener and 5% "devolatilized" silica aerogel or other approved antiagglomerant, such as Attasorb clay. Cresylic acid is used as the peptizer. Used in preparation of Incendiary Oil: NP2 as firebomb fuel by continuous mixing in Mixing and Transfer Unit: AN-M3A1.

(3) (U) M3, Aluminum 2-ethylhexanoate. Obsolete; replaced by M4-aluminum isooctanoate.

(4) (U) M4-Aluminum isooctanoate (Standard A). Composed of 98% aluminum isooctanoate and either 2% Attasorb clay or Santocel C as an antiagglomerant. 2-ethylhexanoic acid is used as the peptizer. It is employed for the preparation of Incendiary: ISO by field mixing in Mixing and Transfer Unit: M5 or Service Unit: M4A2. The M4 thickener has a greater density than the M1 or M2 thickeners. For use of M4 at about 0° C, a peptizer is required. The "gels" formed with this thickener are more stable than those formed with the M1 or M2 thickeners.

(5) (U) Polymer AE.[8,12] 5% Polymer AE (isobutyl methacrylate) is used in the preparation of M1 incendiary oil, Type I, and in PT1 incendiary mixture (Standard B).

(6) (U) Metavon. A Dutch napalm thickener prepared according to US specifications.

(7) (U) Northick. A Norwegian fuel thickener made of aluminum soaps of a mixture of whale oil, lauric acid, and tall oil acids (70:15:15).

(8) (U) Octogel. A French fuel thickener consisting of aluminum di-2-ethylhexanoate (similar to M3 thickener) for flamethrowers. "Nagel" incorporates a clay filler that is claimed to be effective in improving storage life of the thickened fuel.[9]

(9) (U) T-55. A Swedish fuel thickener made of aluminum soaps of tall oil acids with Cellosolve added as a stabilizer.

(10) (U) Opalm. A Swiss thickener containing polyisobutylene.

(11) (U) Octal. A Canadian thickener similar to M3 thickener.

b. ~~(C)~~(U) Experimental Thickeners.

(1) (U) E10: Polybutadiene (GRS-XP268). 94% Polybutadiene containing 3% talc and 3% sorbitan palmitate (Span 40). Polymer is not reproducible in large batch production for this application. Tested for field mixing of portable flamethrower fuels. Unsatisfactory for mechanized flamethrower fuels.

(2) (~~C~~) (b)(1)

(b)(1)

Section XII.

ANTIPLANT AGENTS

1. (U) General

a. Chemical antiplant agents have come into use as chemical warfare agents in recent years. These agents are used to destroy the enemy's food supply and to deny him concealment by foliage or vegetation. Numerous statements and accusations in both the foreign and domestic press were concerned with the effect of these chemical agents on the ecology.

b. The antiplant chemicals currently in use can be classified as herbicides, defoliants, and growth suppressants or inhibitors:

(1) Herbicides. These substances are used to kill plants or interrupt their growth. They are divided into two main groups depending on whether they are selective or nonselective as to the types of plants they attack. Selective herbicides kill only certain plant species, and have little or no effect on others. These are generally organic compounds such as derivatives of phenoxyacetic acid (2,4-D and 2,4,5-T), triazines and urea compounds. The nonselective group kills all plant life without regard to species. These are usually inorganic compounds such as sodium arsenite and sodium chlorate. However, some herbicides may be classed as both selective and nonselective, depending on the concentrations and the amounts used per unit area. The herbicides may also be further divided into three additional subgroups based upon the method of application and their mode of entry into the plant. Contact herbicides such as dessicants kill primarily by contact with the plant tissue rather than by translocation or movement within the plant. If the dosage is insufficient, unexposed parts of the plant may sprout new growth. The systemic or translocated herbicides are capable of penetrating the plant fibers, through both leaves and roots, into the "vascular" system where they are rapidly conveyed throughout the entire plant, to cause a change in the water balance, leaf fall, dying of the stems and branches, and possible death of the plant. Finally, soil herbicides also include those compounds which, when applied directly to the soil, penetrate the root system of the plant and destroy it along with any dormant or sprouted seeds.

(2) Defoliating agents. These chemicals cause trees, shrubs, and other plants to shed their leaves prematurely. Contact and systemic herbicides can have a defoliating action; however, a true defoliant is a growth-regulating chemical that causes leaf-fall without killing or seriously affecting the plant. Several chemicals are available that are effective defoliants for cotton and other agricultural crops, but no satisfactory nonherbicidal defoliant has been found for woody vegetation. Defoliation may be of value militarily to prevent ambush along routes of movement through jungles and forests, and to deny the enemy food and concealment.

(3) Growth suppressants or inhibitors. These substances are growth regulating chemicals which retard or inhibit growth and can be used to maintain vegetation at a desired height or stage of growth.

2. (U) Atrazine

a. Code or Alternate Designations.

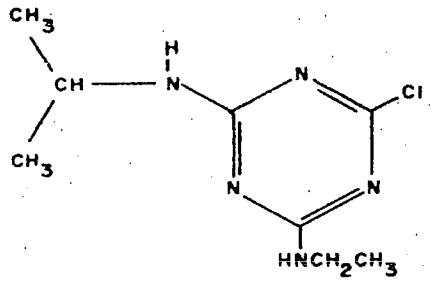
- United States -- Atrazine, F-30027.
- USSR -- Atrazine, ZEAZINE, F-30027.

b. Class. Selective herbicide.

c. Chemical Names.

- 2-Chloro-4-ethylamino-6-isopropylamino-*sym*-triazine
- 2-chloro-4-ethylamino-6-isopropylamino-sym-triazine.

d. Formula. $C_8H_{14}ClN_5$



e. Molecular Weight. 216.06.

f. Method of Preparation. Unknown.

g. Physical and Chemical Properties.

- Physical state and color: White crystalline powder.
- Melting point: 171° to 174° C.
- Solubility: Soluble in ether, chloroform and methanol; slightly soluble in water (70 ppm at 25° C). Wettable; more mobile in soil than simazine and enhances nitrate formation in soil.

h. Use. Selective herbicide for dicotyledonous, monocotyledonous, and grassy plants.

i. Anti-plant Effects. Atrazine enters the plant through both roots and leaves. Material washed off the leaves enters through the roots. The agent affects perennial plants having deep root systems.

j. Physiological Effects. Atrazine causes inhibition of liver and kidney catalase and thyroid dysfunction in animals. These effects have not been observed in man.

k. Therapy. None necessary.

l. Decontamination. None necessary.

m. Protection. None necessary.

n. Storage. No fire hazard; nonpoisonous; does not corrode metals.

o. Persistence. Persists in soil for several years in dry climates.

p. Toxicity. Atrazine is considered nontoxic for man. The oral LD_{50} for rats is 1750 to 3080 mg/kg.

q. Historical.

- 1961: Prepared by (b)(6) in USSR.

- 1962: Hungarian Pat. 149,189, Andriska et al. (Nehezvegyipari Kutato Intezet).
- 1963: French Pat. 1,317,812, Mildner (Radonja Kernijska Industrija).

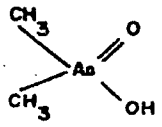
3. (U) BLUE (Cacodylic Acid Mixture)

a. Code or Alternate Designations. Phytar 560G (Ansul Company).

b. Class. Herbicide.

c. Chemical Name and Composition. BLUE is composed of 21% sodium cacodylate plus additional cacodylic acid to make a total dimethylarsinic acid equivalent of not less than 26% on a weight basis. Included in the formulation is 3% to 5% surfactant by volume and 0.5% antifoam agent by volume.[120,121]

d. Formula. $C_2H_7AsO_2$



Neg. 513192 Cacodylic Acid

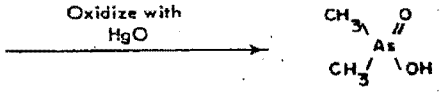
e. Molecular Weight. 137.99.

f. Raw Materials.

- Arsenic trioxide (As_2O_3).
- Potassium acetate ($KC_2H_3O_2$).

g. Method of Manufacture.

Cacodyl oxide



Neg. 513193 Cacodylic Acid

h. Physical and Chemical Properties.[120,121]

- Physical state and color: Cacodylic acid (technical) is a colorless, crystalline solid. BLUE (Phytar 560G) is a free-flowing reddish or brownish liquid.
- Melting point: Cacodylic acid, 200° C.
- Freezing point: BLUE, below -30° C.
- Solubility: Cacodylic acid and BLUE are soluble in water and alcohol, insoluble in diesel fuel and oils.
- Specific gravity: BLUE, 1.31 at 25° C.
- Vapor pressure: BLUE, very low.
- Volatility: BLUE, nonvolatile.
- Viscosity: BLUE, centipoises at

10° C (50° F)----------19.9
23.9° C (75° F)----------11.0
35° C (95° F)---------- 9.0.

i. Method of Dissemination. Helicopter and airplane spray systems, backpack sprayers for small ground operations.

j. Use. Contact herbicide and anticrop agent.

k. Anti-plant Effects. BLUE is a dessicant or contact herbicide and causes rapid browning of foliage. Foliage of broad-leaved plants affected by BLUE may shrivel and remain on the plant. Grasses may show rapid browning and death of top growth with regrowth of resistant perennial species in 1 to 2 months. BLUE has a short term effect on woody vegetation with the maximum effect occurring 2 to 6 weeks after treatment. BLUE is the agent of choice for destruction of cereal or grain crops.[120,121]

l. Physiological Effects. The arsenic in cacodylic acid is in the relatively innocuous pentavalent state rather than in the toxic trivalent form. The toxicity of BLUE to man is considered to be very low, being even less toxic than aspirin.

m. Therapy. BAL for acute and chronic arsenic poisoning.

n. Decontamination. Storage and loading areas can be decontaminated by repeated washings with ammonia water and clear water.

o. Protection Required. Mask to prevent inhalation.

p. Storage. BLUE should be stored in airtight containers. Corrosion tests show that zinc is the least resistant metal while steel undergoes moderate corrosion. Brass, copper, aluminum, or tin corrode only to a slight extent. BLUE has no significant effect on paint, natural or butyl rubber, neoprene, or polyethylene.[117] Light has no effect on BLUE.

q. Persistence. BLUE is nonpersistent. When applied directly to the soil, the chemical is rapidly absorbed and deactivated by soil colloids. New crops can be planted during the same growing season.[121]

r. Toxicity. BLUE may be considered nontoxic to animals and fish. The acute oral toxicity (LD_{50}) of cacodylic acid in rats ranges between 1280 to 1400 mg/kg, and for BLUE, the LD_{50} is 2600 mg/kg. Cattle fed 24.5 mg/kg of cacodylic acid daily in a 60-day feeding test showed no arsenic in the milk or accumulation in the body. Fish were able to withstand 100 ppm for 72 hr.

4. (U) Butyphos

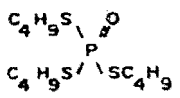
a. Code or Alternate Designations.

- United States -- DEF, Degreen, Fos-Fall "A", E-Z-OFF D.
- USSR -- Butifos.

b. Class. Defoliant.

c. Chemical Name. S,S,S-Tributyl trithiophosphate.

d. Formula. $C_{12}H_{27}OPS_3$

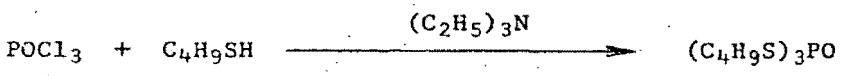


e. Molecular Weight. 314.51.

f. Raw Materials.

- Phosphorus oxychloride ($POCl_3$).
- Butyl mercaptan (C_4H_9SH).
- Triethylamine [$(C_2H_5)_3N$].

g. Method of Manufacture.



Phosphorus oxychloride		Butyl mercaptan	Triethylamine	Butyphos

Used as 70% concentrate in emulsion form or 70% oily solution in diesel fuel. Emulsion can be mixed with water in any proportion.

h. Physical and Chemical Properties.[108]

- Physical state and color: Colorless to pale yellow liquid.
- Melting point: Less than -25° C.
- Boiling point: 154° C at 0.5 mm Hg.
- Specific gravity: 1.057 at 20° C.
- Solubility: Soluble in ethanol, chloroform, benzene, and other organic solvents; insoluble in water.

i. Use. Excellent cotton plant defoliant. Highly effective in small doses. Ineffective against fine-fibered plants.

j. Physiological Effects. Since it is a cholinesterase inhibitor, its symptoms to animals are similar to those of nerve agents.

k. Therapy. Atropine.

l. Decontamination. Alkaline solutions.

m. Protection. Protective mask in areas of high concentration.

n. Storage. Store separately from food products.

o. Toxicity. Butyphos is mildly toxic with cumulative action. LD_{50} is 325 mg/kg, for white rats, orally.

p. Historical. 1957: Prepared by Melnikov in USSR.

5. (U) Calcium Cyanamide

a. Code or Alternate Designations.

- United States -- Cyanamide, Aero, "Lime-nitrogen."
- USSR -- "Free cyanamide."

b. Class. Defoliant.

c. Chemical Names.

- Calcium cyanamide.
- Calcium carbimide.

d. Formula. $CaCN_2$

$N \equiv CN{-}Ca$

e. Molecular Weight. 80.11.

f. Method of Preparation. Passing nitrogen (N_2) over calcium carbide (CaC_2) in an electric furnace at 1200° C.

g. Physical and Chemical Properties.

- Physical state and color: Pure form consists of glistening hexagonal crystals; commercial grade consists of gray-black lumps of powder that may contain as much as a 40% mixture of $Ca(OH)_2$, $CaCO_3$ and carbon.
- Melting point: 1200° C.
- Sublimation temperature: 1150° to 1200° C.
- Solubility: No known solvent will bring about solution without decomposition.
- Specific gravity: 2.3.
- Hydrolysis: Decomposes in water to liberate ammonia.

h. Use. Cotton defoliation in humid climates. Fertilizer.

i. Physiological Effects. Free cyanamide is very irritating and caustic and can produce severe cellulitis and abscesses on moist skin. Ingestion or inhalation will cause transitory intense redness of face, headache, vertigo, increased respiration, tachycardia, hypotension, and possible deep ulcers of the mucous membrane. Excessive amounts may cause profound shock.

j. Therapy. Treatment of the symptoms.

k. Decontamination. None necessary.

l. Protection. Masks are required for high concentrations and the skin should also be protected.

m. Storage. Store in airtight containers, away from moisture.

n. Toxicity. LD_{50}, orally, is 1 g/kg for white rats. LD_{100}, orally, for humans is 40-50 g/man.

o. Historical.

- 1931: Preparation, Franck, Heimann.
- 1951: Preparation, Kastens, McBurney.
- 1961: Owen, Dedman.

6. (U) 2,4-D and Esters and Salts

a. Code or Alternate Designations.

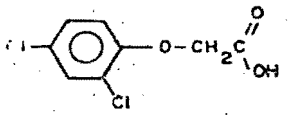
- 2,4-D-Hedonal.
- Sodium Salt -- 2,4-DU, Dikonirt, Dikoteks 30, Dikoteks 80.
- Amine Salt -- 2,4-DA, Agent WHITE.
- Butyl Ester -- Preparation 359, Agent ORANGE, Agent PURPLE.
- Octyl Ester -- Preparation 50, Krotilin, Crotylin.

b. Class. Selective herbicide.

c. Chemical Names.

- 2,4-Dichlorophenoxyacetic acid.
- Sodium salt of 2,4-D.
- Other forms in which 2,4-D is used are the dimethylamine, isopropylamine, triethylamine, diethanolamine, and triethanolamine salts, the butyl ester and the gamma chlorocrotyl ester.

d. Formula of (2,4-D). $C_8H_6Cl_2O_3$

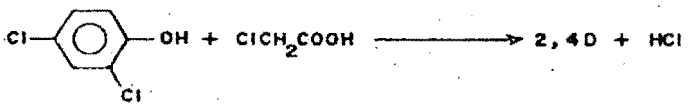


Neg. 513195 2,4-D

e. Molecular Weight. 221.04.

f. Method of Preparation.

(1) 2,4-D.



(2) Esters and salts. Butyl and octyl esters are prepared by esterification of 2,4-D with butyl or octyl alcohol in the presence of sulfuric acid or benzenesulfonic acid. For preparing the octyl ester, hexamethylenetetramine or pyridine can be used as a catalyst. The sodium salt is formed by treating 2,4-D with sodium hydroxide. The amine salts are prepared by treating the acid with the appropriate amine.

g. Physical, Chemical Properties and Antiplant Effects.

(1) 2,4-D.

- Physical state and color: White crystalline powder.
- Melting point: 130° C.
- Boiling point: 168° C at 0.4 mm Hg.
- Solubility: Soluble in organic solvents; insoluble in water.

- Antiplant effects: 2,4-D interferes with the exchange of phosphorus-containing compounds in broad-leafed plants. 2,4-Dichlorophenol, a metabolic product formed in the plant tissue, is 20 times more toxic than the original 2,4-D. 2,4-D retains its toxicity in treated fields for 4 to 6 weeks and is eventually broken down by microorganisms in the soil.

(2) Sodium salt of 2,4-D.

- Physical state and color: Pure state -- white needles; industrial product -- pinkish or grayish crystalline substance.
- Odor: Odor of phenol.
- Solubility: Slightly soluble in water at 20° C (approximately 3.5%).
- Volatility: Low volatility.
- Decomposition temperature: 215° C.
- Antiplant effects: The sodium salt of 2,4-D is effective on dicotyledonous plants. Wetting agents must be added.

(3) Amine salts of 2,4-D.

- Physical state and color: Industrial product is a brown liquid with 40% to 50% active ingredient. The amine salt is more soluble than the sodium salt. The addition of a wetting agent is desirable. A small amount of sequestering agent, such as ethylenediaminetetracetic acid, is generally added to prevent complex formation in hard water.
- Antiplant effects: The amine salts of 2,4-D are effective on dicotyledonous plants. The amine salts penetrate through the leaves within 2 hr after application.

(4) Butyl ester of 2,4-D.

- Physical state and color: Oily, dark brown liquid with 50% to 60% butyl ester plus solvents.
- Solubility: Insoluble in water, but forms stable emulsions.
- Volatility: Highly volatile; may injure other crops.
- Antiplant effects: The butyl ester of 2,4-D is effective against dicotyledonous plants. The ester penetrates plant leaves rapidly and is not affected by rainfall 30 min after application. The granulated form is not retained by dry leaves or grasses.

(5) Octyl ester of 2,4-D.

	Pure Compound	Industrial Product
• Physical state and color:	Colorless crystals	Dark brown liquid
• Odor:		Unpleasant
• Melting point:	33° to 34° C	
• Boiling point:	185° to 188° C	
• Solubility:	Soluble in ether, acetone benzene, alcohol, chloroform; insoluble in water	Soluble in ether and acetone, slightly soluble in alcohol; insoluble in water.
• Specific gravity:		1.397 (liq)
• Vapor pressure:		2 mm at 20° C

h. Methods of Dissemination, (2,4-D). Portable decontamination apparatus; M106 riot control disperser, power-driven decontaminating apparatus, and aerial spray tanks.

i. Use. Selective herbicide. The octyl ester of 2,4-D is sprayed on leaves to kill or defoliate dicotyledonous plants.

j. Physiological Effects.[12]

(1) Derivatives of 2,4-D in concentrations ordinarily used in crop spraying do not accumulate in the bodies of warm blooded animals, but break down and are eliminated within a day. It is nontoxic to man or animals.

(2) The sodium salt leaves a salty taste in the victim's mouth. The butyl ester and amine salt affect the blood and circulatory systems--the number of red blood cells is sharply reduced, the number of white cells are increased, and arterial blood pressures are modified. Humans have been affected for as long as 14 days.

k. Antiplant Effects.[8] Plant responses appear within 1 hr on actively growing sensitive plants. Leaf and stem curvatures are the first discernible effects. Plant injury will usually be evident within 24 hr. It produces injury to all broadleaf plant species such as cotton, beans, soybeans, and sugar beets. Several weeks after treatment, seriously affected plants may develop spongy, enlarged roots. The outer portion of the root may slough off and leave wet, stringy cores that will later dry up or rot. The esters are more effective than the salts in penetrating the leaf cuticle and in killing resistant species.

l. Therapy. A weak bicarbonate of soda solution will relieve irritation of skin, eyes, nose, and throat. In case the herbicides are ingested, the victim should drink copious quantities of water.

m. Decontamination. Loading and storage areas can be decontaminated by repeated washings with diesel fuel and the run-off diverted to settling basins or pits for incorporation into the soil where microbial or photo-decomposition will occur.

n. Protection. The danger to humans working with herbicides is increased by high air temperature and dry weather. It is recommended that work with these chemicals be confined to early morning hours when temperatures are low and humidity is higher. It is also recommended that workers wear protective respirators, goggles and coveralls, and should shower immediately after work.

o. Storage.[3] A small amount of sequestering agent is usually added (for example, ethylenediaminetetraacetic acid) to prevent complex formation in hard water.

p. Toxicity. The oral toxicities of the various 2,4-D derivatives for rats are as follows:

Compound	LD_{50} (mg/kg)
2,4-D	560
Sodium salt	710
Amine salt	1150
Butyl ester	950
Octyl ester	2100

These compounds have teratogenic effects.[12]

q. Detection. Paper chromatography, gas chromatography.

r. Historical.

- 1941: Preparation, Pokorny.
- 1945: British pat. 573,476, Foster.
- 1949: US pat. 2,471,575, Nanske (US Rubber Co.).

7. (U) Endothal

a. Code or Alternate Designations.

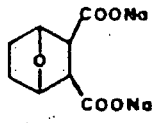
- United States -- Endothal, Aquathiol, Hydrothiol.
- USSR -- Endotal.

b. Class. Defoliant.

c. Chemical Names.

- Disodium salt of 3, 6-endoxohexahydrophthalic acid.
- Disodium salt of 7-oxabicyclo [2.2.1] heptane-2,3-dicarboxylic acid.

d. Formula. $C_8H_8Na_2O_5$



Neg. 513197

e. Molecular Weight. 230.13.

f. Method of Preparation. Diels-Alder addition of maleic anhydride to furan, catalytic hydrogenation of adduct, using furan as a solvent.

g. Physical and Chemical Properties.

- Physical state and color: White crystalline powder.
- Melting point: 116° C.
- Solubility: Very soluble in water.

h. Use. Pre-emergence herbicide, defoliant and dessicant.

i. Physiological Effects. Endothal may be irritating to skin, eyes and mucous membrane. Ingestion may cause vomiting and diarrhea.

j. Therapy. Treatment of symptoms.

k. Decontamination. None necessary.

l. Protection. None necessary.

m. Storage. Store separately, away from food products.

n. Toxicity. LD_{50} orally in rats 35 mg/kg.

o. Historical. 1951: US pat. 2,550,494, Olm (Sharples Chemicals, Inc.).

8. (U) Magnesium Chlorate

a. Alternate Code or Designations.

- United States -- De-Fol-Ate, E-Z-Off, Magron, Ortho MC.
- USSR — "Etalon."

b. Class. Defoliant.

c. Chemical Name. Magnesium chlorate.

d. Formula. $Mg(ClO_3)_2 \cdot 6H_2O$

e. Molecular Weight. 299.33.

f. Method of Manufacture. Chlorine reacts with magnesium hydroxide in the presence of heat to form magnesium chlorate.

g. Physical and Chemical Properties.

- Physical state and color: White crystals or powder; has a bitter taste.
- Melting point: 35° C.
- Solubility: Soluble in water; slightly soluble in alcohol. Very deliquescent.
- Specific gravity (solid): 1.8 at 25° C.
- Decomposition temperature: 120° C.

h. Use. For defoliation. Used in aqueous solution. Magnesium chlorate acts through the green portions of plants and is effective on all vegetation.

i. Physiological Effects. Magnesium chlorate is readily absorbed from the alimentary tract. Ingestion of large amounts of magnesium chlorate produces methemoglobin in blood, destroys red blood cells, causes gastric irritation, nausea, vomiting, and irritation of the kidneys. The compound is also reported to damage heart muscles.

j. Therapy. Emetics, gastric lavage and saline catharsis are required to remove material from stomach. Oxygen should be administered and a blood transfusion performed to counter methemoglobinemia.

k. Decontamination. None necessary.

l. Protection. None required.

m. Storage. The compound is a fire hazard and should be stored in closed containers in a cool, well-ventilated area, away from easily oxidizable materials. The compound may also form explosive mixtures when mixed with combustible materials, such as paper, wood, saltpeter, and ammonium phosphate.

n. Toxicity. LD_{50} in rats is 5250 mg/kg, orally. A dose of 5000 mg in man is generally fatal, although higher doses sometimes are nonfatal.

9. (U) Monuron

a. Code or Alternate Designations.

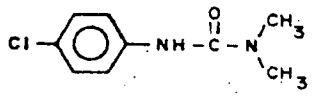
- United States -- Monuron, Telvar.
- USSR -- Monuron, Karmex W, Telar-W, KhMM, Telvar.

b. Class. Selective herbicide.

c. Chemical Names.

- 3-(*p*-Chlorophenyl)-1,1-dimethyl urea.
- N-(4-Chlorophenyl) N,N-dimethyl urea.

d. Formula. $C_9H_{11}ClN_2O$



e. Molecular Weight. 198.65.

f. Method of Preparation. Reaction of *p*-chlorophenyl isocyanate with dimethyl amine.

g. Physical and Chemical Properties.

- Physical state and color: Thin rectangular prisms. Commercial product (80% active ingredients) is a grayish-white powder.
- Melting point: 170.5° to 171.5° C; commercial product, 176° to 177° C.
- Solubility: Very slightly soluble in water and in No. 3 diesel oil; soluble in methanol, ethanol and acetone; insoluble in hydrocarbon solvents.
- Hydrolysis: Hydrolyzes at high temperatures, and in acid or alkaline conditions.

h. Use. General weed control in non-crop areas. Used as water suspension for spraying directly on soil.

i. Physiological Effects. Anemia and methemoglobinemia have been produced in experimental animals.

j. Therapy. None necessary.

k. Decontamination. None required.

l. Protection. None required.

m. Storage. Monuron is stable to oxygen and moisture under ordinary conditions at neutral pH, is not flammable, and does not corrode metals.

n. Toxicity. Monuron is considered to be nontoxic. The oral LD_{50} for white rats is 3600 mg/kg.

o. Persistence. May be retained in the soil 2 to 3 years.

10. (U) ORANGE I

a. Code or Alternate Designations. None.

b. Class. Herbicide and defoliant.

c. Chemical Name and Composition. ORANGE consists of equal parts by volume of n-butyl esters of 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T).

d. Physical and Chemical Properties.[120,121]

- Physical state and color: Clear reddish brown to straw-colored liquid at room temperature.
- Melting point: 7° to 8° C.
- Solubility: Soluble in diesel fuel and organic solvents; insoluble in water.
- Specific gravity: 1.28 to 1.30 at 25° C.
- Vapor pressure: less than 1 mm Hq at 35° C.
- Flash point: 146° C.
- Viscosity, centipoise, at:[60]

-17.8° C (0° F)	5,000
-6.7° C (20° F)	940
0.0° C (32° F)	390
10.0° C (50° F)	134
23.9° C (75° F)	43
37.8° C (100° F)	24

e. Method of Dissemination. Backpack sprayers for small ground operations. Helicopter and airplane spray systems - for example, the US Army 80-gal spray tank, the counterinsurgency Air Force A/B23Y-1 dispenser, and the internal herbicide Air Force A/A45Y-1 dispenser.[8]

f. Use. ORANGE is a defoliant for broad-leaved or dicotyledonous plants and is also used as an anticrop agent.

g. Antiplant Effects. ORANGE, consisting of two systemic herbicides, is effective on a wide range of plant species, principally of the broad-leaved or dicotyledonous groups. 2,4-D is effective on broad-leaved herbaceous plants, and 2,4,5-T is effective on a broad array of woody plants. Herbicidal response is caused by disruption of the respiration, metabolic, and cell division processes in plants. Mixed woody vegetation shows a browning and discoloration of the foliage within 1 to 2 weeks after the application of ORANGE. Leaf drop will occur over a period of 1 to 2 months; maximum leaf drop may occur 2 to 3 months after application. Under tropical conditions, application of the agent at a rate of 3 gal/acre is needed for defoliation, particularly in multiple canopy forests. Grasses and bamboos may exhibit browning and partial topfall, but these plants recover rapidly. Under temperate conditions, application rates of 1 to 1.5 gal/acre appear to be adequate for effective defoliation.[120]

h. Therapy. None necessary.

i. Decontamination. Loading and storage areas can be decontaminated by repeated washings with diesel fuel and the run-off diverted to settling basins or pits for incorporation into the soil where microbial or photodecomposition will occur.[121]

j. Protection Required. None necessary.

k. Storage.[12,119] ORANGE is noncorrosive on most metals but is deleterious to some paints, rubber and neoprene. Teflon, polyethylene and Viton are resistant to deterioration by ORANGE.

l. Persistence. The components of ORANGE undergo photodecomposition and microbial decomposition in the soil and will generally disappear in 1 to 2 months.[120]

m. Toxicity. ORANGE is low in toxicity to man, fish, and wildlife. The LD_{50} for acute oral toxicity of ORANGE for rats is 550 mg/kg. The toxicity of 2,4-D and 2,4,5-T for fish varies widely with the

species. Only under conditions of direct application of ORANGE to shallow bodies of water at a rate of 3 gal/acre would it kill the most sensitive species of fish.

11. (U) ORANGE II

a. Code or Alternate Designations. None.

b. Class. Herbicide and defoliant.

c. Chemical Name and Composition. A mixture containing equal parts by volume of n-butyl ester of 2,4-D and isooctyl ester of 2,4,5-T.

d. Physical and Chemical Properties.

- Physical state and color: Reddish brown to straw-colored liquid at room temperature.
- Melting point: 9° C.
- Solubility: Soluble in diesel fuel and organic solvents; insoluble in water.
- Specific gravity: 1.22 to 1.24.
- Vapor pressure: Less than ORANGE.
- Flash point: Not known.
- Viscosity, centipoises, at:[121]

  23.9° C (75° F)---------- 67

  37.8° C (100° F)---------- 27

e. Methods of Dissemination. Same as ORANGE I.

f. Use. Same as ORANGE I.

g. Antiplant Effects. Same as ORANGE I.

h. Therapy. None necessary.

i. Decontamination. Same as ORANGE I.

j. Protection Required. None necessary.

k. Storage. Same as ORANGE I.

l. Persistence. Same as ORANGE I.

m. Toxicity. Same as ORANGE I.

n. Effectiveness. Same as ORANGE I.

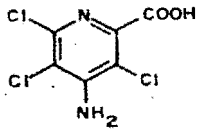
12. (U) Picloram

a. Code or Alternate Designations. United States -- Agent White, M-2993, Tordon.

b. Class. Antiplant agent -- selective herbicide.

c. Chemical Name. 4-Amino-3,5,6-trichloropicolinic acid. See also agent WHITE.

d. Formula. $C_6H_3Cl_3N_2O_2$



Neg. 513199

e. Molecular Weight. 241.48.

f. Method of Preparation. Unknown.

g. Physical and Chemical Properties.

- Physical state and color: Colorless crystalline powder.
- Melting point: 218° to 219° C, with decomposition.

h. Use. Very effective defoliant and herbicide on broadleaf species of trees such as birch, beech, red maple. Other broadleaf trees are resistant to it. Good herbicide for conifers (fir, spruce, hemlock), if applied in high enough concentration (3.4 kg/hectare or 3 lb/acre of active ingredient). See also agent WHITE.

i. Physiological Action. No evidence that its use will create toxicity problems for man or animals.

j. Therapy. None necessary.

k. Decontamination. None necessary.

l. Protection. None necessary.

m. Toxicity. Orally, LD_{50} is 3080 mg/kg for rats, 2000 mg/kg for sheep, and 3163 mg/kg for cattle.

13. (U) Simazine

a. Code or Alternate Designations.

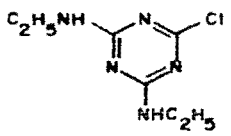
- United States -- Simazine.
- USSR -- Simazine, Sym-triazine, CET, G-27692.

b. Class. Selective herbicide.

c. Chemical Names.

- 2,4-Bis(ethylamino)-6-chloro-*sym*-triazine.
- 2-Chloro-4,6-bis(ethylamino)-1,3,5-triazine.

d. Formula. $C_7H_{12}ClN_5$



e. Molecular Weight. 201.67.

f. Method of Preparation. Reaction of ethylamine with cyanuric chloride.

g. Physical and Chemical Properties.

- Physical state and color: White crystalline powder.
- Melting point: 226° to 227° C.
- Solubility: Slightly soluble in dioxane, ethyl cellosolve; insoluble in water and in most organic solvents.
- Volatility: Slightly volatile.

h. Use. Selective herbicide for monocotyledonous and dicotyledonous plants.

i. Antiplant Effects. Simazine acts as a selective herbicide on monocotyledonous and dicotyledonous plants and is effective on new shoots. The compound enters the plant through the root system and thus, should be sprayed directly on the soil. Simazine is favorable for the development of microorganisms in the soil, especially nitrogen fixing bacteria. The compound also stimulates the action of cellulose-decomposing microorganisms in wet soil.

j. Physiological Effects. No danger to man.

k. Therapy. None required.

l. Decontamination. None required.

m. Protection. None required.

n. Storage. Simazine is stable to action of weak bases and acids. It is also resistant to the action of air and water but should be stored in a cool place. There is no fire hazard or corrosion of metals or rubber by simazine.

o. Toxicity. LD_{50} is 5000 mg/kg for mice, orally.

p. Persistence. Simazine moves slowly through the soil and has a low rate of decomposition. Residual action may last from several months to 8 years.

q. Historical. 1885: Prepared by Hoffman in Germany.

14. (U) Sodium Arsenite

a. Code or Alternate Designations. United States -- Killall, Penite, Chem-Sen.

b. Class. Nonselective herbicide.

c. Chemical Names.

- Sodium arsenite.
- Sodium metaarsenite.

d. Formula. $NaAsO_2$.

e. Molecular Weight. 129.90.

f. Method of Manufacture.

$$As_2O_3 + H_2O + 2NaOH \longrightarrow 2NaAsO_2 + 2H_2O$$

Arsenic trioxide — Sodium arsenite

g. Physical and Chemical Properties.

- Physical state and color: White or grayish white powder. Commercial product is 95% to 98% pure.
- Solubility: Soluble in cold water; slightly soluble in alcohol. It is hygroscopic.

h. Use. Sodium arsenite is used as a nonselective herbicide, insecticide, and aquatic herbicide.

i. Antiplant Effects. The compound kills plant leaves outright, blackening them in a day or two. Small amounts have no perceptible effect for some weeks; then the leaves turn yellow and fall off.

j. Physiological Effects. The arsenic in sodium arsenite is in the toxic trivalent form rather than in the innocuous pentavalent state. Sodium arsenite is a general protoplasmic poison absorbed by the respiratory and gastro-intestinal tract. The compound binds organic sulfhydryl groups found in various enzymes. As a result, sulfhydryl enzyme systems essential to cellular metabolism are inhibited. Acute poisoning, resulting from ingestion of large quantities of arsenic, causes nausea, vomiting, and diarrhea. Chronic poisoning causes loss of appetite, cramps, nausea, constipation, diarrhea, and itching and pigmentation of skin.

k. Therapy. Symptomatic for arsenic poisoning.

l. Decontamination. Intensive use may poison the soil sufficiently to interfere with growth of crops. Applying cryolite to the soil will correct this.

m. Protection. Protective mask.

n. Storage. Store in airtight, moisture-free containers, away from food items.

o. Toxicity. LD_{50} is 10 to 50 mg/kg for white rats, orally. MLD is 10 mg/kg for rats, intraperitoneally.

15. (U) Sodium Chlorate

a. Code or Alternate Designations.

- Altacide.
- Chlorax.
- Drop-Leaf.
- Fall.
- MBC.
- Monoborochlorate.
- Polybor Chlorate.
- Shed-a-Leaf "L."
- Tumbleaf.

b. Class. Nonselective herbicide.

c. Chemical Name. Sodium chlorate.

d. Formula. $NaClO_3$

e. Molecular Weight. 106.45.

f. Method of Preparation. Electrolysis of sodium chloride (NaCl) solution.

g. Physical and Chemical Properties.

- Physical state and color: White crystalline powder or granules.
- Melting point: 248° C. Liberates oxygen at 300° C.
- Specific gravity: 2.5 at 25° C.
- Solubility: Soluble in water, alcohol and glycerine. Very hygroscopic. Addition of sodium chloride diminishes solubility in water.

h. Use. Nonselective, systemic herbicide. It is used in aqueous solutions, or mixed with other herbicides such as simazine for weed control in non-crop area, defoliation of cotton, and for soil sterilization. Sodium chlorate is also used as an oxidizer in explosive and dye industry.

i. Physiological Effects. Considered nontoxic.

j. Therapy. None required.

k. Decontamination. None required.

l. Protection. Fire hazard only.

m. Storage. Must be stored in hermetically sealed containers. Fire hazard in dry weather and must be stored away from combustible materials. Aqueous solutions corrode zinc and soft steel.

n. Toxicity. LD_{50} orally is 12,000 mg/kg for rats.

16. (U) 2,4,5-T

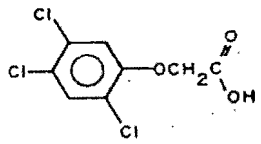
a. Code or Alternate Designations.

- United States -- 2,4,5-T, Agent PINK, Weedone, Inverton-245, TCP, Agents PURPLE and ORANGE.
- USSR -- 2,4,5-T, TKhF.

b. Class. Selective herbicide.

c. Chemical Names. 2,4,5-Trichlorophenoxyacetic acid.

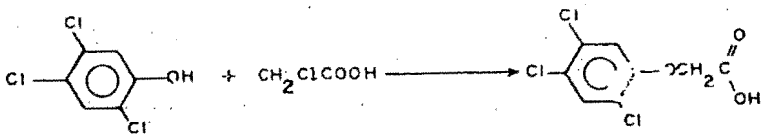
d. Formula.. $C_8H_5Cl_3O_3$



Neg. 513201

e. Molecular Weight. 255.49.

f. Method of Manufacture.



2,4,5-Trichlorophenol 2,4,5-T

g. Physical, Chemical and Biological Properties.

- Physical state and color: White solid or light tan crystals.
- Melting point: 153° to 155° C.
- Solubility: Soluble in alcohol; slightly soluble in benzene; insoluble in water.

h. Use. 2,4,5-T kills woody plants which are resistant to 2,4-D and is also effective for brush and scrub pine control. It burns leaves faster than 2,4-D because of its greater causticity. The compound is also used in the butyl and isobutyl ester forms and is adaptable to year-round spraying.

i. Methods of Dissemination.[8] Portable decontaminating apparatus, M106 riot control disperser, power-driven decontaminating apparatus, and aerial spray tanks.

j. Physiological Effects. It has teratogenic effects.[12]

k. Antiplant Effects. Generally similar to those for 2,4-D. However, it is more effective than 2,4-D on certain woody plants.[8]

l. Therapy. None required.

m. Decontamination. None required. Soil microorganisms that inactivate 2,4,5-T increase when the herbicide is present in the soil.

n. Protection. None required.

o. Storage. No specific precautions.

p. Toxicity.

- 2,4,5-T: LD_{50} is 500 mg/kg for rats, orally.
- Butyl ester: LD_{100} is 1200 mg/kg for mice, orally.
- Isobutyl ester: LD_{100} is 600 mg/kg for mice, orally.

q. Detection. Paper chromatography.

r. Historical. In use in United States since 1945.

17. (U) WHITE[60,61]

a. Code or Alternate Designations. Tordon 101.

b. Class. Defoliant and herbicide.

c. Chemical Name and Composition. Agent WHITE is composed of:

- Picloram (4-amino-3,5,6-trichloropicolinic acid), triisopropanolamine salt ---------- 10.2%

- 2,4-D, triisopanolamine salt ---------- 39.6%
- Water, wetting agent, and inert material ---- 50.2%

d. Physical and Chemical Properties.[60,61]

- Physical state and color: Dark brown viscous liquid.
- Solubility: Miscible in water; soluble in acetone and alcohol; insoluble in diesel fuel and other oils.
- Specific gravity: 1.15.
- Vapor pressure: 6.16×10^{-7} mm Hg at 35° C.
- Volatility: Considered nonvolatile.
- Flash point: 35° C.
- Viscosity, centipoise, at

  10° C (50° F) ---------- 362

  23.9° C (75° F) ---------- 125 to 135

  37.8° C (100° F) ---------- 95

e. Method of Dissemination. Same as ORANGE.

f. Use. WHITE is used as a defoliant for woody and certain broad-leaved plants and is partially more selective than ORANGE.

g. Antiplant Effects. WHITE is partially selective in its defoliant and herbicidal action, acting principally on woody and certain herbaceous plants. WHITE is relatively ineffective on grasses, bamboos and other monocotyledonous plants. Both picloram and 2,4-D are readily absorbed by the foliage.

h. Therapy. None necessary.

i. Decontamination. Loading and storage areas may be partially decontaminated by repeated washings with ammonia water and flushing with clear water. Runoff water from the washing should be diverted to settling basins or restricted areas not subject to overflow on cropland.

j. Protection Required. None necessary.

k. Storage.[12] WHITE is stable, moderately resistant to ultraviolet light, and noncorrosive.

l. Persistence. The picloram component of WHITE is more persistent in soils than ORANGE or BLUE. Losses of WHITE from soil occur principally by leaching and some photodecomposition. Decomposition by microorganisms, sunlight, and ultraviolet radiation is limited. WHITE may persist in soil for a year or more, and for this reason it is not recommended for use as an anti-crop agent.

m. Toxicity. WHITE is considered nontoxic and not hazardous to humans, animals, and fish. WHITE has an acute oral LD_{50} for rats of about 3.1 g/kg, 2 g/kg for sheep, and 3.2 g/kg for cattle. The median tolerance limits of fish ranged from 64 to 240 ppm. Toxicological studies also indicate that a single direct exposure to the spray at the prescribed rates would not constitute a hazard to the skin or a systemic hazard by inhalation.

SECTION XIII

PROPHYLAXIS AND THERAPY (U)

A. INTRODUCTION (U)

1. General (U)

(U) As new chemical warfare agents are developed, prophylactic and therapeutic drugs are also sought to counteract the toxic effects of the agents. Some success in this regard has been achieved in counteracting the poisonous effects of hydrogen cyanide (HCN), Lewisite, LSD, and most of the nerve agents. The effects of poisoning by other CW agents are usually treated symptomatically.[175-179]

2. Mechanisms of Action (U)

a. (U) Hydrogen Cyanide (U). The use of nitrites as antidotes for HCN is based on the fact that the nitrites convert hemoglobin in the red blood cell to methemoglobin, which in turn readily reacts with cyanide ion to form the innocuous cyanomethemoglobin. In this fashion the cyanide ion is prevented from destroying the cytochrome oxidase system and causing death. Actual detoxication can then be achieved by the administration of thiosulfate, which, under the influence of sulfurtransferase, reacts with cyanide to form thiocyanate (SCN^-), a relatively nontoxic substance readily excreted in the urine.

b. (U) Lewisite (U). The Lewisite antidotes, BAL and Unithiol, are effective in protecting sulfhydryl-dependent enzyme systems from arsenical poisons (such as Lewisite) and in reactivating enzyme systems already inhibited by such poisons.

c. Nerve Agents (U).

(1) (U) In the treatment of nerve agent poisoning, atropine is used generally in conjunction with oximes and artificial respiration. Atropine counteracts the muscarinic action of accumulated acetylcholine on cholinergic neurons; oxime compounds are used because their ability to reactivate inhibited cholinesterase can counteract the nicotinic action of the accumulated acetylcholine. Artificial respiration is often necessary because neither atropine nor oximes can fully relieve the paralysis of respiratory muscles resulting from serious nerve agent poisoning. A combination of atropine and artificial respiration was found to be many more times effective than either alone. When used alone, oximes generally do not protect or save, with any measure of certainty, a man who has been exposed to toxic levels of G- or V-type nerve agents. The effectiveness of oximes as adjuncts varies

with the nerve agent involved; they are very effective as prophylactics and therapeutics for GB and VX, less effective for GA and GF, and ineffective against GD after a lapse of time. The difficulty in reactivating the enzyme inhibited by GD and similar refractory agents is due to rapid aging, a process by which the inhibitor becomes more tightly bound to the enzyme with the passage of time. About 50% of the aging process occurs within the first 6 minutes of GD attachment, after which the cholinesterase virtually cannot be liberated with the usual oxime concentrations used for reactivation. For the less refractory nerve agents, such as sarin, 12 to 14 hours are required for 50% of the aging process to occur.[122] Toxic side reactions sometimes are encountered with oxime use, and in some cases a phenomenon of enhanced cholinesterase inhibition is observed as a consequence of a reaction between the nerve agent and the oxime to form an even more toxic product.

(2) (C-NOFORN) (b)(1)

(b)(1)

d. (U) Psychotropic Agents (U). One theoretical explanation of the action of LSD holds that the compound exerts its effect by modifying the actions of endogenous 5HT (serotonin) in the brain. Chlorpromazine, reserpine, and serotonin have been investigated as antagonists because of their actions on this neurotransmitter system.

NOT RELEASABLE TO FOREIGN NATIONALS

B. HYDROGEN CYANIDE ANTIDOTES (U)

3. Amyl Nitrite (U)

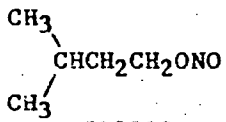
a. (U) Code or Alternate Designations (U). Vaporole, aspiral, nitramyl, isoamyl nitrite.

b. (U) Class (U). Generator of methemoglobin.

c. (U) Chemical Names (U).

- Isoamyl nitrite
- Isopentyl nitrite

d. (U) Formula (U). $C_5H_{11}NO_2$.


Neg. 513203

e. (U) Molecular Weight (U). 117.15.

f. (U) Method of Manufacture (U). Prepared by adding dilute sulfuric acid to a cold mixture of isoamyl alcohol followed by sodium nitrite and water.

g. (U) Physical and Chemical Properties (U).

- Physical state and color: clear, yellowish liquid, pungent aromatic taste
- Odor: penetrating, fragrant, somewhat fruity, stifling odor
- Boiling point: 97° to 99°C
- Solubility: miscible with alcohol, chloroform, benzene, and ether; insoluble in water
- Specific gravity: 0.875
- Volatility: volatilizes readily at low temperatures and is flammable

- Other properties: decomposes slowly on exposure to air, light, or moisture; forms an explosive mixture with air or oxygen

h. (U) Use (U).

- As an antidote and emergency treatment for cyanide poisoning
- A vasodilator of short duration, primarily used for angina pectoris, convulsions, bronchial asthma, and biliary or renal colic

i. (U) Physiological Effects (U). Amyl nitrite converts hemoglobin to methemoglobin; the cyanide ion, having a greater affinity for methemoglobin, is prevented from destroying the cytochrome-oxidase system.

j. (U) Dosage (U). 0.1 to 0.3 mL by inhalation.

k. (U) Toxicity (U). Overdoses may cause flushing, headache, and dizziness. Acute poisoning results in cyanosis, nausea, vomiting, abdominal cramps, mental confusion, convulsions, paralysis, and death. Amyl nitrite vasodilates coronary arteries causing a fall in blood pressure.

l. (U) Contraindications and Precautions (U). Amyl nitrite increases intracranial pressure and thus is contraindicated in cases of head trauma or cerebral hemorrhage.

m. (U) Therapy (U). Methylene blue (orally or intravenously), epinephrine, oxygen inhalation.

n. (U) Storage (U). Must be kept in tightly closed containers in a cool place, protected from light and air.

3.1. Sodium Thiosulfate (U)

a. (U) Code or Alternate Designations (U). Antichlor, sodothiol, sulfothiorine, ametox.

b. (U) Class (U). Sulfur donater.

c. (U) Chemical Name (U). Sodium thiosulfate.

d. (U) Formula (U). $Na_2S_2O_3$.

e. (U) Molecular Weight (U). 158.13.

f. (U) Physical and Chemical Properties (U).

- Odorless crystals or granules
- Pentahydrate
- Melts at 48°C
- Soluble in water, practically insoluble in alcohol
- Effloresces in warm dry air and slightly deliquesces in moist air.

g. (U) Use (U). As an antidote and emergency treatment for cyanide poisoning. It is most effective when following amyl nitrite therapy.

h. (U) Physiological Effects (U). Thiosulfate, under the influence of sulfurtransferase, reacts with cyanide to form thiocyanate (SCN^-), a relatively nontoxic substance readily excreted in the urine.

i. (U) Dosage (U). 12.5 grams in 50 mL administered by slow intravenous injection over a 10-minute period.

j. (U) Toxicity (U). Relatively nontoxic.

k. (U) Contraindications and Precautions (U). The final reaction with thiosulfate is slowly reversible through the action of thiocyanate oxidase. Therefore, if renal function is impaired and signs of poisoning reappear, the amyl nitrite and sodium thiosulfate treatment should be repeated.

l. (U) Storage (U). Thiosulfate slowly decomposes in aqueous solution at normal temperature; this reaction rate is increased by heating.

3.2. Glyceraldehyde (U)

a. (U) Code or Alternate Designations (U). Glyceric aldehyde.

b. (U) Class (U). Antidote for cyanide poisoning.

c. (U) Chemical Name (U).

- 2,3-dihydroxypropanal
- α-β dihydroxypropionaldehyde

d. (U) Formula (U). $C_3H_6O_3$.

$HOCH_2CHOHCHO$

e. (U) Molecular Weight (U). 90.08.

f. (U) Method of Manufacture (U). Obtained from glycerol by mild oxidation with hydrogen peroxide and ferrous salts as catalysts.

g. (U) Physical and Chemical Properties (U).

- DL form: tasteless crystals
- Melting point: 145°C
- Soluble in water; insoluble in benzene, petroleum ether, pentane.

h. (U) Use (U). As an antidote and emergency treatment for cyanide poisoning.

3.3. Aquocobalamine (U)

a. (U) Code or Alternate Designations (U). Vitamin $B12_b$, aquocobamide.

b. (U) Class (U). Direct cyanide binder.

c. (U) Chemical Name (U). α-(5,6-dimethylbenzimidazolyl) aquocobamide.

d. (U) Formula (U). $C_{62}H_{89}CoN_{13}O_{15}P \cdot H_2O$

e. (U) Molecular Weight (U). 1364.

f. (U) Physiological Effects (U). Aquocobalamine is converted to Vitamin B12 in the presence of cyanide. This reaction occurs very rapidly and is useful in the removal of the toxic cyanide molecule from the body.

g. (U) Toxicity (U). Relatively nontoxic.

3.4. Paradimethylaminophenol (U)

a. (U) Code or Alternate Designation (U). DMAP.

b. (U) Class (U). Generator of methemoglobin.

c. (U) Formula (U). $(CH_3)_2NC_6H_4OH$.

d. (U) Molecular Weight (U). 137.

e. (U) Physiological Effects (U). DMAP converts hemoglobin to methemoglobin, which binds cyanide.

f. (U) Dosage (U). The 250-mg dose recommended for humans generates 30% methemoglobin. Subsequent applications are contraindicated because of the massive loss of hemoglobin involved.

g. (U) Contraindications and Precautions (U). Generation of methemoglobin may result in headaches and fatigue. DMAP given in conjunction with certain antimalarial drugs (e.g., primaquine) may result in hemolysis; Negroes are especially susceptible to this effect.

C. LEWISITE ANTIDOTES (U)

4. Dimercaprol (U)

a. (U) Code or Alternate Designations (U).

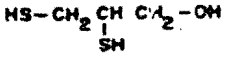
- British Anti-Lewisite
- Antoxol
- BAL
- Dicaptol
- 1,2-dithioglycerol
- Sulphactin

b. Class. Antidote for arsenicals.

c. Chemical Names.

- 2,3-Dimercapto-1-propanol.
- 1,2-Dithioglycerol.

d. Formula. $C_3H_8OS_2$



e. Molecular Weight. 124.21.

f. Method of Manufacture.

- Method A: Prepared by the bromination of allyl alcohol to glycerol dibromohydrin followed by reaction with sodium hydrosulfide under pressure.
- Method B: Hydrogenation of hydroxypropylene trisulfide.

g. Physical and Chemical Properties.

- Physical state and color: Colorless, viscous, oily liquid.
- Odor: Pungent offensive odor of mercaptans.
- Boiling point: 120°C at 15 mm Hg, 130°C at 25 mm Hg, 140°C at 40 mm Hg.[3]
- Solubility: Soluble in vegetable oils, ethanol, methanol, benzyl benzoate and water.
- Specific gravity: 1.24 at 25°C.

h. Use. Developed as protection against arsenical CW agents, especially Lewisite. BAL stops the agent's toxic effect upon the pyruvate oxidase system in the brain. BAL is also used in the treatment of chronic poisoning by arsenic, mercury, gold; it is less effective for bismuth, antimony, cobalt, and nickel.

i. Physiological Effects. BAL removes arsenic rapidly from the body by forming a complex with the metal. The antidote is generally effective even in advanced stages of poisoning. Doses of 4 mg/kg or more in humans may cause: nausea; vomiting; headache; burning sensation of mouth, throat, lips, and eyes; lacrimation; salivation; dental pain; burning and tingling sensation of extremities; substernal pressure; and hypertension. Symptoms appear a few minutes after injection, but are transient in nature. Smaller doses may produce mild symptoms. Contact with skin may cause local swelling and reddening at the area of application. When ingested, BAL may produce ulceration of gastric and respiratory tracts.

j. Dosage. A 3 mg/kg dose, intramuscularly (10% solution in peanut oil for arsenicals).

k. Toxicity. LD_{50} for rats is 105 mg/kg, intramuscularly.

l. Therapy. Epinephrine or ephedrine. Antihistamines may be used for prophylaxis.

m. Storage. Stored in airtight containers at temperatures not above 5°C. Benzyl benzoate is added as a stabilizer.

n. History.

- 1945: Developed by Peters, Stocken and Thompson in United Kingdom.
- 1946: US pat. 2,402,665 (E. I. du Pont de Nemour & Co.).

5. (U) Unithiol

a. Code or Alternate Designation. USSR—Unitiol.

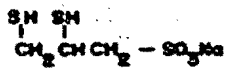
b. Class. Antidote for heavy metal poisoning.

c. Chemical Names.

- 2,3-Dimercaptopropanesulfonic acid sodium salt.
- 1-Propanesulfonic acid -2,3-dimercapto sodium salt.
- Sodium 2,3-dimercaptopropanesulfonate.

Original ST-HB-03-18-74

d. Formula. $C_3H_7O_3S_3$



Reg. 513205

e. Molecular Weight. 213.31.

f. Method of Manufacture. Reaction of BAL with sodium sulfite.

g. Physical and Chemical Properties.

- Physical state and color: Fine crystalline white powder; non-hygroscopic.
- Odor: Mild mercaptan odor.
- Solubility: Soluble in water.

h. Use. Therapy in heavy metal poisoning, especially arsenic (Lewisite) and mercury. For treatment of eye contamination, a salve of 40% unithiol in lanolin is used.

i. Physiological Effects. Unithiol forms a stable compound with arsenic in vivo, which is rapidly removed from the body. The antidote restores the level of blood pressure, prevents collapse, restores activity of enzymes and has no cardiovascular effects. Therapeutic doses of unithiol are well tolerated and have no cumulative properties. Side effects which may occur include nausea, vomiting and constriction in the chest.

j. Toxicity. Low toxicity with a broad range of therapeutic action. Fatal dose is 20 to 40 times greater than the therapeutic dose of 5 mg/kg—intravenously, subcutaneously, or orally. LD_{100}, intravenously, is 1000 mg/kg for rabbits and LD_{100}, subcutaneously, is 1500 mg/kg for rats, 2400 mg/kg for mice, and 500 mg/kg for dogs and cats.

k. Historical. 1950: Developed in Kiev, USSR.

D. NERVE AGENT PROPHYLAXIS AND THERAPY
D.1 CHOLINOLYTICS

6. (U) Atropine

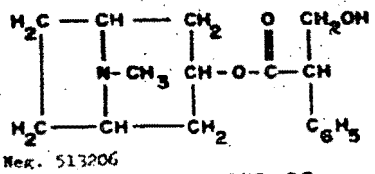
a. Code or Alternate Designations.

- dl-Hyoscyamine.
- dl-Tropyl tropine.
- Tropine tropate.

b. Class. Functional antidote, cholinolytic drug.

c. Chemical Names. Ester of tropine (2,3-dihydro-3-hydroxy-8-methyl-nortropidine) and tropic (2-phenyl-β-hydroxypropionic) acid.

d. Formula. $C_{17}H_{23}NO_3$



Neg. 513206

e. Molecular Weight. 289.38.

f. Method of Preparation. Extraction of Atropa belladonna L., Datura stramonium L. and other Solanaceae. During extraction, partial racemization of the l-hyoscyamine takes place. Dilute alkali or heating in chloroform solution completes the process. It is purified by recrystallization of the oxalate salt.

g. Physical and Chemical Properties.

(1) Atropine.

- Physical state and color: White, needlelike crystals or powder; optically inactive.
- Melting point: 114° to 116°C.
- Sublimation temperature: 93° to 110°C in high vacuum.

- Solubility: Very soluble in alcohol and chloroform, soluble in ether, glycerol, benzene, and dilute acids; slightly soluble in water.

- Hydrolysis: Hydrolyzes to form tropine and tropic acid.

(2) Atropine sulfate. Atropine forms the sulfate salt with H_2SO_4, molecular weight of 694.82. Atropine sulfate consists of colorless crystals or white crystalline granules; effloresces in dry air, melts at 190° to 194°C; is odorless, almost inactive optically, and readily soluble in hot or cold water, glycerol, and alcohol. An aqueous solution has a pH of approximately 5.4.

h. Use.[9 124] Standard antidote for organophosphorus nerve agent poisoning. It is contained in syrettes and automatic injectors. Atropine is also used in the treatment of Parkinson's Disease and to dilate the pupil of the eye.

i. Physiological Effects.

(1) Atropine blocks responses to certain types of parasympathetic stimulation, that is, it antagonizes the muscarinic action of acetylcholine by preventing acetylcholine from acting on receptor sites of effector organs.

(2) Symptoms of atropinization are depressed respiration, dryness of mouth and throat, dilation of pupil of the eye, intolerance toward light, flushed face, nausea, giddiness, numbness of limbs, staggering gait, drowsiness, and stupor. With larger doses, central excitation becomes more prominent, leading to restlessness, disorientation, and hallucinations. With still larger doses, stimulation gives way to depression and medullary paralysis causing death.

(3) In the treatment of nerve agent poisoning, atropine nullifies the muscarine-like effects of accumulated acetylcholine (i.e., miosis, blurred vision, excessive bronchial secretions, nausea, abdominal cramps, tightness in chest, and other symptoms) due to inhibition of the enzyme, cholinesterase. Atropine has no effect on the nicotine-like manifestations of a cholinesterase inhibitor (i.e., muscular twitching, weakness of respiratory muscles, and convulsions).

j. Dosage.[57 124]

(1) In nerve agent poisoning, 2 mg of atropine sulfate is administered intramuscularly, by means of a syrette or an automatic self-injector. Repeat every 10 min until atropinization symptoms appear (dry mouth and a pulse rate of 90 to 100/min). In severe poisoning, as much as 24 mg of atropine may be administered in a single day without producing more than transient, mild symptoms attributable to atropine. A large total dose of 200 mg may be required in severe poisoning. Atropine is one of the basic ingredients of present-day therapy, and is generally used as the first step of treatment because it works rapidly and allows time for ancillary treatment. Atropine tartrate may be substituted for atropine sulfate.

(2) A combination of atropine and artificial respiration is many times more effective than either alone. The use of oximes in conjunction with atropine-artificial respiration therapy is generally even more effective in counteracting the effects of nerve agent poisoning. The combined use of atropine with an oxime mixture of pralidoxime chloride and TMB-4 was found to be superior to atropine in combination with either pralidoxime chloride or TMB-4 individually.

k. Toxicity. LD_{50}, orally, for mice is 794 mg/kg, and for rats, 750 mg/kg. LD_{50}, intravenously, for mice is 90 mg/kg. LD_{50}, subcutaneously, for mice is 750 mg/kg, and for rats, 2000 mg/kg.

l. Therapy. Pilocarpine, physostigmine, or artificial respiration.

m. Storage. In airtight containers, protect from light.

n. History.

- 1927: Extracted by Chemmitrius.
- 1961: Commercial production, Woodward.

Original

ST-HB-03-18-74

7. (U) Caramiphen Hydrochloride

a. Code or Alternate Designations.

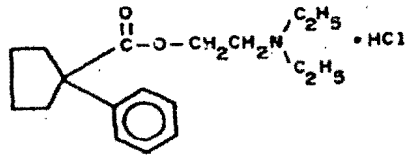
- Parpanite.
- Panparnit.
- Pentaphen.
- Geigy 2747.
- Parpanit.

b. Class. Atropinoid spasmolytic, cholinolytic drug.

c. Chemical Names.

- 1-Phenylcyclopentanecarboxylic acid 2-diethylamino-ethyl ester hydrochloride.
- Diethylamino-ethyl-1-phenylcyclopentane-1-carboxylate hydrochloride.

d. Formula. $C_{18}H_{27}NO_2 \cdot HCl$



Neg. 513207

e. Molecular Weight. 325.87.

f. Method of Preparation. Prepared from 1-phenylcyclopentane-carboxylic acid chloride and diethylaminoethanol.[3]

g. Physical and Chemical Properties.

- Physical state and color: Crystalline solid.
- Melting point: 145° to 146°C.
- Boiling point: Free ester, 110° to 115°C.

- Solubility: Soluble in methanol, ethanol, physiological saline; slightly soluble in water; insoluble in ether.

h. Use. Antidote for massive organophosphorus poisoning when atropine is contraindicated (extreme oxygen starvation, hypoxemia of heart); also for treatment of Parkinson's disease and bronchial asthma.

i. Physiological Effects. Caramiphen is a powerful cholinolytic preparation with both peripheral and central nervous system actions. This therapeutic has antispasmodic, antihistaminic, ganglio-blocking and local anesthetic properties. The prophylactic action is increased considerably if combined with scopolamine. Caramiphen inhibits gastric motility, raises blood pressure, and in large doses has curare-like action. There are very few side effects. In combination with oxime, it is only slightly more effective than atropine.

j. Dosage. The dosage must be individualized. Effective dose for rabbits in parathion poisoning is 5 mg/kg, intravenously, and 12.5 to 100 mg total dose, orally.

k. Toxicity. It is less toxic than Trasentine. LD_{50} for rats is 209 mg/kg, intraperitoneally. LD_{50} for mice is 67 mg/kg, intravenously.

l. Therapy. Not known.

m. Storage. Normal precautions, as for most drugs.

n. History.

- 1945: Swiss pat. 234 452 (Geigy).
- 1946: Prepared by Martin and Häflinger at Geigy in United States.
- 1952: Synthesized by A. I. Briskin in USSR.

8. (U) Trasentine

a. Code or Alternate Designations.

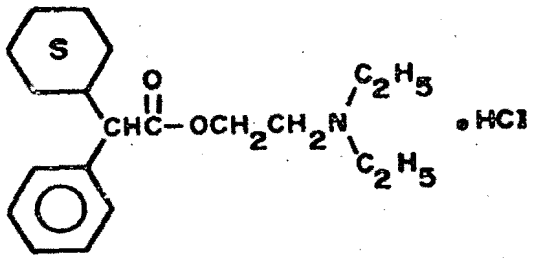
- Trasentine hydrochloride.
- Spasmolytin.
- Diphacil.

- Difatsil
- Patrovina
- Adiphenine hydrochloride

b. (U) Class (U). Atropinoid antispasmodic, cholinolytic drug.

c. (U) Chemical Name (U). 2-diethylaminoethyl α-cyclohexyl-α-phenylacetate hydrochloride.

d. (U) Formula (U). $C_{20}H_{25}NO_2 \cdot HCl$.



Neg. 513208

e. (U) Molecular Weight (U). 353.92.

f. (U) Method of Manufacture (U). Prepared by controlled hydrogenation of 2-diethylaminoethyl diphenylacetate.

g. (U) Physical and Chemical Properties (U).

- Physical state and color: Needle-like crystals
- Melting point: 145° to 147°C (crystallized from alcohol and petroleum ether)
- Solubility: Soluble in water; slightly soluble in alcohol and ether. (A 5% aqueous solution is neutral to litmus.)

h. (U) Use (U). Trasentine can be used as an antidote for organophosphorus poisoning, a synthetic substitute for atropine in spasms of involuntary muscles, and a local anesthetic.

i. (U) Physiological Effects (U). Trasentine is a potent antispasmodic agent that acts like papaverine on smooth muscles and like atropine in the parasympathetic nerves. If taken in prescribed doses there are fewer side effects than most antispasmodics, and the effects on the eyes and cardiovascular system are insignificant. Trasentine is centrally active and predominantly nicotinic.

j. (U) Dosage (U). 75 to 100 mg.

k. (U) Toxicity (U). It is much less toxic than atropine and requires very large doses to obtain similar side effects. Should not be used with morphine. LD_{50} for mice is 690 mg/kg, orally, and 380 mg/kg intramuscularly (i.m.).

l. (U) Contraindications and Precautions (U). Trasentine should be used with great caution in patients receiving morphine.

m. (U) Therapy (U). Not known.

n. (U) Storage (U). Normal precautions, as for most drugs.

o. (U) History (U).

- 1936: First introduced
- 1941: Swiss patent 215 775
- 1942: Swiss patent 217 225
- 1942: Swiss patent 219 301 (Ciba).

9. Tropacine (U)

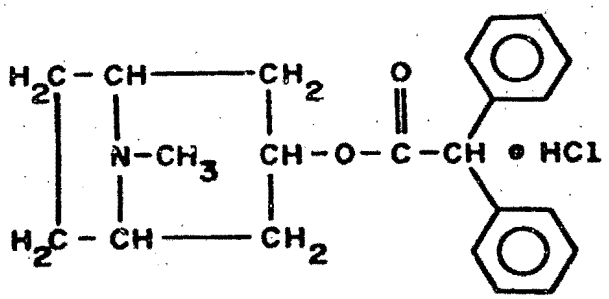
a. (U) Code or Alternate Designations (U). Tropazine, tropasin, tropatsin.

b. (U) Class (U). Cholinolytic drug.

c. (U) Chemical Names (U).

- Tropine ester of diphenylacetic acid hydrochloride
- 3-tropanyl diphenylacetate hydrochloride
- Tropine diphenylacetate hydrochloride

d. (U) Formula (U). $C_{22}H_{25}NO_2 \cdot HCl$.



Neg. 513209

e. (U) Molecular Weight (U). 371.91.

f. (U) Method of Preparation (U). Prepared from tropine and diphenylacetyl chloride.

g. (U) Physical and Chemical Properties (U).

- Physical state and color: White crystalline powder
- Melting point: 217° to 218°C (crystallized from chloroform and ether)
- Solubility: soluble in water, alcohol, and chloroform; insoluble in ether and benzene.

★ h. (U) Use (U). Tropacine is used as a therapeutic for organophosphorus poisoning and for the treatment of Parkinson's Disease, traumatic brain diseases, disorders of the central nervous system, and epidemic encephalitis. The Soviets produce 5-, 10-, and 15-mg tablets. Maximum daily dose is 100 mg.

i. (U) Physiological Effects (U). Tropacine has gangliolytic and spasmolytic effects. This therapeutic blocks both muscarinic and nicotinic-cholinoreactive systems. Tropacine causes dryness of mouth and dilation of the pupils (of short duration). It has greater central and weaker peripheral action than atropine.

j. (U) Effectiveness (U). An i.v. dose of 1 mg/kg removes the lethal effect from an LD_{50} dose of parathion in rabbits.

k. (U) Toxicity (U). Doses over 0.3 gram may be fatal.

l. (U) Therapy (U). Not known.

m. (U) Storage (U). Store in well-stoppered containers away from light.

n. (U) History (U).

- 1939: Swiss patent 202 181 (Ciba)
- 1953: Prepared by M. D. Mashkovskiy in USSR.

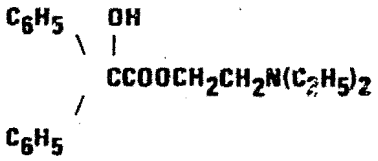
9.1. Benactyzine (U)

a. (U) Code or Alternate Designations (U). Amizil (WP), amisil (WP), nervatil (RO), amisyl (WP), nervacton, arcadine, actozine, cedad, parasan, cafron, lucidil, parpon, cevanol, nutinal, phobex, tranquillin, fobex, ibiotyzil, neuroleptone, suavitil, and AY 5406-1.

b. (U) Class (U). Cholinolytic, tranquilizer.

c. (U) Chemical Name (U). Benzylic acid β-diethylaminoethyl ester, β-diethylaminoethyl benzilate, 2-diethylaminoethyl diphenylglycolate.

d. (U) Formula (U). $C_{20}H_{25}NO_3$.



e. (U) Molecular Weight (U). 327.41.

f. (U) Physical and Chemical Properties (U).

- Crystals
- Melting point: 177° to 178°C
- Soluble in water; practically insoluble in ether.

g. (U) Use (U). Antidote for organophosphorus poisoning, usually administered in combination with an oxime. Also used as a tranquilizer.

h. (U) Physiological Effects (U). Benactyzine is a mild antidepressant and anticholinergic agent that, in animals, has been shown to reduce the autonomic response to stress. In combination with oximes it is only slightly more effective than atropine. Centrally acting.

i. (U) Dosage (U). The Soviets produce 1 mg and 2 mg tablets and recommend a daily dose of 3 to 10 mg. They also produce a 1% to 2% solution for eye drops.

j. (U) Toxicity (U). Overdosage leads to CNS depression and coma. In mice LD_{50} = 100 mg/kg i.m.

k. (U) Contraindications and Precautions (U). In high dosage, benactyzine may produce dizziness, thought-blocking, a sense of depersonalization, aggravation of anxiety, or disturbance of sleep patterns.

l. (U) Therapy (U). Supportive therapy in general.

m. (U) Storage (U). Fairly stable; normal precautions should be taken.

n. (U) History (U).

- 1938: prepared by Horenstein and Pahlicke.
- 1946: US Patent No. 2 394 770.

9.2. Aprophen (U)

a. (U) Code or Alternate Designation (U). Aprofen (WP).

b. (U) Chemical Names (U).

- 2,2-diphenylpropionic acid
  2-diethylaminoethyl ester
- α, α-diphenylpropionic acid
  β-diethylaminoethyl ester
- 2-diethylaminoethyl
  2,2-diphenylpropionate

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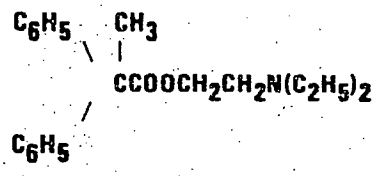
c. (U) Formula (U). $C_{21}H_{27}NO_2$.



d. (U) Molecular Weight (U). 325.

e. (U) Physiological Effects (U). Analgesic, antispasmodic, central and peripheral m- and n-cholinolytic (predominantly blocking nicotinic sites).

★ f. (U) Use (U). Aprophen is used in the Soviet Union as supportive therapy to treat nerve agent poisoning. One mL of a 1% solution or 25-mg tablets are recommended two or three times per day (para 9.6).

9.3. G3063 (U)

a. (~~C-NOFORN~~) Chemical Name (U). (b)(1) (b)(1)

b. (~~C-NOFORN~~) Physiological Effects (U). (b)(1) (b)(1)

9.4. PMCG (U)

a. (~~C-NOFORN~~) Chemical Name (U). (b)(1) (b)(1)

b. (~~C-NOFORN~~) Physiological Effects (U). (b)(1) (b)(1)

9.5. Arpenal (U)

a. (U) Chemical Name (U). Diphenylacetic acid diethylaminopropylamide.

b. (U) Formula (U). $(C_6H_5)_2CHC(O)NH(CH_2)_3N(CH_2CH_3)_2$.

c. (U) Molecular Weight (U). 324.

d. (U) Use (U). Arpenal is used in the Soviet Union to supplement the cholinolytic activity of atropine.

e. (U) Physiological Effects (U). Arpenal exhibits pronounced central n-cholinolytic effects. Cholinolytic action at peripheral and central muscarinic sites is weaker.

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9.6. Taren (U)

a. (C) Chemical Name (U). (b)(1)

(b)(1)

b. (U) Physiological Effects (U). Taren been reported to exhibit cholinclytic activity. One to two tablets can cause dryness of the mouth, increased heart rate, expansion of the pupils, disturbance of near vision, dryness, and sometimes a state resembling alcoholic euphoria.

c. (U) Use (U). Taren is a civil defense nerve agent prophylactic used in the Soviet Union. It is issued in the form of 200-mg tablets (believed to be the weight of active components and filler) and 1-mL ampoules. One tablet is taken every 5 or 6 hours prior to a nerve agent attack or two tablets immediately after exposure to the agent. A taren solution is used to treat mildly intoxicated victims upon the appearance of symptoms or is used in conjunction with the oximes TMB-4 (1 mL of a 15% solution) or isonitrosine (3 mL of a 40% solution) for more seriously intoxicated victims.

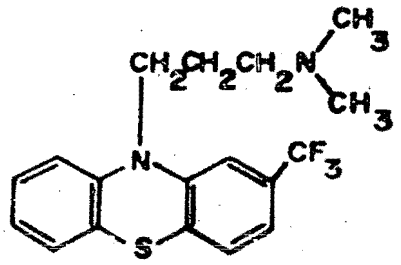
9.7. Triflupromazine Hydrochloride (U)

a. (U) Alternate Designations (U). TFP, vetane, vesprin.

b. (U) Class (U). Antipsychotic, phenothiazine derivative.

c. (U) Chemical Name (U). 10-[3-(dimethylamino)propyl]-2-trifluorom ethylpheno thiazine.

d. (U) Formula (U). $C_{18}H_{20}ClF_3N_2S$.



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e. (U) Molecular Weight (U). 388.9.

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f. (U) Physical and Chemical Properties (U).

- Crystals
- Decomposition point: 173° to 174°C
- Soluble in water, ethanol, acetone

g. (C-NOFORN) Use (U). (b)(1)

(b)(1)

h. (U) Physiological Effects (U). TFP has gangliolytic, adrenolytic, antifibrillatory, antiedema, antipyretic, antishock, anticonvulsant, and antiemetic properties.

i. (U) Dosage (U). Dosage should be titrated to the individual case. Ranges include 50-400 mg orally or 20 to 50 mg i.m. daily.

j. (U) Toxicity (U). Side effects include sedative effects, nonvoluntary effects, and hypotensive effects.

k. (U) Contraindications and Precautions (U). TFP is contraindicated in comatose or greatly depressed states due to various central nervous system depressants. TFP, a member of the phenothiazine group, markedly affects the actions of many other drugs. It may block the action of guanethidine, an antihypertensive. TFP enhances the effects of alcohol and morphine and markedly enhances the respiratory depression produced by meperidine. Combinations of these drugs must be avoided. Phenothiazines interfere with a number of laboratory tests, notably the glucose tolerance test.

l. (U) Therapy (U). A clear airway must be maintained in overdose therapy.

m. (U) Storage (U). Protect from light, store in tinted glass.

n. (U) History (U).

- 1957: Prepared by Yale and coworkers
- 1959: British Patent No. 813 861

9.8. Methylbenactyzine (U)

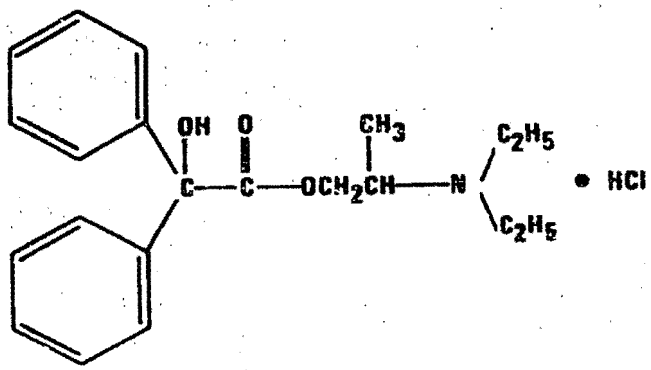
a. (U) Code or Alternate Designations (U). Metamizl (UR), metamizilum (UR), methyldiazil.

b. (U) Class (U). Cholinolytic.

c. (U) Chemical Names (U).

- 2-diethylaminopropyl diphenylglycolate
- Benzilic acid 2-diethyl-aminopropylester

d. (U) Formula (U). $(C_6H_5)_2COHCOOCH_2CH(CH_3)N(CH_2CH_3)_2$



e. (U) Molecular Weight (U). 341.

f. (U) Physiological Effects (U). Predominantly m-cholinolytic effects. Both central and peripheral effects are more pronounced than those of benactyzine.

★ g. (U) Use (U). The Soviet Union produces 1-mg tablets and ampules containing 1 mL of 0.25% solution. One to two mg can be taken two to three times per day.

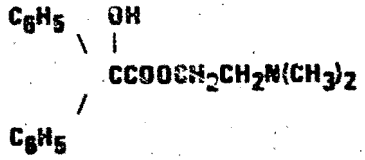
9.9. 2-dimethylaminoethyl Benzilate (U)

a. (U) Code or Alternate Designations (U). Benzacine (USSR), diphemin, labotropin.

b. (U) Chemical Names (U).

- Benzilic acid 2-dimethyl-aminoethyl ester
- 2-dimethylaminoethyl diphenylglycolate

c. (U) Formula (U). $C_{18}H_{21}NO_3$.



d. (U) Molecular Weight (U). 299.

e. (U) Physiological Effects (U). It exhibits m-cholinolytic action half the strength of atropine. Its effects on the brain approximate benactyzine.

f. (U) Use (U). The Soviet Union produces 2-mg tablets and ampoules containing 1 mL of 0.1% solution. A dose of 2 mg can be given two to three times per day.

9.10. Scopolamine (U)

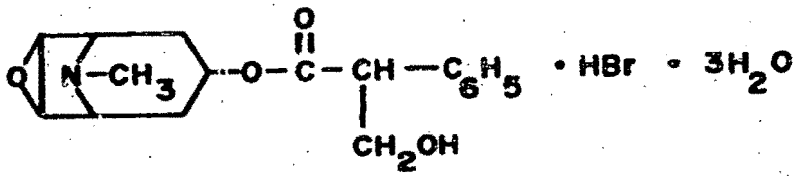
a. (U) Code or Alternate Designations (U). Scopine tropate, tropic acid ester with scopine, hyoscine, l-scopolamine.

b. (U) Class (U). Cholinolytic.

c. (U) Chemical Names (U).

- 6β, 7β-epoxy-3α-tropanyl S-(-)-tropate.
- 6, 7-epoxytropine tropate.

d. (U) Formula (U). $C_{17}H_{21}NO_4$.



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e. (U) Molecular Weight (U). 303.35.

f. (U) Method of Preparation (U). Extracted from the shrub Hyoscymus niger (henbane) and Scopolia carniolica.

g. (U) Physical and Chemical Properties (U).

- Viscous liquid
- Freely soluble in hot water, alcohol, ether, chloroform, and acetone
- Sparingly soluble in benzene and petroleum ether
- Easily hydrolyzed by acids or alkalies
- Decomposes on standing

★ h. (U) Use (U). The Soviets produce ampules containing 1 mL of 0.05% solution. Internal dose is 0.5 mg two to three times per day.

i. (U) Dosages (U). Oral, 0.6 mg in the United States.

j. (U) Toxicity (U). Side effects include dryness of mouth, palpitation, dilated pupils, blurring of vision, headache, restlessness, and fatigue. In mice LD_{50} = 670 mg/kg i.m.

k. (U) Contraindications and Precautions (U). Given alone in the presence of pain or severe anxiety, scopolamine may induce outbursts of uncontrolled behavior. It may cause blindness if administered to patients suffering from narrow angle glaucoma.

l. (U) Therapy (U). In overdose: physostigmine and supportive therapy.

m. (U) Storage (U). Decomposes on standing.

n. (U) History (U). 1928 extracted and purified by Chemnitius.

o. (U) Physiological Effects (U). Its peripheral effects are not as prolonged as the effects of atropine but are more pronounced on the pupil, the ciliary muscle, and the salivary, bronchial, and sweat glands. Scopolamine can also tranquilize the central nervous system.

9.11. 3-oxyquinuclidine Diphenylpropionate (U)

a. (U) Code or Alternate Designation (U). Aprolidine.

b. (U) Physiological Effects (U). It has been found to be more effective than atropine when given to mice either before or after exposure to phosphacol or armin.

9.12. Hexamethonium Chloride (U)

a. (U) Code or Alternate Designations (U). Hexathonide chloride, bistrium chloride, hexone chloride.

b. (U) Class (U). Ganglionic blocking agent, antihypertensive.

c. (U) Chemical Name (U). Hexamethylenebis(trimethyl-ammonium chloride).

d. (U) Formula (U). $C_{12}H_{30}Cl_2N_2$.

$$[(CH_3)_3\overset{+}{N}-(CH_2)_6-\overset{+}{N}(CH_3)_3]2Cl-$$

e. (U) Molecular Weight (U). 273.29.

f. (U) Method of Preparation (U). There are several methods of preparation, e.g., from hexamethylene dichloride and trimethylamine.

g. (U) Physical and Chemical Properties (U).

- Hygroscopic crystals
- Decomposes at 289°-292°C
- Freely soluble in water; soluble in 95% ethanol; practically insoluble in chloroform and ether.

h. (U) Use (U). Used in management of hypertensive cardiovascular disease.

i. (U) Toxicity (U). Side effects include hypotension, tachycardia, mydriasis, constipation, dry mouth, and nausea. In mice LD_{50} = 100 mg/kg i.m.

j. (U) Contraindications and Precautions (U). Hexamethonium chloride causes histamine release and should be used with extreme caution in patients who have a history of allergy.

9.13. Anisodamine (U)

a. (U) Code or Alternate Designations (U). 654 (China).

b. (U) Class (U). Cholinolytic.

c. (U) Chemical Name (U). Benzeneacetic acid γ-(hydroxymethyl)-6-hydroxy-8-methyl-8-azabicyclo (3.2.1)-oct-3-yl ester.

d. (U) Molecular Weight (U). 305.

e. (U) Method of Preparation (U). Extracted from Scopolia tangutica or Anisodus tanguticus.

f. (U) Physiological Effects (U). Similar to atropine but with fewer side effects and lower toxicity. Side effects usually disappear within 3 hours. Greater penetration into central nervous system.

g. (U) Physical Properties (U).

- Colorless, needle-shaped crystals in benzene
- Dissolves in water and alcohol
- Melting point: 62°-64°C.

9.14. Anisodine (U)

a. (U) Code or Alternate Designations. 703 (China).

b. (U) Class (U). Cholinolytic.

c. (U) Method of Preparation (U). Extracted from Scopolia tangutica or Anisodus tanguticus.

d. (U) Physiological Effects (U). Similar to scopolamine in pharmacology.

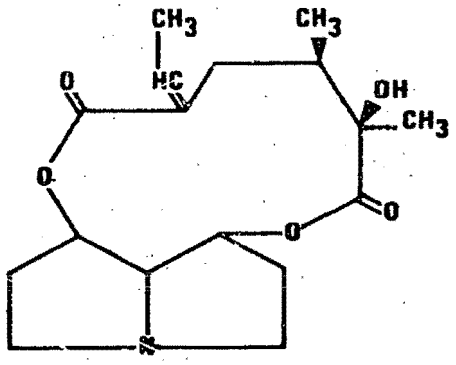
9.15. Platyphylline (U)

a. (U) Code or Additional Names (U). Platifillin.

b. (U) Class (U). Spasmolytic.

c. (U) Chemical Name (U). 1,2-dihydro-12 hydroxysenecionan-11-16 dione.

d. (U) Formula (U). $C_{18}H_{27}NO_5$.



e. (U) Molecular Weight (U). 337.

f. (U) Physical and Chemical Properties (U).

- Crystals
- Melting point: 129°C
- Practically insoluble in water; soluble in alcohol, chloroform, ether, dilute acids

g. (U) Method of Preparation (U). Extracted from Senecia platyphyllus.

★ h. (U) Use (U). Platyphylline is used in the Soviet Union as a spasmolytic and mydriatic. Mentioned by the Soviets as a possible cholinolytic for nerve agent poisoning. It is available in 5-mg tablets and ampules containing 1 mL of a 0.2% solution.

i. (U) Physiological Effects (U). Platyphylline is milder than atropine in action and can be used in doses that do not produce atropine-like side effects.

D.2. CHOLINESTERASE REACTIVATORS

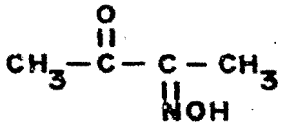
10. Diacetylmonoxime (U)

a. (U) Code or Alternate Designation (U). DAM.

b. (U) Class (U). Oxime.

c. (U) Chemical Name (U). 2,3-butanedione monoxime.

d. (U) Formula (U). $C_4H_7NO_2$.



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e. (U) Molecular Weight (U). 101.04.

f. (U) Method of Preparation (U). Prepared by the interaction of diacetyl with hydroxylamine in an almost neutral alcoholic or aqueous solution.

g. (U) Physical and Chemical Properties (U).

- Physical state: Crystalline solid
- Solubility: Soluble in water, physiological saline, and alcohol
- Half-life: 7.2 hours

h. (U) Use (U). DAM is a cholinesterase reactivator and is used prophylactically and therapeutically as an antidote for anticholinesterase poisoning. DAM is more effective as a prophylactic.

i. (U) Physiological Effects (U). DAM has a pronounced central effect and can penetrate the blood-brain barrier. Although DAM eliminates symptoms of organophosphorus poisoning, it is ineffective against GD (soman). Side reactions of DAM may include sensation of heat at point of injection, blurred vision, dizziness, sleepiness, rapid heartbeat, low blood pressure, bitter taste in mouth, diffused tingling of skin, and temporary anxiety. Large doses may result in nausea, convulsions, and death.

j. (U) Dosage (U). (b)(1)

(b)(1)

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k. (U) Toxicity. LD_{50} for mice is 900 mg/kg. (Route of administration unknown).

l. (U) Storage. Not known.

11. (U) Monoisonitrosoacetone

a. Code or Alternate Designations. MINA.

b. Class. Oxime.

c. Chemical Name. Monoisonitrosoacetone.

d. Formula. $C_3H_5NO_2$

e. Molecular Weight. 87.03.

f. Method of Preparation. Prepared by the reaction of ethyl acetoacetate with potassium hydroxide, then adding sodium nitrite and sulfuric acid.

g. Physical and Chemical Properties.

- Physical state and color: Pale brown needles, vacuum sublimation gives colorless plates.
- Melting point: Pure material, 64° to 66°C; crude material, 45° to 50°C.
- Solubility: Soluble in water and physiological saline solution.

h. Use. MINA is a cholinesterase reactivator and acts both as a prophylactic and antidote for nerve agent poisoning.

i. Physiological Effects. MINA has a pronounced effect on the central nervous system and can penetrate the blood-brain barrier. Side reactions from MINA may include blurred vision, dizziness, rapid heartbeat, and low blood pressure. Large doses may result in convulsions and death. It is more active in CNS than 2-PAM.

j. Dosage. Prophylactic dose for mice against GB is 75 mg/kg, intravenously. MINA is effective only in amounts that are close to their lethal doses.

k. Therapy. Not known.

l. Storage. Not known.

12. (U) Pralidoxime Chloride

a. Code or Alternate Designations.

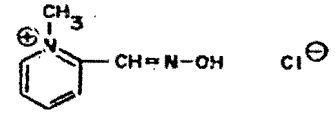
- EA 2170.
- 2-PAM.
- PAM.
- 2-PAM-Cl.
- 2-PAM chloride.
- Protopam chloride.

b. Class. Oxime (pyridine quaternary oxime).

c. Chemical Names.

- Pralidoxime chloride.
- Pyridine 2-aldoxime methochloride.
- 2-Formyl-1-methylpyridinium chloride oxime.

d. Formula. $C_7H_9ClN_2O$



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e. Molecular Weight. 172.63.

f. Method of Preparation. Prepared from 2-pyridinecarboxaldehyde with hydroxylamine hydrochloride, followed by addition of chloromethane.

g. Physical and Chemical Properties.

- Physical state and color: White crystalline powder; non-hygroscopic.

- Odor: Odorless.
- Melting point: 235° to 238°C with decomposition (crystallized from alcohol and ether).
- Solubility: Freely soluble in water and physiological saline; soluble in chloroform and fats; more soluble in water than pralidoxime iodide.

h. Use. 2-PAM chloride is a cholinesterase reactivator and acts as a prophylactic and therapeutic for poisoning by some anticholinesterases. The therapeutic effectiveness is increased when combined with atropine.

i. Physiological Effects. The action of 2-PAM chloride is slightly stronger than the iodide as a cholinesterase reactivator. When used alone 2-PAM chloride raises the LD_{50} of GA for rats 1.2 times; in conjunction with atropine, the LD_{50} increases 1.6 times. When used with atropine, the LD_{50} of GB for rats is raised 10 to 20 times. 2-PAM chloride is ineffective against GD. 2-PAM chloride relieves such symptoms as muscle tightening, spasms, shaking, and breathing difficulties. Overdoses of 2-PAM chloride may cause dizziness, double image, headache, rapid heartbeat, and unconsciousness.

j. Dosage. Usual dosage is 10 to 20 mg/kg, intravenously. See also 2-PAM iodide. The use of a PAM salt in conjunction with atropine is considered satisfactory in most cases of nerve poisoning. PAM generally is administered intravenously by current techniques, but this procedure is being studied further for use under combat conditions. 2-PAM chloride is preferable to 2-PAM iodide because of the greater water-solubility of 2-PAM in the chloride form. The combined use of PAM and diacetylmonoxime was found to have a synergistic effect, and the combination of atropine, PAM, and TMB-4 (sec XIII, para 15) was superior to mixtures of atropine and PAM, or of atropine and TMB-4 separately.

k. Toxicity. LD_{50} for mice is 115 mg/kg, intravenously, and 410 mg/kg, orally. Oral toxicity to man is 2000 to 10 000 mg/70 kg for man.

l. Therapy. Not known.

m. Storage. It is not as stable as bispyridinium compounds, such as TMB-4, but is more stable than PAM iodide. Stable in solutions with pH between 3.5 and 4.5. The powder is stored in small glass vials.

n. History.

- 1964: US pat 3 140 289, Ellin et al. (US Army).
- 1964: US pat 3 155 674, McDowell (Olin Mathieson).

13. (U) Pralidoxime Iodide

a. Code or Alternate Designations.

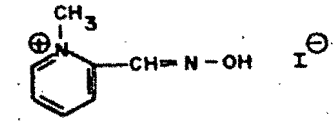
- PAM.
- EA 1821.
- 2-PAM.
- "Chick-ling-ting" (PRC).
- 2-PAM iodide.

b. Class. Oxime (pyridine quaternary oxime).

c. Chemical Names.

- Pralidoxime iodide.
- Pyridine 2-aldoxime methiodide.
- 2-Formyl-1-methylpyridinium iodide oxime.

d. Formula. $C_7H_9IN_2O$



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e. Molecular Weight. 264.08.

f. Method of Preparation. Prepared from 2-pyridine aldehyde by treatment with hydroxylamine, followed by methyl iodide addition.

g. Physical and Chemical Properties.

- Physical state and color: Yellow crystals.
- Melting point: 225° to 226°C.[125]
- Solubility: Slightly soluble in water giving a yellowish solution.

h. Use. Same as for PAM chloride.

i. Physiological Effects. 2-PAM iodide is a cholinesterase reactivator and is used as a therapeutic for relief of nerve agent symptoms such as: muscle tightening, spasms, and breathing difficulties. 2-PAM iodide is ineffective against GD. Doses of 15 to 30 mg/kg of 2-PAM iodide may cause dizziness, double image, headache, and rapid heartbeat. It is rapidly destroyed in body by the liver.

j. Dosage. The dose depends upon the severity of poisoning. A dose of 15 to 30 mg/kg intravenously in aqueous solution is given initially. A dose of 500 to 1000 mg in 25 ml of sterile water can be repeated after 30 min if no improvement is observed. No more than 2000 mg should be given. Dosage may be increased if given with atropine. A combination of PAM and DAM exert a synergistic effect on cholinesterase reactivation.

k. Toxicity. Same as for PAM chloride.

l. Therapy. Not known.

m. Storage. Aqueous solutions at pH 4.5 at 25°C have a half-life of over 3 years.

n. History.

- 1953: Synthesized by Wilson in the United States.
- 1957: US pat 2 816 113 (US Sec. of the Army).

14. (U) Pralidoxime Methanesulfonate

a. (U) Code or Alternate Designations.

- 7676 RP.
- P2S.

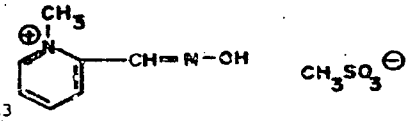
- 2-PAM methanesulfonate.
- Contrathion.
- Pralidoxime mesylate.
- AMP.

b. (U) Class. Oxime (pyridine quaternary oxime).

c. (U) Chemical Names.

- Pyridine-2-aldoxime methanesulfonate.
- 2-Hydroxyiminomethyl-N-methylpyridinium methanesulfonate.

d. (U) Formula. $C_9H_{12}N_2O_4S$



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e. (U) Molecular Weight. 232.2.

f. (U) Method of Preparation. Prepared from pyridine-2-aldehyde with hydroxylamine hydrochloride in aqueous sodium carbonate, followed by addition of methyl methanesulfonate in benzene.

g. (U) Physical and Chemical Properties.

- Physical state and color: White needles.
- Melting point: 155° to 157°C (crystallized from alcohol).
- Solubility: Highly soluble in water and physiological saline solution.

h. (C) Use. 9 57 (b)(1)

(b)(1)

i. (U) Physiological Effects. P2S is a cholinesterase reactivator. As a therapeutic, P2S relieves muscle tightening, spasm, and difficulty in breathing. Blood pressure is also increased along with a reversal of the tendency of recurrent periphery respiratory failure. P2S is ineffective against GD and cannot penetrate the

blood-brain barrier. Toxic doses cause restlessness, fast respiration, drowsiness, tremor, and finally collapse. Oral preparations of P2S have been used prophylactically and therapeutically. Because of the relatively slow rate of absorption into the body via the intestinal tract, the oral route is generally recommended only under circumstances when poisoning is mild, when the cholinesterase inhibitor undergoes transformation to a more toxic substance in the body (for example, parathion to paraoxon), or when the oxime is given as a prophylactic. A mixture of P2S with diacetylmonoxime, used prophylactically, was twice as effective as diacetylmonoxime alone against GB poisoning. A combination of P2S and monoisonitrosoacetone produced a prophylactic effect eight times greater than P2S alone.

j. (U) Dosage. Safe dose is 30 mg/kg intramuscularly for man.

k. (U) Toxicity. More toxic than PAM; acute oral toxicity to rats is 6.9 g/kg.

l. (U) Therapy. Piperoxan.

m. (U) Storage. Stable in aqueous solutions at pH 4.0. The solid form is stable indefinitely.

n. (U) History.

- 1958: Described by Poziomek et al.
- 1958: US pat. 2 996 510, Green (National Research and Development Co.).

15. (U) TMB-4

a. Code or Alternate Designations.

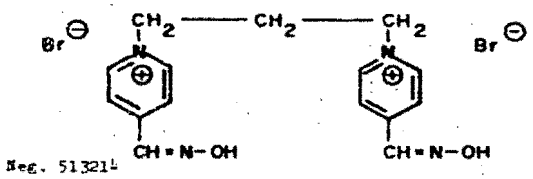
- US ——— EA 1814.[122]
- E. Germany ——— Trimedoxime.
- USSR ——— Dipyroxime.

b. Class. Oxime (pyridine quaternary oxime).

c. Chemical Names.

- 1,1'-Trimethylene-bis (4-formyl-pyridinium bromide) dioxime.
- N,N'Trimethylene-bis(pyridinium-4-aldoxime)dibromide.

d. Formula. $C_{15}H_{18}Br_2N_4O_2$



Neg. 513214

e. Molecular Weight. 446.21.

f. Method of Preparation. Prepared by refluxing 1,3 Dibromopropane with 4-pyridinium aldoxime in absolute alcohol.

g. Physical and Chemical Properties.

- Physical state and color: Crystals.
- Melting point: 241°C with decomposition.
- Solubility: Soluble in water and physiological saline; insoluble in chloroform and fats.

h. Use. TMB-4 is a prophylactic and therapeutic for nerve agent poisoning and can be used alone or combined with atropine. The effectiveness varies with the species of animals.

i. Physiological Effects. TMB-4 is an effective cholinesterase reactivator. In terms of therapeutic effectiveness it is 15 to 20 times stronger than PAM, but it reportedly has more toxic side effects. Deleterious effects have been observed on administration to GD-intoxicated animals. TMB-4 does not readily penetrate the blood-brain barrier.

j. Dosage. A 10 mg/kg dose reverses the Sarin effect in rabbits. A 25 to 50 mg/kg dose of TMB-4, intraperitoneally, counteracts the lethal dose in mice. A 7 mg/kg dose, intravenously, reactivates 40% to 60% of GA-inhibited cholinesterase within 4 hours.

k. (U) Toxicity (U). It is 3.5 times more toxic for man than PAM, but less toxic than P2S. Lethal dose is 1000 mg/70 kg for man. LD_{50}, intravenously, for mice is 53 mg/kg. LD_{50}, intraperitoneally, for mice is 6.38 mg/kg; for guinea pigs, 87 mg/kg; and for rats, 137 mg/kg.

l. (U) Therapy (U). Not known.

m. (U) Storage (U). Ten times more stable than PAM; normal drug storage procedures should be used.

n. (U) History (U). 1957: Prepared by Poziomek et al.

15.1. Dialkob (U)

a. (U) Code or Alternate Designations (U). Cobalt (+3) chelate.

b. (U) Class (U). Non-oxime reactivator.

c. (U) Chemical Name (U). Bis (N-allyldiethanolamine) cobalt chloride.

d. (U) Formula (U). $C_{14}H_{30}O_4N_2CoCl_3$

$$Co\,[C_3H_5N(C_2H_4OH)_2]_2\,Cl_3$$

e. (U) Synthesis (U). An aqueous solution containing 0.01 mole of $[Co(NH_3)_5Cl]\,Cl_2$ is heated for 5 hours at 60°C with 0.025 mole of allyldiethanolamine and 0.1 mole of NaOH. The red-violet crystals that are formed are filtered and recrystallized. The alkaline solution of the reaction deprotonates the four ethanolic OH groups, resulting in the incorporation of Na (+1) as a counterion.

f. (U) Physical Properties (U).

- Crystalline
- Water soluble

g. (U) Use (U). Cholinesterase reactivator. The mechanism of action is currently not known but is believed to be analogous to transition-metal-ion-catalyzed hydrolysis of organophosphorus esters.

h. (U) Physiological Effects (U). Dialkob is claimed by the Soviets to show a marked therapeutic effect in rats poisoned with the organophosphorus pesticide DDVP. The therapeutic index (TI), which is the factor by which the lethal dose is raised, for a 5 mg/kg dose of dialkob was 3.1. The TIs for 5 mg/kg of TMB-4 and 20 mg/kg of 2-PAM were 3.2 and 2.7, respectively. In

combination with atropine, the ratio for dialkob was raised to 8.2 versus 7.6 and 6.2 for TMB-4 and 2-PAM, respectively. The effectiveness of dialkob has not been verified in Western laboratories.

i. (U) Dosage (U). Experimental, 5-25 mg/kg in rats.

j. (U) Toxicity (U). LD_{50} is 1000 mg/kg.

k. (U) Stability (U). Low pH increases the rate of hydrolysis in aqueous solution.

l. (U) Historical (U).

- 1974--Soviet patent, Evreev et al., USSR 449 720
- 1979--Soviet clinical trials

16. Toxogonin (U)

a. (U) Code or Alternate Designations (U).

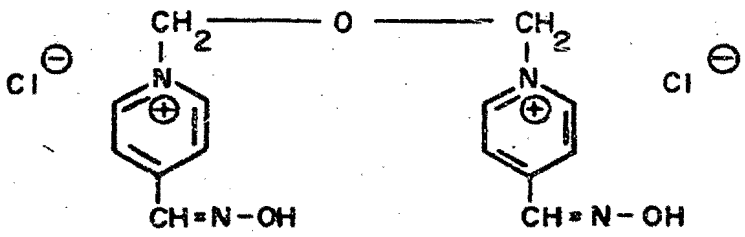
- Obidoxim
- LuH6
- BH6
- S100
- Toxogenin

b. (U) Class (U). Oxime (pyridine quaternary oxime).

c. (U) Chemical Names (U).

- Bis(4-hydroxyiminomethyl-pyridinium-1-methyl) ether dichloride
- Dimethyl-bis-(4-hydroxyiminomethyl-pyridine) ether dichloride

d. (U) Formula (U). $C_{14}H_{16}N_4O_3Cl_2$



Neg. 513215

e. (U) Molecular Weight (U). 359.22.

f. (U) Method of Preparation (U). Most effective method is the conversion of pyridine-4-aldoxime with α, α' dichlorodimethyl ether.

g. (U) Physical and Chemical Properties (U).

- Physical state and color: Fine white powder; turns yellow on standing; slight bitter taste
- Odor: Odorless
- Solubility: Freely soluble in water
- Decomposition temperature: 225°C

h. Use (U).

(1) (U) As a therapeutic, Toxogonin is effective for 1.25 to 2 hours after administration, the effectiveness increasing when used in conjunction with atropine. Toxogonin is an effective prophylactic when injected intramuscularly 1 hour prior to exposure. It is not effective orally.

(2) (U) (b)(1)

(b)(1)

i. (U) Physiological Effect (U). (b)(1)

(b)(1)

j. Dosage (U).

(1) (~~X~~) (b)(1)

(b)(1)

(2) (U) Atropine-Toxogonin antidote mixtures, consisting of 2 mg of atropine sulfate and 150 mg Toxogonin in 1.5 mL of water (preserved with 0.065% methyl paraben and 0.035% propyl paraben), are available in ampoules for use with the Swedish "Astra" autoinjector.[126]

k. (U) Toxicity (U). Less toxic than TMB-4. Orally, its toxicity is approximately 250 g/man. LD_{50} for mice is approximately 2.2 g/kg.

l. (U) Therapy (U). Not known.

m. (U) Storage (U). Stable for months in 1% to 10% solutions. Shelf life is at least 2 years in powder form.

n. (U) History (U). 1960: developed by Merck in West Germany; developed independently in East Germany at approximately the same time.

16.1. DINA (U)

a. (U) Code or Alternate Designations (U). Diisonitrosoacetone.

b. (U) Class (U). Oxime.

c. (U) Chemical Formula (U). $C_3H_4O_3N_2$.

HON=CHC(O)CH=NOH

d. (U) Use (U). DINA is more active in CNS than 2-PAM, but it is effective only in amounts close to the LD.

16.2. Isonitrosine (U)

a. (U) Code or Alternate Designation (U). Isonitrosin.

b. (U) Chemical Name (U). 1-dimethylamino-2-isonitroso-3-butanone.

c. (U) Formula (U). $C_6H_{12}O_2N_2$.

$(CH_3)_2NCH_2C(NOH)C(O)CH_3$

d. (U) Molecular Weight (U). 144.

e. (U) Use (U). Used by the Soviets as an enzyme reactivator having primarily central effects.

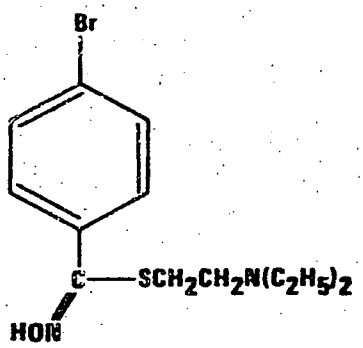
f. (U) Dosage (U). Humans, 3 mL of a 40% solution every 1 to 2 hours.

g. (U) Toxicity (U). LD_{50} > 920 mg/kg i.m. in mice.

16.3. P-bromobenzothio-hydroxime-S-diethylaminoethylate (U)

a. (U) Code or Alternate Designations (U). LA-54 (WP), diethyxime (WP).

b. (U) Formula (U). $C_{13}H_{19}ON_2BrS$.



c. (U) Use (U). This compound is being tested clinically in the USSR.

d. (U) Physiological Effects (U). The Soviets claim that LA-54 is an effective centrally acting oxime. Other countries have not been able to reproduce the optimistic Soviet results.

e. (U) Toxicity (U). LD_{50} > 600 mg/kg i.m. in mice.

16.4. (4-hydroxyiminomethyl-pyridinium-1-ethyl) Sulfoxide Dichloride (U)

a. ~~(C)~~ Code or Alternate Designation (U). (b)(1)

b. ~~(C)~~ Formula (U). (b)(1)

(b)(1)

c. (c) Use (U). (b)(1) [redacted]

16.5. Trimethylene-1-(4-hydroxyiminomethyl-pyridinium)-3-N-methyl morphorinium Dibromide (U)

a. (U) Code or Alternate Designation (U). TPMM.

b. (FOUO) Use (U). (b)(1) [redacted]

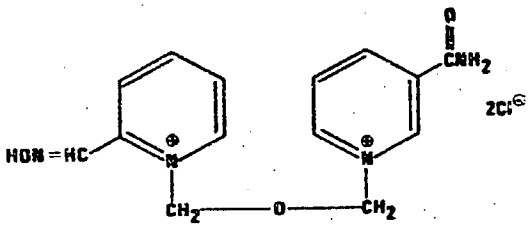
(b)(1) [redacted]

16.6. HI and HS Series (U)

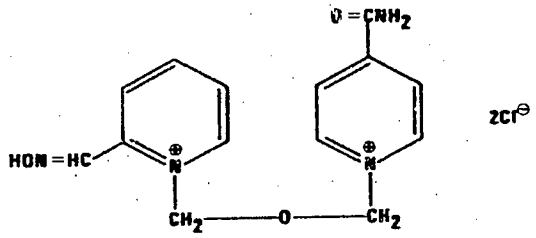
a. (U) Class (U). Bispyridinium oximes.

b. (U) Formula (U). $C_{14}H_{16}O_3N_4Cl_2$.

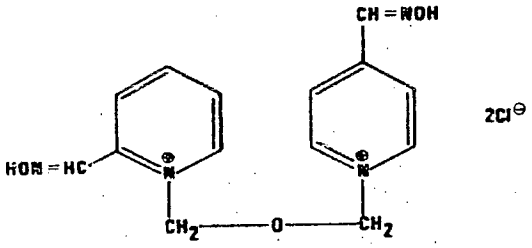
HS - 6



HI - 6



HS - 3



c. (U) Chemical Names (U).

- HS-6 1-(2-hydroxyiminomethylpyridinium)-1-(3-carboxy amido-pyridinium)-dimethyl ether
- HI-6 1-(2-hydroxyiminomethylpyridinium)-1-(4-carboxy amido-pyridinium)-dimethyl ether
- HS-3 1-(2-hydroxyiminomethylpyridinium)-1-(4-hydroxy imino-methylpyridinium)-dimethyl ether

d. (U) Use (U). Potential therapeutic agents for soman intoxication.

e. (U) Toxicity (U). HS-6 has an i.p. LD_{50} in the mouse of 232 mg/kg. HI-6 has an i.p. LD_{50} in the mouse of 295 mg/kg.

16.7. 3-diethylaminopropyl 1-formylacetate Oxime (U)

a. (U) Code or Alternate Designation (U). OA3.

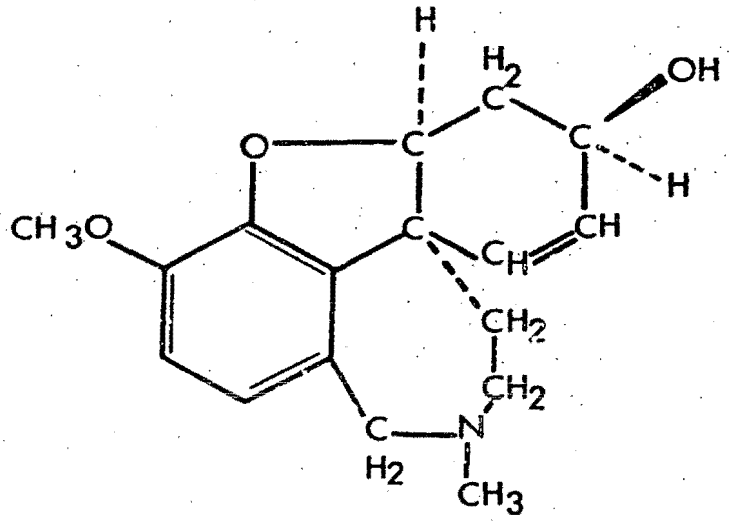
b. (U) Use (U). OA3 has been found to be a very effective centrally active oxime.

D.3 ANTICHOLINESTERASES (U)

16.8. Galanthamine (U)

a. (U) Code or Alternate Designations (U). Lycoremine, Jilkon, Nivalin (hydrobromide).

b. (U) Formula (U). $C_{17}H_{21}NO_3$.



Neg. 517703

c. (U) Molecular Weight (U). 287.

d. (U) Toxicity (U). LD_{50} in mice is 8.0 mg/kg i.v. and 18.7 mg/kg orally.

e. (U) Physical and Chemical Properties (U).

- Fairly soluble in hot water; freely soluble in alcohol, acetone, chloroform
- The hydrochloride is soluble in hot water but very sparingly soluble in alcohol and acetone.

f. (U) Use (U). The Soviet Union has 1-mL ampules containing 0.25%, 0.5%, or 1.0% solutions. One mL of a 0.5% solution can be given twice a day.

g. (U) Physiological Effects (U). Galanthamine penetrates the blood-brain barrier and facilitates the transmission of impulses in the synapses of the central nervous system.

16.9. Carbamates (U)

a. (U) Constituents (U). Pyridostigmine (16.10), physostigmine (16.12), and neostigmine (16.13).

b. (U) Molecular Weights (U). 261, 275, and 303, respectively.

c. (U) Use (U). Carbamates are considered to have excellent potential for use as prophylactics against organophosphorus poisoning. The Soviet Union has neostigmine in 15-mg tablets and in ampules containing 1 mL of a 0.05% solution. The maximum internal single dose in the Soviet Union is 15 mg. Fifty mg may be given daily. Carbamates are useful for treating myasthenia gravis and for reversing poisoning caused by cholinolytic agents.

d. (U) Physiological Effects (U). Carbamates inhibit the destruction of acetylcholine by AChE, thus facilitating transmission of impulses across the myoneural junction (see fig in sec I, para 1). Side effects include nausea, abdominal cramps, diarrhea, increased bronchial secretions, miosis, diaphoresis, muscle cramps, and weakness. The side effects are least severe with pyridostigmine, more severe with physostigmine, and most severe with neostigmine.

e. (U) Dosage (U). US recommended doses are 60 to 180 mg of pyridostigmine bromide three to six times a day orally, 0.5 to 2.0 mg i.m. or i.v. of physostigmine salicylate, and 15 to 30 mg of neostigmine bromide three to six times a day orally.

f. (U) Contraindications and Precautions (U). All of the carbamates are contraindicated in cases of mechanical intestinal or urinary obstruction. In addition, pyridostigmine should not be used in the presence of asthma; physostigmine should not be used in the presence of gangrene or asthma and should not be administered with neuromuscular blocking agents such as decamethonium or succinylcholine; neostigmine is contraindicated in the presence of halothane or cyclopropane and requires adjustments of the dosage of certain antibiotics (neomycin, streptomycin, and kanamycin) that can accentuate neuromuscular block.

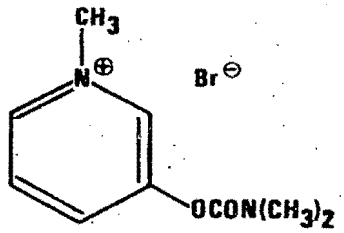
16.10. Pyridostigmine (U)

a. (U) Code or Alternate Designations (U). Mestinon bromide, balymin, RO 1-5130.

b. (U) Chemical Names (U).

- 3-hydroxy-1-methylpyridinium bromide dimethylcarbamate
- 1-methyl-3-hydroxypyridinium bromide dimethylcarbamate
- 3-(dimethylcarbamyloxy)-1-methylpyridinium bromide

c. (U) Formula (U). $C_9H_{13}BrN_2O_2$.



16.12. (C-NOFORN) (b)(1)

(b)(1)

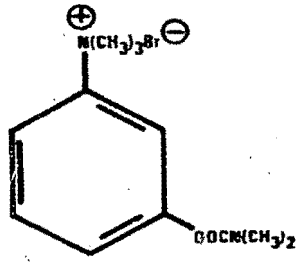
16.13. (U) Neostigmine Bromide

a. Code or Alternate Designations. Proserine bromide (USSR), synstigmin bromide, eustigmine bromide, neoserine, stigmosan, vasostigmine bromide, philostigmin bromide, prostigmin bromide.

b. Chemical Names.

- (m-hydroxyphenyl)trimethyl-ammonium bromide dimethylcarbamate.
- (3-dimethylcarbamoxyphenyl)trimethylammonium bromide.

c. Formula. $C_{12}H_{19}BrN_2O_2$



d. Use. Reports indicate that its effectiveness is greatly increased when it is used with atropine.

NOT RELEASABLE TO FOREIGN NATIONALS

D.4 TRANQUILIZERS

15.14. (C) (b)(1)

(b)(1)

16.15. (C-NOFORN) (b)(1)

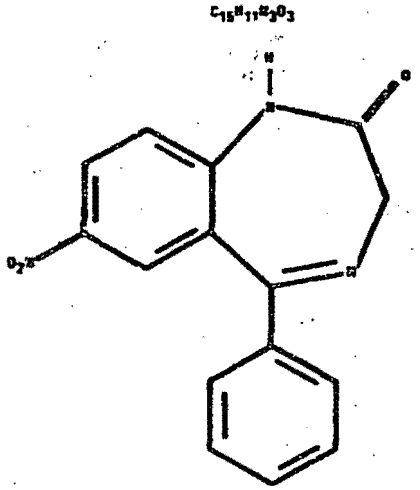
(b)(1)

16.16. (U) Nitrazepam

a. Code or Alternate Designations. Nitrenpax, mogadan, nogadon, sonebon.

b. Chemical Name. 1,3-dihydro-7-nitro-5-phenyl-2H-1,4-benzodiazepin-2-one.

c. Formula.



16.17. (C) (b)(1)

(b)(1)

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16.18. (U) Mydocalm

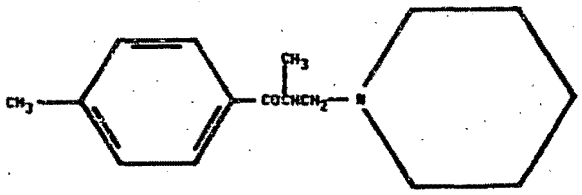
a. Code or Alternate Designations. Mydetron (USSR), mydetone.

b. Chemical Names.

- 2,4'-dimethyl-3-piperidino-propiophenone.
- 1-piperidino-2-methyl-3-(p-tolyl)-3-propanone.

c. Formula.

$C_{16}H_{23}NO$



16.19. (C-NOFORN) (b)(1)

(b)(1)

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d. (C-NOFORN) Use (U). (b)(1)

(b)(1)

D.5. SYMPATHOMIMETICS (U)

16.20 Amfepramone (U)

a. (U) Code or Additional Names (U). Anorex, Danglen, Dobesin, Frekentine, Kermik, Kermin, Magrene, Modulor, Parabolin, Prefamone, Regenone, Tenuate, Tenuate Dospan, Tepanil, Tylinal.

b. (U) Class (U). Sympathomimetic agent, anorexic agent.

c. (U) Chemical Names (U).

- 2-diethylamino-1-phenyl-1-propanone
- 2-diethylaminopropiophenone
- d-benzoyltriethylamine
- diethylpropion

d. (U) Formula (U). $C_{13}H_{19}NO$.

$$C_6H_5COCHN(C_2H_5)_2$$
$$|$$
$$CH_3$$

e. (U) Molecular Weight (U). 205.30.

f. (U) Physical and Chemical Properties (U).

- Crystals (hydrochloride)
- Decomposes at 168°C

g. (U) Method of Preparation (U). Chemically synthesized by method of Hyde, 1928.

h. (C-NOFORN) Use (U). (b)(1)

(b)(1)

i. (U) Physiological Effects (U). Amfepramone is a sympathomimetic amine with pharmacological activity similar to that of the amphetamines. Actions include CNS stimulation and elevation of blood pressure.

j. (U) Toxicity (U). Adverse reactions are an extension of the pharmacological action and include tachycardia, elevated blood pressure, insomnia, dizziness, anxiety, euphoria, and psychotic episodes.

k. (U) Contraindications and Precautions (U). Tolerance to the actions of the drug develops with repeated use and there is potential for drug abuse. The drug is contraindicated in hyperthyroidism or advanced arteriosclerosis. Amfepramone should not be administered during or within 14 days following the administration of monoamine oxidase inhibitors, since a hypertensive crisis may result. Insulin dosages must be adjusted.

l. (U) Therapy (U). Largely symptomatic and includes sedation with a barbiturate.

m. (U) Storage (U). Very stable; store with usual precautions.

m. (U) History (U). 1961: US patent 3 001 910.

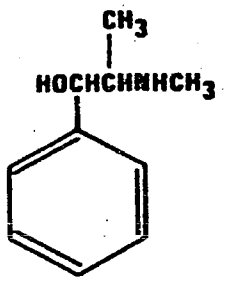
16.21 Ephedrine (U)

a. (U) Code or Additional Names (U). Ephetonin, Racephedrine Hydrochloride, Biophedrin, Ephedral, Ephedrosat, Sanedrine.

b. (U) Chemical Names (U).

- α-[1-(methylamino) ethyl] benzenemethanol
- 2-methylamino-1-phenyl-1-propanol

c. (U) Formula (U). $C_{10}H_{15}NO$.



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d. (U) Molecular Weight (U). 165.

e. (U) Physical and Chemical Properties (U).

- Crystals; melts at 79°C
- Soluble in water, alcohol, ether, chloroform, and oils

f. (U) Use (U). The Soviet Union produces powder, 25-mg tablets, and ampules containing 1 mL of a 5% solution of ephedrine hydrochloride. It is used for collapse, shock, and poisonings.

g. (U) Physiological Effects (U). Causes constriction of blood vessels and an increase in arterial blood pressure. Stimulates the heart and dilates the pupils. Although less potent than adrenalin, it is effective longer and produces a pronounced stimulating effect on the central nervous system.

h. (U) Dosage (U). Twenty-five to fifty milligrams two to three times per day internally; 0.5 to 1 mL of 5% solution one to two times per day intramuscularly (USSR).

i. (U) Side Effects (U). Nausea, vomiting, mild tremor, heart pain, nervousness, and headache.

D.6. NERVE AGENT ANTIDOTES IN USE (U)

16.22. Military Nerve Agent Antidotes (U)

(C-NOFORN)	(b)(1)
(b)(1)	

16.23. Civil Defense Nerve Agent Antidotes (U)

(U) Most countries have atropine available for use by the civilian population. The Soviet Union also has prophylactic taren tablets and substitutes for taren, such as tablets of benactyzine, amedine, aprophen, and spasmolytin.

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CONFIDENTIAL

★(U) Military Nerve Agent Antidotes

(CONFIDENTIAL)

(b)(1)

2118

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CONFIDENTIAL

(U) Military Nerve Agent Antidotes (Continued)

(CONFIDENTIAL)

(b)(1)

(b)(1)

(CONFIDENTIAL)

D.7. EXPERIMENTAL ANTIDOTE MIXTURES (U)

16.24. ASP-3 (Bulgaria) (U)

a. (U) Components (U). Unknown combination of cholinolytics and oximes.

b. (U) Effectiveness (U). ASP-3 is claimed to be more effective than the Nemikols (para 16.27).

16.25. AV-72 (Bulgaria) (U)

a. (U) Components (U). This mixture is an unknown combination of cholinolytics and oximes.

b. (U) Status (U). AV-72 appears to be the successor to ASP-3 and may be the mixture listed in paragraph 16.26.

c. (U) Effectiveness (U). The Bulgarians believe AV-72 is effective against VX.

16.26. Unnamed (Bulgaria) (U)

a. (U) Components (U). One mg atropine sulfate, 100 mg Toxogonin, 5 mg ethylbenztropine hydrochloride, and 5 mg ephedrine hydrochloride.

b. (U) Status (U). A West German patent was obtained by the Bulgarians in 1978 on this organophosphorus antidote, which may be AV-72.

c. (U) Effectiveness (U). This mixture is effective against light poisoning and in the initial stages of heavier poisoning. Higher concentrations of the constituents are recommended for use in hospitals.

16.27. Nemikols (Bulgaria)[169] (U)

a. (C) Components (U). (b)(1)

(b)(1)

b. (C) Status (U). (b)(1)

(b)(1)

c. (U) Effectiveness (U). Nemikol 4 has been claimed to be effective prophylactically against GD; Nemikol 5 has been shown by Bulgarian researchers to be effective both prophylactically and therapeutically against GD.

16.28. TAB (Probably Bulgaria)[170] (~~C~~)

a. (~~C~~-NOFORN) Components (U). (b)(1)

(b)(1)

b. (~~C~~-NOFORN) Status. (b) (1) Per NSA

(b)(1)

c. (~~C~~-NOFORN) Effectiveness (U). (b)(1)

(b)(1)

16.29 Unnamed (Yugoslavia)[171] (U)

a. (U) Components (U). Two mg atropine sulfate, 3 mg benactyzine hydrochloride, and 1000 mg 2-PAM.

b. (U) Status (U). An experimental mixture used in field trials and reported to have excessive side effects.

16.30 Morsafen (Soviet Union)[172] (U)

a. (~~C~~) Components (U). (b)(1)

(b)(1)

b. (~~C~~) Status (U). (b)(1)

(b)(1)

16.31 Unnamed (United Kingdom) (U)

a. (U) Components (U). Two mg atropine sulfate and 500 mg P2S.

b. (U) Status (U). Will become the standard fill for the British autoject.

E. HALLUCINOGEN ANTIDOTES (U)

17. Chlorpromazine (U)

a. (U) Code or Alternate Designations (U).

- United States--SKF 2601A, Thorazine

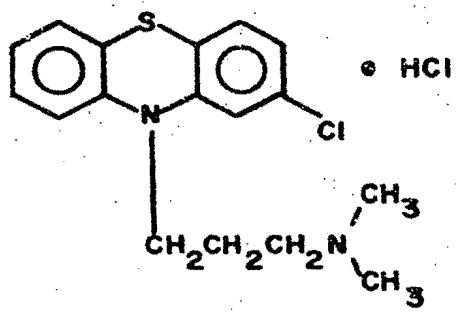
NOT Rreleasable TO FOREIGN NATIONALS

- Canada--Largactil
- Japan--Wintermin
- Sweden--Megaphen Hibernal
- Brazil--Amplictin
- Norway--Largactil, Hibanyl
- Hungary--Plegomazine
- East Germany--Megaphen, Largactil
- USSR--Aminazin

b. (U) Class (U). Therapeutic for LSD.

c. (U) Chemical Name (U). 2-chloro-10-(3-dimethylaminopropyl) phenothiazine hydrochloride.

d. (U) Formula (U). $C_{17}H_{19}ClN_2S \cdot ECl$.



Neg. 513216

e. (U) Molecular Weight (U). 355.4.

f. (U) Method of Manufacture (U). Prepared form 2-chloro-diphenylamine, sulfur, sodamide and 3-dimethylaminopropyl chloride. US patent 2 645 640 to Rhone-Poulenc in 1953 for preparation.

g. (U) Equipment (U). Standard chemical processing equipment.

NOT RELEASABLE TO FOREIGN NATIONALS

h. (U) Physical and Chemical Properties (U).

- Physical state and color: Free base is an oily liquid; hydrochloride is a white or yellow crystalline powder; turns black on exposure to light.
- Boiling point: Free base is a liquid boiling at 200° to 205°C at 107 Pa.
- Melting point: Hydrochloride--179° to 180°C by capillary (decomposes); 194° to 196°C on microblock.
- Solubility: Hydrochloride is freely soluble in water, alcohol, and chloroform; insoluble in ether and benzene; and is hygroscopic.

i. (U) Use (U). Antidote for LSD, and possibly for mescaline. Also, a tranquilizer.

j. (U) Physiological Effects (U). Chlorpromazine depresses conditioned reflexes, brings about a condition of indifference toward environment, causes sleepiness, eliminates anxiety and tension, and decreases body temperature without slowing down metabolism. The compound is neither a hypnotic nor an anesthetic, but it does enhance and prolong the effects of drugs with this action. Chlorpromazine has no effect on the peripheral nervous system but frequently causes dizziness, general weakness, fainting, headache, dryness of mouth, goose pimples, and nausea.

k. Therapy. Physostigmine (an anticholinesterase).

l. Storage. Store in dark, well-stoppered glass containers in a dry place and protected from light.

m. Toxicity. Doses of 200 mg cause convulsions similar to epilepsy. Fatal poisonings are rare.

n. Historical. 1952: US pat. 2,645,640 (prepared by Charpentier et al., in France).

18. (U) Reserpine

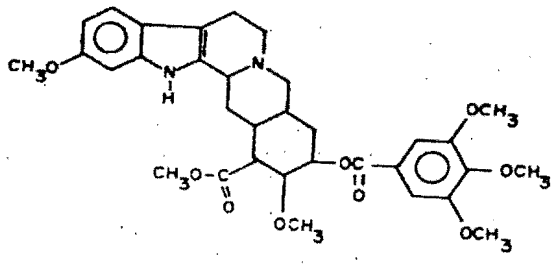
a. Code or Alternate Designations.

- Serpasil in United States, United Kingdom, USSR, Poland, Canada, France, Sweden, Italy, Austria, Belgium.
- Japan — Apoplon.
- Also known as Serfin, Race-sed, Serpanray, Sandril, and Reserpex.

b. Class. Therapeutic for LSD.

c. Chemical Name. 3,4,5-Trimethoxybenzoyl methyl reserpate.

d. Formula. $C_{33}H_{40}N_2O_9$



e. Molecular Weight. 608.70.

f. Method of Manufacture. Extraction from crude oleorum from the roots of Rauwolfia serpentina, L. Benth and R. Vomitoria. Difficulties arise because it is accompanied by at least six other alkaloids which have somewhat similar structures and physical properties. Synthesis developed by Woodward et al., in 1956.

g. Equipment. Standard chemical processing equipment.

h. Physical and Chemical Properties.

- Physical state and color: White crystalline powder.
- Melting point: Melts 250° to 260°C.
- Decomposition temperature: 264° to 265°C.[4]
- Solubility: Freely soluble in chloroform, methylene chloride; soluble in benzene, ethyl acetate; slightly soluble in water, acetone, methanol, and ether.

i. Use. Tranquilizer, antidote for LSD and possibly for mescaline.

j. Physiological Effects. Reserpine has a tranquilizing effect on the central nervous system. The drug reduces high blood pressure, reduces motor activity, causes drowsiness, excessive salivation, diarrhea, and mental depression. In large doses, Parkinsonism may occur.

k. Therapy. Effects removed by inhibitors of monoamino oxidase.

l. Toxicity. Relatively nontoxic.

m. Historical.

- 1954: Isolated and structure identified by Dorfman et al. in Switzerland.
- 1956: Synthesized by Woodward et al. in United States.
- 1958: US pat. 2,833,771, Mueller, Schwyzer (Ciba).

19. (U) Serotonin

a. Code or Alternate Designations.

- Enteramine.
- Thrombocytin.

- Thrombotonin.
- Antenovis.

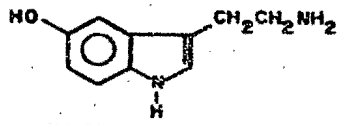
b. Class. Vasoconstrictor, neural function regulator.

c. Chemical Name. 5-Hydroxytryptamine.

d. Alternate Chemical Names.

- 3-(2-Aminoethyl)5-indolol.
- 3-(β-Aminoethyl)-5-hydroxy indole.

e. Formula. $C_{10}H_{12}N_2O$



Neg. 513218

f. Molecular Weight. 176.21.

g. Method of Preparation. Serotonin is present in the blood stream of all mammals and has been isolated from beef serum and ox blood in crystalline form. The best source is from poisonous organs and secretions of invertebrates (posterior salivary gland of Octopus vulgaris). It is extracted with acetone. The compound is absent in cephalopods. Serotonin has been synthesized from 5-benzyloxyindole.

h. Physical and Chemical Properties.[3]

- Physical state: Crystalline material.
- Melting point: Hydrochloride, 167° to 168°C.
- Solubility: Soluble in water, glacial acetic acid; slightly soluble in methanol, 95% ethanol; insoluble in absolute ethanol, acetone, pyridine, chloroform, ethyl acetate, ether, benzene.

i. Use. Vasoconstrictor and as an antagonist of LSD, indoles, atropine, novacaine, and antihistamines.

j. Storage. Aqueous solutions of hydrochloride are stable at pH 2.0 to 6.4. Serotonin is heat stable.

k. Physiological Effects.[100] Serotonin stimulates a variety of smooth muscles and nerves. The wide spectrum of responses to the chemical include the cardiovascular, respiratory, and gastrointestinal systems. Serotonin is a potent vasoconstrictor and produces bradycardia and electrocardiographic disturbances. The compound also stimulates intestinal motility, respiratory rate, and causes bronchoconstriction.

1. History.

- 1951: Synthesis, Speeter, Heinzelmann, Weisblat.
- 1955: US pat. 2 715 129, Hamlin (Abbott Labs).
- 1960: US pat. 2 947 757, Justoni, Pessina (Vismara).

19.1. (U) Thiopropazate and Chlorphencyclan

a. Code or Alternate Designation. Vestian.

b. Use.

- Effective in treatment of hallucinatory paranoid psychosis.
- May be useful as antidote for LSD.

19.2. (C) Physostigmine Salicylate

(b)(1)

19.3. Galanthamine (U)

a. (U) Code or Alternate Designations (U). (b)(1)

(b)(1)

b. (U) Formula (U). (b)(1)

c. (U) Use (U). (b)(1)

(b)(1)

F. ANTIDOTES FOR INCAPACITANTS AND RESPIRATORY TRACT IRRITANTS (U)

20. 1, 2, 3, 4-tetrahydro-9-aminoacridine (U)

a. (U) Code or Alternate Designation (U). Tacrin.

b. (U) Use (U). It is a possible antidote for BZ.

21. Undesignated (U)

a. (U) Components (U). (b)(1)

b. (U) Status (U). (b)(1)

(b)(1)

22. Haloperidol (U)

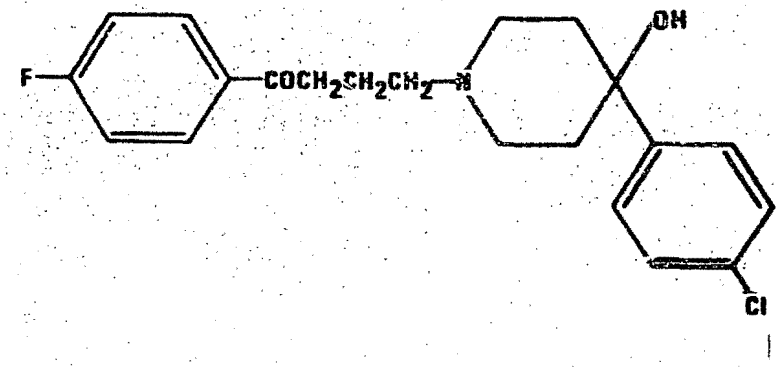
a. (U) Code or Additional Names (U). R1625; Aloperidine; Haldol; Keselan; Serenace; Serenase.

b. (U) Class (U). Tranquilizer, butyrophenone.

c. (U) Chemical Names (U).

- 4-[4-(4-Chlorophenyl)-4 hydroxy-1-piperidinyl]-1-(4-Fluorophenyl)-1-butanone
- 4-[4-(p-chlorophenyl)-4-hydroxypiperidino]-4'-fluorobutyrophenone

d. (U) Formula (U). $C_{21}H_{23}ClFNO_2$



e. (U) Molecular Weight (U). 375.88.

f. (U) Physical and Chemical Properties (U).

- Crystals
- Melting point: 148.0°-149.4°C
- Soluble in water; freely soluble in chloroform, methanol, acetone, benzene, dilute acids

g. (U) Method of Preparation (U). Chemically synthesized by the method of Janssen, 1959.

h. (U) Use (U). Haloperidol is used in management of psychotic disorders and also to control tics and involuntary vocal utterances of Gilles de la Tourette's syndrome. Used for treating BZ intoxication in the Soviet Union.

i. (U) Physiological Effects (U). The precise mechanism of action has not been established, but haloperidol's actions resemble those of the piperazine phenothiazines. It has prominent effects on the CNS, but has little anticholinergic activity. It blocks the activation of receptors by sympathomimetic amines but is less potent than chlorpromazine in this action.

j. (U) Dosage (U). There is considerable variation from patient to patient in the amount of medication required for therapy. Typical doses range from 0.5 mg to 5.0 mg total internal dose.

k. (U) Toxicity (U). The LD_{50} in the rat is 165 mg/kg orally and 63 mg/kg subcutaneously.

l. (U) Contraindications and Precautions (U). Haloperidol is contraindicated in patients who are comatose or have severe CNS depression. The drug will impair the mental and physical abilities required for the performance of tasks such as operating machinery. Because haloperidol lowers the convulsive threshold, adequate anticonvulsant therapy may be needed in special cases. Lithium and methyldopa increase the toxicity of haloperidol.

m. (U) Therapy (U). Supportive treatment. Epinephrine should not be used.

n. (U) History (U).

- 1958: synthesized by Janssen
- 1967: marketed in United States by McNeil Laboratories

23. Bemegride (U)

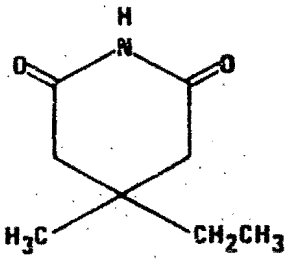
a. (U) Code or Additional Names (U). NP13; Mikedimide (Panray); Eukraton; Malysol, Megimide.

b. (U) Class (U). Analeptic, antidote for incapacitants.

c. (U) Chemical Names (U).

- 4 ethyl-4 methyl 2-6-piperidinedione
- 3 ethyl-3-methylglutarimide

d. (U) Formula (U). $C_8H_{13}NO_2$.



e. (U) Molecular Weight (U). 155.19.

f. (U) Physical and Chemical Properties (U).

- Platelets from water
- Melting point: 127°C
- Soluble in water, acetone

g. (U) Method of Preparation (U). Chemically synthesized.

h. (U) Use (U). Bemegride is an analeptic and CNS stimulant and is used to counteract barbiturate poisoning. Used in the treatment of BZ incapacitation in the Soviet Union.

i. (U) Physiological Effects (U). Bemegride decreases neuronal recovery time so that a single stimulus produces repetitive discharge.

j. (U) Toxicity (U). LD_{50} in mice and rats are 18.8 and 17.0 mg/kg i.v., respectively.

k. (U) Contraindications and Precautions (U). In high doses may cause convulsions.

l. (U) Therapy (U). Antagonized by barbiturates.

24. Methotrimeprazine (U)

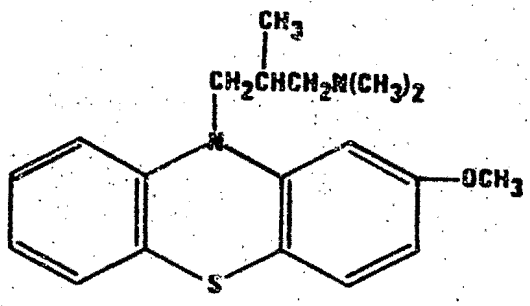
a. (U) Code or Additional Names (U). Levoprome, levomepromazine, levomeprazine, 2-methoxytrimeprazine, RP Levoprome, Sinogan-Debil, Tiscerin, Neozine, Nirvan.

b. (U) Class (U). Analgesic; phenothiazine.

c. (U) Chemical Names (U).

- 2-Methoxy-N, N, B-trimethyl-10H-phenothiazine-10-propanamine
- 10-(3-dimethylamino-2-methylpropyl)-2-methoxyphenothiazine

d. (U) Formula (U). $C_{19}H_{24}N_2OS$.



e. (U) Molecular Weight (U). 328.24.

f. (U) Physical and Chemical Properties (U).

- Normally produced as a salt
- Maleate salt; crystals, darkened by light
- Decomposes at 190°C
- Levorotary
- Sparingly soluble in water and in ethanol

g. (U) Method of Preparation (U). Chemically synthesized by the method of Courvoisier (1957).

h. (U) Use (U). Methotrimeprazine is used to relieve severe pain in nonambulatory patients. It is also used as a preanesthetic medication for producing sedation, somnolence, and relief of apprehension and anxiety. Used in the Soviet Union for treating BZ intoxication.

i. (U) Physiological Effects (U). Methotrimeprazine is a potent CNS depressant with sites of action postulated in the thalamus, hypothalamus, reticular, and limbic systems. It produces suppression of sensory impulses, reduction of motor activity, sedation, and tranquilization. It raises the pain threshold and produces amnesia. The drug also has an antihistaminic, anticholinergic, and antiadrenalin effect.

j. (U) Dosage (U). Ten to twenty mg administered deeply into a large muscle every 4 to 6 hours, as required.

k. (U) Toxicity (U). The LD_{50} in the rat is 1100 mg/kg orally and 45 mg/kg subcutaneously.

l. (U) Contraindications and Precautions (U).

(1) (U) Following administration of this drug, fainting and dizziness probably will occur; ambulation should be avoided or carefully supervised.

(2) (U) Use with great caution in conjunction with atropine, scopolamine and succinylcholine, because tachycardia and a fall in blood pressure may occur. Undesirable CNS effects, such as stimulation, delirium, and extrapyramidal symptoms, may be aggravated.

(3) (U) Do not use concurrently with antihypertensive drugs, including monoamine oxidase inhibitors.

(4) (U) Do not use in presence of comatose states or overdose of CNS depressants.

(5) (U) Do not use in the presence of severe myocardial, renal, or hepatic disease.

(6) (U) Dosage should be reduced and critically adjusted when used concomitantly with, or when sequence of use results in overlapping of effects of, the following: narcotics, barbiturates, general anesthetics, acetylsalicyclic acid, meprobamate, and reserpine.

m. (U) Therapy (U). Supportive measures.

APPENDIX I.

COLOR MARKINGS ON CHEMICAL WARFARE MUNITIONS
AND STORAGE CONTAINERS[5] 127-129

(U) Munitions are painted for the purpose of protection against corrosion and identification. Background paint of a specific color is ordinarily applied to the entire surface of the projectile with the exception of the rotating bands and the fuze. Colored bands or rings with appropriate lettering or stencil serve to identify the contents of the munitions, its use, code number, caliber, charging, date of manufacture, and to give other pertinent data.

(b)(1)

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CLASSIFIED BY: MULTIPLE SOURCES
REVIEW ON: 4 MARCH 2011

(C-NOFORN) (b)(1)

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NOT RELEASABLE TO FOREIGN NATIONALS

(C) Toxic Agents and Munitions.

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APPENDIX II.

TOXICITIES OF VARIOUS NATURAL POISONS

AMPHIBIAN TOXINS

Poison	Source	Nature	Toxicity (mg/kg)	Method	Animal
Batrachotoxin	Kokoi frog	Steroid ester, $C_{31}H_{42}N_2O_6$ (538 MW)	LD_{50}: 0.002	NR	mouse[130]
Bufotenine	Bufo vulgaris Laur (toad). Also, Amanita Muscaria (Mushroom)	N,N-Dimethylserotonin $C_{12}H_{16}N_2O$ (204 MW)	Hallucinogen ID: 0.11 to 0.22	p.o.	man[130]
Bufotoxin	Bufo vulgaris (toad)	Nicotine-like $C_{40}H_{60}N_4O_{10}$ (757 MW)	LD_{50}: 0.39	i.v.	cat[131]

(UNCLASSIFIED)

ARTHROPOD TOXINS

Poison	Source	Nature	Toxicity (mg/kg)	Method	Animal
Beetle Larvae Poison	Diamphidia Beetle	High MW Protein	LD: 0.025	i.v.	rabbits[132]
Neurotoxin I	Androctonus australis scorpion venom	Protein (6822 MW)	LD_{50}: 0.019	NR	mouse[133]
Neurotoxin II	Androctonus australis scorpion venom	Protein (7249 MW)	LD_{50}: 0.01	NR	mouse[133]
Scorpion venom	Leiurus quinquestriatus scorpion	Mixture, mostly protein	MLD: 0.3 MLD: 0.1 MLD: 0.6	i.m. i.m. i.m.	mice[134] rats[134] dog[134]
Spider venom	Phoneutria fera spider	Mixture, mostly protein	LD_{50}: 0.76	NR	mice[135]

(UNCLASSIFIED)

BACTERIAL TOXINS

Poison	Source	Nature	Toxicity (mg/kg)	Method	Animal
Botulinum:					
Type A	Clostridium botulinum	Protein (12,000-1,000,000 MW)	LD_{50}: 2.7×10^{-8} LD: 1.25×10^{-6}	i.p. NR	mouse[96] mouse[108]
Type B	C. botulinum	Protein (60,000-500,000 MW)	LD_{50}: 2.7×10^{-8} LD: 1.25×10^{-6}	i.p. NR	mouse[96] mouse[111]
Type C	C. botulinum	Protein with an undetermined MW	LD_{50}: 1.4×10^{-7}	i.p.	mouse[96]
Type D	C. botulinum	Protein (1,000,000 MW)	LD_{50}: 1.3×10^{-8} LD: 4.0×10^{-7}	i.p. NR	mouse[96] mouse[111]
Type E	C. botulinum	Protein (18,000-200,000 MW)	LD_{50}: 1.7×10^{-7}	i.p.	mouse[96]
Diphtheria	Corynebacterium diptheriae	Protein (72,000 MW)	LD: 1.9×10^{-4}	NR	guinea pig[111]
Dysentery neurotoxin	Shigella sonnei	Protein (82,000 MW)	MLD: 1.0×10^{-6}	NR	rabbit[111]
Histolyticum alpha-toxin	Clostridium histolyticum	Protein	MLD: 0.0013	NR	mouse[136]

BACTERIAL TOXINS (Continued)

Poison	Source	Nature	Toxicity (mg/kg)	Method	Animal
Murine toxin	Pasteurella pestis	Protein	LD_{50}: 0.05	i.p.	mouse[111]
Perfringens toxin	Clostridium perfringens	Protein (40,500 MW)	LD: 0.004	NR	mouse[111]
Plague toxin	Pasteurella pestis	Protein	LD_{50}: 0.083	NR	rat[137,138]
Staphylococcal alpha-toxin	Staphylococcus aureus	Protein (44,000 MW)	LD: 0.002	NR	rabbit[111]
			LD_{50}: 0.05	NR	mouse[111]
Staphylococcal enterotoxin B	S. aureus	Protein (30,000 MW)	ED_{50}: $6x10^{-4}$	r.t.	dog[130]
			ED_{50}: 0.98	p.o.	dog[130]
			LD_{50}: 1.5	i.v.	dog[130]
			LD_{50}: 0.05	r.t.	dog[130]
			ED_{50}: $2.5x10^{-5}$	r.t.	man[130]
			LD_{50}: 0.039	r.t.	man[130]
Tetanus	Clostridium tetani	Protein (67,000 MW)	LD: $2x10^{-6}$	NR	mouse[111]
			LD: 0.003 to 0.004	NR	man[11]

(UNCLASSIFIED)

MARINE POISONS

Poison	Source	Nature	Toxicity (mg/kg)	Method	Animal
Amberjack Toxin	Seriola aureovittata (amberjack)	Similar to ciguatoxin	LD: 1.0	NR	mouse[139]
Crab toxin	Zosimus aenus (Xanthid crab)	Closely related to saxitoxin	LD: 0.0095	NR	mouse[140]
Eledoisin	Eledone moschatz (octopi)	Peptide	LD: 0.15-0.30	NR	dog[141]
Erabutoxin b	Laticauda semi-fasciata (sea snake)	Peptide (7,000 MW)	LD_{50}: 0.07	i.m.	rat[141]
Goby toxin	Gobius criniger (Ryukyu goby)	Similar to tetrodotoxin	LD: 0.22	NR	mouse[142]
Holothurin A	Actinopyga agassiy (sea cucumber)	Saponin	LD: 5-15	i.v.	mouse[141]
Laticotoxin a	Laticauda semifasciata (sea snake)	Peptide (7,000 MW)	LD_{50}: 0.13	i.m.	mouse[141]
Murexine	Murex trunculus (purple snail)	β-(4-imidazolyl) acrylylcholine	LD_{100}: 300 LD_{100}: 15 to 30	s.c. i.v.	mouse[130] mouse[130]

MARINE POISONS (Continued)

Poison	Source	Nature	Toxicity (mg/kg)	Method	Animal
Nereistoxin	Lumbreconeris heteropoda Marenz (marine annelid)	4-N,N-Dimethyl-amino-1, 2-dithiolane (149 MW)	MLD: 38 MLD: 1.8	NR NR	rat[143] rabbit[143]
Oyster toxin	Oyster	Probably impure saxitoxin	LD_{50}: 1.34	i.p.	mouse[144]
Pahutoxin	Pahu (Hawaiian box fish)	NR	MLD: 0.2	NR	mouse[141]
Palytoxin	Palythoa sp.	NR	LD_{50}: 1.5×10^{-4} LD_{50}: 4.0×10^{-4}	i.v. i.p.	mouse[130] mouse[130]
Prymnesin	Prymnesium parvum (yellow-green algae)	Glycolipid	LD_{50}: 1.4	i.p.	mouse[141]
Saxitoxin	Saxidomus giganteus (Alaskan clam)	$C_{10}H_{17}N_7O_4 \cdot 2HCl$ (372 MW)	LD_{50}: 0.001 LD_{50}: 0.002-0.007	i.p. i.v.	mouse[145] cat[130] rabbit[130]
Tetrodotoxin	Puffer fish	$C_{11}H_{17}N_3O_8$ (319 MW)	LD_{50}: 0.014 LD_{50}: 0.011 LD_{50}: 0.010 LD_{50}: 0.002	s.c. i.p. i.v. i.v.	mouse[107] mouse[107] mouse[107] rabbit[107]

PLANT TOXINS

Poison	Source	Nature	Toxicity (mg/kg)	Method	Animal
Abrin	Abrus precatorius	Protein (65,000 MW)	LD: 0.007	NR	man[2]
Aconite	Aconitum chasmanthum	Alkaloid	LD_{50}: 0.03 to 0.07	NR	mouse[146]
			LD_{100}: 0.06 to 0.11	NR	mouse[146]
Anisatine	Illicium anisatum L.	$C_{15}H_{20}O_8$	LD_{50}: 0.7	i.v.	mouse[11]
Bulbocapnine	Corydalis cava (herb)	Heterocyclic,	ID: 3.0 to 7.0	NR	man[130]
		$C_{19}H_{19}NO_4$ (325 MW)	LD_{50}: 195	s.c.	mouse[130]
Curare	Chondodendron tomentosum	Heterocyclic	LD_{50}: 0.20	i.v.	rabbit[130]
Dimorphandra	Dimorphandra mollis benth	Curare-like	LD_{50}: 20	NR	mouse[147]
Harmine	Penganum harmala L. (wild rue)	Indole $C_{13}H_{12}N_2O$	ID: 2.9	i.v.	man[130]
			MLD: 200	s.c.	rat[130]
Mescaline	Anhalonium lewinii (cactus)	3,4,5-Trimethoxy-phenylethylamine $C_{11}H_{17}NO_3$	Hallucinogen ID: 1.4 to 7.0	p.o.	man[130]

PLANT TOXINS (Continued)

Poison	Source	Nature	Toxicity (mg/kg)	Method	Animal
Muscarine	Amanita muscaria (mushroom)	Alkaloid $C_9H_{20}O_2N$ (158 MW)	LD: 3.4	s.c.	cat[101]
Muscimol	A. muscaria	Alkaloid $C_4H_6O_2N_2$ (98 MW)	LD: 2.8	i.p.	mouse[148]
			LD: 4.5	i.p.	rat[148]
Phalline B	A. phalloides	Peptide	LD_{50}: 15	NR	mouse[149]
Psilocybin	Psilocybe mexicana (Mexican mushroom)	An indolyl phosphate.	Hallucinogen		
			ID: 0.1-0.3	p.o.	man[130,150]
Ricin	Ricinus sanquineus L. (castor bean)	Albumin	LD_{100}: $6x10^{-4}$	i.m.	dog[130]
			LD_{100}: 150-200	p.o.	man[130]
			LD_{50}: $5x10^{-5}$	i.v.	rabbit[130]
Scopolamine hydrobromide	Scopola carniolica	6,7-Epoxytropine tropate $C_{17}H_{21}NO_4 \cdot HBr \cdot 3H_2O$	LD_{50}: 5900	s.c.	mouse[130]
			ID: 0.005 to 0.010	p.o.	man[130]

PLANT TOXINS (Continued)

Poison	Source	Nature	Toxicity (mg/kg)	Method	Animal
Tetrahydro-cannabinol (Marijuana)	Cannabis sativa L. (India hemp)	Heterocyclic, $C_{21}H_{30}O_2$ (314 MW)	ID: 0.06	p.o.	man[130]
D-Tubocurarine chloride	Chondodendron tomentosum	Alkaloid $C_{38}H_{44}O_6N_2Cl_2$ (696 MW)	LD_{50}: 0.223 LD: about 0.7	i.v. NR	rabbit[130] man[99]
Vincarine	Vinca genus	$C_{21}H_{24}N_2O_3$	ID: 10	NR	mouse[151]

(UNCLASSIFIED)

SNAKE VENOMS

Poison	Source	Nature	Toxicity (mg/kg)	Method	Animal
Alpha-toxin	Naja haje haje	Protein (7000 MW)	LD_{50}: 0.10	s.c.	mouse[152]
Alpha-toxin	N. nigricollis	Protein	LD_{50}: 2.5	s.c.	mouse[107]
			LD_{50}: 3.0	i.p.	mouse[107]
			LD_{50}: 0.6	i.v.	mouse[107]
Venom	Dendroaspis polylepis (black mamba)	A complex mixture, mostly protein	LD_{50}: 5.7	NR	mouse[153]
Venom	Haemachatus haemachatus	A complex mixture, mostly protein	LD_{50}: 1.8	s.c.	mouse[107]
			LD_{50}: 1.5	i.p.	mouse[107]
			LD_{50}: 0.38	i.v.	mouse[107]
Venom	Indian krait	A complex mixture, mostly protein	LD_{50}: 0.10	NR	mouse[107]
Venom	N. haje	A complex mixture, mostly protein	LD_{50}: 1.7	s.c.	mouse[107]
			LD_{50}: 1.3	i.p.	mouse[107]
			LD_{50}: 0.42	i.v.	mouse[107]

SNAKE VENOMS (Continued)

Poison	Source	Nature	Toxicity (mg/kg)	Method	Animal
Venom	N. naja	A complex mixture, mostly protein	LD_{50}: 0.25	i.v.	mouse[107]
			LD_{50}: 0.35	i.p.	mouse[107]
			LD_{50}: 0.45	s.c.	mouse[107]
Toxin A	N. naja	Protein	LD_{50}: 0.15	NR	mouse[154]
Venom	N. naja atra	A complex mixture, mostly protein	LD_{50}: 0.63	s.c.	mouse[107]
			LD_{50}: 0.44	i.p.	mouse[107]
			LD_{50}: 0.40	i.v.	mouse[107]
Venom	N. nivea	A complex mixture, mostly protein	LD_{50}: 0.65	s.c.	mouse[107]
			LD_{50}: 0.6	i.p.	mouse[107]
			LD_{50}: 0.2	i.v.	mouse[107]
Venom	Notechis scutatus (Australian tiger snake)	A complex mixture, mostly protein	LD_{50}: 0.10	NR	mouse[107]
Venom	Ophrophagus hannah	A complex mixture, mostly protein	LD_{50}: 2.0	i.p.	mouse[107]
Hemorrhagic Principle 1	Trimeresurus flavoviridus (habu)	A complex mixture, mostly protein	LD_{50}: 0.23	NR	mouse[155]

SNAKE VENOMS (Continued)

Poison	Source	Nature	Toxicity (mg/kg)	Method	Animal
Venom Protein	Vipera ammodytes (Bulgarian viper)	Protein (110,000 MW)	MLD: 0.90	NR	mouse[156]
Venom	Vipera lebetina	A complex mixture, mostly protein	LD_{50}: 5.6	d.c.	mouse[157]
			LD_{50}: 0.3	i.v.	mouse[157]
Venom	V. palestinae	A complex mixture, mostly protein	LD_{50}: 1.9	i.p.	mouse[158]

(UNCLASSIFIED)

APPENDIX III.

GLOSSARY

Absorption (verb absorb)	The process of sucking up or taking in of fluids or other substances, as the absorption of water by a sponge; the absorption of gas in a liquid.
Acetylcholinesterase	An enzyme that hydrolyzes acetylcholine most rapidly. See cholinesterase.
Activated charcoal	Charcoal having neutralizing power and greater adsorptive capacity as a result of the removal (by treatment with heat and steam) of foreign materials from its pores.
Active site	Position of the portion of a molecule that is responsible for its activity.
Adsorbate	A substance taken up by, and held on the surface of, an adsorbent.
Adsorbent	A substance that takes up and retains another body on its surface. Activated charcoal, for example, is an adsorbent; whereas the gas held by the charcoal is an adsorbate.
Adsorption (verb adsorb)	The adhesion of liquids or gases to the surface of solid bodies; as, the adsorption of gases by (or on) activated charcoal. (Sorption, a more general term, refers to absorption and adsorption.)
Aerosol	A suspension or dispersion of small solid or liquid particles in air or gas. Examples are mists, fogs, and smokes.

Alkaloid	One of a large group of organic basic substances found in plants. They are usually bitter in taste and physiologically active. The term is sometimes applied to synthetic substances which have structures similar to the plant alkaloids.
Amorphous	Having no definite form; shapeless; not crystallized.
Analgesic	Relieving pain; an agent that alleviates pain without causing loss of consciousness.
Analogs	Chemical compounds that have a common basic structure but differ from one another with respect to a particular chemical group.
Anoxia	Absence or lack of oxygen; reduction of oxygen in body tissues below physiological levels.
Anesthetic	A drug or agent that is used to abolish the sensation of pain.
Antibody	A substance formed by the body in antagonism to specific foreign bodies (antigens) such as toxins; for example, antitoxin.
Anticholinesterase	Substance which inhibits action of the enzyme cholinesterase.
Antidote	Remedy for counteracting a poison.
Antigen	A substance, usually a protein, carbohydrate, or fat-carbohydrate complex, that stimulates the production of an antibody when introduced directly into animal tissues.
Antihistaminic	A drug which counteracts the action of histamine.

Antiplant agent	A chemical which causes damage to plants.
Antiserum	A serum that contains antibody or antibodies. It is produced in an animal body that had been subjected to the action of antigen either by injection into the tissues or blood, or by infection.
Antitoxin	A substance present in the blood serum or other body fluids which is antagonistic to a specific toxin that stimulated its production.
Antivenin	A serum containing antibody against venom (for example, insect and snake venoms).
Areactogenic	Absence of side reactions.
Ataxia	Failure of muscular coordination; irregularity of muscular action.
Autonomous nervous system	The involuntary portion of the nervous system concerned with regulation of the activity of heart, blood vessels, smooth muscle, glands, and viscera.
Anticoagulant	A substance that prevents or delays coagulation of blood.
Bacillus	A rod-shaped bacterium.
Biosynthesis	Building up of a chemical compound in a living organism.
Bradycardia	Abnormal slowness of the heartbeat, as evidenced by slowing of the pulse rate to 60, or less.
Cardiovascular	Pertains to the heart and blood vessels.
Catalepsy	A condition characterized by a waxy rigidity (flexibilitas cerea) of the muscles so that the patient tends to remain in any position in which he is placed.

Catalyst	A substance which accelerates a chemical reaction and can be recovered practically unchanged at the end of the reaction.
Catatonic stupor	Partial or complete unconsciousness resulting from catatonia, a form of schizophrenia.
Central nervous system (CNS)	An assemblage of several billion nerve cells with their processes, collaterals, and terminals which make up the brain, cerebellum, medulla, and spinal cord.
Chemical ammunition	A type of ammunition, the filler of which is primarily a chemical agent (toxic chemical agent), training and riot control agent, a smoke or an incendiary.
Chemical warfare agent (or chemical agent)	A solid, liquid, or gas which, through its chemical properties, produces lethal or damaging effects on man, animals, plants or material, or produces a screening smoke or flame.
Cholinergic	A term applied to nerve fibers that liberate acetylcholine at a synapse when a nerve impulse passes, or to substances with an action similar to acetylcholine.
Cholinesterase	An esterase enzyme which is necessary to maintain orderly passage of nerve impulses from the nerve endings to the muscles, glands, and organs of the body by hydrolysis of acetylcholine.
Cholinolytic	A substance that blocks the action of acetylcholine or of cholinergic agents.
Cholinomimetic	A substance with an action similar to acetylcholine.

Clonic convulsion	A convulsion marked by an alternating contraction and relaxation of the muscles.
Coagulant	A substance that promotes or accelerates the coagulation of blood.
Colloid	Any substance in a certain state of fine division, in which the particles range in diameter from about 0.2 to 0.005 micron. Mixed with certain media, colloids form so-called colloidal solutions, colloidal systems, or sols.
Concentration	The quantity of chemical present in a unit volume. Concentrations of airborne chemical agents are usually expressed in milligrams of agent per cubic meter of air (mg/m^3).
Contamination	The deposition and/or absorption of chemical agents on and by structures, areas, personnel, or objects. Contamination density for liquid chemical agents is usually expressed in mg/m^2, kg/km^2, or pounds per hectare.
Curariform	Resembling curare in physiological properties.
Cyanosis	A bluish discoloration, applied especially to such discoloration of skin and mucous membranes due to excessive concentration of reduced hemoglobin in the blood.
Cytolysis	A dissolving action on cells.
Cytostatic	To check the growth or multiplication of cells.
DANC	A decontaminant consisting of 6.25% solution of 1,3-dichloro-5-dimethylhydantoin in acetylene tetrachloride.

Decontamination	The process of making any person, object, or area safe by absorbing, destroying, neutralizing, making harmless, or removing chemical agents.
Defoliant	A chemical compound which will cause trees or shrubs to lose their leaves.
Depressive	A lowering or decrease in functional activity.
Desiccant	Drying; a drying agent.
Detection	The determination of the presence of a chemical agent through application of human senses or by devices employing physical, chemical, or electronic techniques.
Detector crayon	Chalklike crayon composed of material which changes color on contact with a chemical agent; normally used for detection of liquid agents such as blister agents.
Detector paper	Paper treated with a chemical compound that changes color in the presence or absence of certain toxic chemical agents.
Detoxification	Reduction of toxicity of poisons by chemical changes induced in the body to produce a relatively nontoxic compound that is more readily eliminated from the body.
Dialysis	Process of separating crystalloids from colloidal substances in solution by diffusion of the former through a semipermeable membrane.
Dicotyledonous	Of or like a plant having two cotyledons, or seed leaves.

Dosage	The concentration of chemical agent to which a person is subjected, multiplied by the time of exposure. It is usually expressed as concentration (C) multiplied by time (t) or mg-min/m^3 as the inhalation dose. Skin dosage is equal to time of exposure of an individual's unprotected skin multiplied by concentration of chemical agent cloud in contact with skin.
Dose	The amount of agent that is taken into or absorbed by the body. a. Lethal dose - Dose required to cause death. b. Incapacitating dose - Dose required to cause a nonlethal casualty. c. Effective dose - That amount of chemical agent required to produce a desired physiological effect.
DS-2	Decontaminant consisting of 70% diethylene-triamine, 28% ethylene glycol monomethyl ether, and 2% NaOH.
Electrolysis	Destruction of a chemical compound by passage of an electric current.
Electrophoresis	The movement of charged particles, suspended in a liquid on various supporting media, under the influence of an applied electric field.
Emetic	An agent that causes vomiting.
Emulsion	A suspension of fine particles (globules) of a liquid in another liquid. See Colloid.
Endotoxin	A toxic substance produced by a bacterium and liberated by the disintegration of the bacterial cell.

Enterotoxin	Toxin which is specific for intestinal mucosa cells; also a toxin formed in the intestine.
Enzymatic test	A test for presence of nerve agents in which the color produced is the result of the action of cholinesterase enzyme on a substrate.
Enzyme	A protein produced by a living organism, which catalyzes one or more chemical reactions.
Erythema	A name applied to redness of the skin produced by congestion of the capillaries, which may result from a variety of causes, the etiology or a special type of lesion often being indicated by a modifying term.
Esterase	An enzyme or ferment capable of hydrolyzing esters; that is, of decomposing them into their acidic and alcoholic constituents. Cholinesterase is an esterase.
Exotoxin	A toxin formed and excreted by a microorganism.
Extractive	Any substance present in an organized tissue and requiring extraction by some special method.
Fibrinolytic	Capable of hydrolyzing or liquefying fibrin (clotting substance in blood).
Ganglia	Groups of nerve cell bodies.
Ganglion-blocking	A substance that blocks the nerve impulses passing through the ganglion. The latter is a mass of nerve cells serving as a center of nervous influence.

Gel diffusion	A process by which a substance is allowed to spread widely in a gelatinous colloid.
Hallucinogen	A substance that produces a sense perception not founded on objective reality, i.e., hallucination.
Hemagglutination	The clumping of red blood cells.
Hemoglobin	The oxygen-carrying pigment of red blood cells.
Hemolysin	A substance causing hemolysis either alone or in presence of complement.
Hemolysis	The dissolution of red blood corpuscles and the liberation of their hemoglobin.
Hemolytic	Capable of causing destruction of the red blood corpuscles with the liberation of hemoglobin.
Hemopoietic (hematopoietic)	A substance that promotes formation of red cells.
Herbicide	A preparation that kills weeds and other undesirable plants.
Histotoxic	Poisonous to tissue.
Homogenate	Obtained by the mechanical breakdown of material to a smaller and more uniform size.
Hopcalite	A porous granular material consisting of copper oxide and manganese dioxide, and possibly cobalt and silver oxides for use in filter of protective mask to convert carbon monoxide to carbon dioxide.
Hormone	Any of various substances secreted into the body fluids by internal secretory glands. Hormones activate specific receptive organs. Examples are adrenalin and pituitrin.

Hydrolysis	It is the interaction of a chemical substance with water to cause decomposition of the substance.
Hygroscopic	A substance which attracts or adsorbs moisture from the air.
Hypertension	Abnormally high blood pressure.
Hyperthermia	An abnormally high body temperature; a fever.
Hypnotic	A drug that acts to induce sleep. Also, pertaining to or of the nature of hypnotism.
Hypotension	Abnormally low blood pressure.
Hypoxic	Producing a deficiency of oxygen in inspired air or low oxygen tension.
Ichthyotoxin	Poisonous principle found in some types of fish.
ICt_{50}, ID_{50}	See Median Incapacitating Dosage.
ID	See Incapacitating Dose.
Immune	Resistant to the effects of any particular toxic substance.
Immunity	Power which the body of an individual acquires to resist an infection or toxin intoxification.
Immunization, Active	The process by which immunity is conferred through the production of antibodies by an individual's own body cells. Antibodies are produced by the stimulus of antigens.
Immunization, Passive	The process of conferring transient immunity to a disease or toxic chemical by inoculation with serum from an animal already actively immunized against the disease or toxic chemical.

Immunogen	An antigenic substance capable of inducing immunity.
Immunophoresis	A combination of electrophoresis and diffusion techniques to distinguish substances by differences in electrophoretic mobility and antigenic activity; the supporting medium may be agar gel, cellulose acetate, or other material.
Immunosorbent	Antigen-coated particles of a supporting medium, such as cellulose.
Impermeable protective clothing	Clothing made of material which prevents passage of toxic chemical agents in any physical form and which can be worn for only short periods of time because of excessive heat load.
Impinger	A device for collecting samples of aerosol particles from the atmosphere.
Inactivate	To destroy the activity of.
Incapacitating agent	An agent that produces temporary physical or mental effects which will render individuals incapable of concerted effort in the performance of their assigned duties.
Incapacitating dose (ID)	The quantity of a chemical agent sufficient to cause incapacitation.
Incendiary	A chemical agent used primarily for igniting combustible substances.
Incubation time	The period of time between the entrance of a chemical agent in the body and the appearance of signs or symptoms of resultant intoxication.
Indirect (passive) hemagglutination	Serological test for detection of antigen (e.g., toxin). Red blood corpuscles, on which specific antibody was previously adsorbed, agglutinates in the presence of antigen as the result of an antigen-antibody reaction.

Intoxication	State of being poisoned.
Intraperitoneally	Within the peritoneal cavity of the serous membrane lining the abdominopelvic walls.
Intravenously	Within a vein.
In vitro	Observed in a test tube.
In vivo	Observed within a living body.
Inversion	A reversal in the normal temperature lapse rate, in which the temperature rises with increased elevation instead of falling.
I.V. (or i.v.)	See Intravenously.
I.P. (or i.p.)	See Intraperitoneally.
Isolectric point	The pH of a substance at which the net electrical charge on a molecule in solution is zero, such as that found in amino acid and protein molecules.
Jaundice	A syndrome characterized by hyperbilirubinemia and deposition of bile pigment in the skin and mucous membranes with resulting yellow appearance of the patient.
Labile	Unstable; for example, thermolabile indicates unstable to heat.
Lacrimator	A substance which increases the flow of tears, such as certain riot control agents.
Lapse	A marked decrease of air temperature with increasing altitude (the ground being warmer than the surrounding air). This condition is usually encountered when skies are clear and

between 1100 and 1600 hr. During lapse conditions, strong convection currents are found; for chemical and biological operations, the state is defined as unstable. This condition is normally considered the most unfavorable for the release of chemical agents.

LCt_{50}, LD_{50} ---------- See Median Lethal Dosage.

Lethal Dosage (LD) ---------- The dosage sufficient to cause death. The lethal dose is generally expressed as the median lethal dose (LD_{50}) or the amount of chemical agent sufficient to kill 50% of exposed animals.

Lyophilization ---------- The process of freezing and dehydrating a substance under vacuum.

Lysis ---------- Destruction of cells by a specific substance.

Macromolecule ---------- A molecule of high-molecular-weight.

Malaise ---------- A vague feeling of bodily discomfort.

Mass immunization ---------- Immunization of a group of animals or humans simultaneously.

Median Incapacitating Dosage (or ID_{50} or ICt_{50}) ---------- The incapacitating dosage of an agent is generally expressed as the median incapacitating dosage--the amount of inhaled vapor or liquid agent on the skin which is sufficient to disable 50% of exposed personnel. For inhalation effect, the median incapacitating dosage is expressed as the ICt_{50}. Liquid contamination on skin or injection of toxic substance into body to cause incapacitation, the median incapacitating dosage is expressed as ID_{50} (mg/kg body weight).

Median Lethal Dosage (LCt_{50} or LD_{50})	The median lethal dosage of an agent employed for inhalation as a vapor or aerosol is generally expressed as the LCt_{50}. The LCt_{50} of a chemical agent is the dosage (vapor concentration of the agent multiplied by the time of exposure) that is lethal to 50% of exposed personnel. The unit used to express LCt_{50} is milligram minutes per cubic meter. (NOTE: Lethal dosage may also be expressed in other than median, for example: LCt_{25} is the amount required to kill 25% of an exposed group of personnel). Liquid contamination, on skin or injection of toxic substance into body to cause death, the median lethal dosage is expressed as LD_{50} (mg/kg body weight).
Metabolism	The sum of all the physical and chemical processes by which living organized substance is produced and maintained, and also the transformation by which energy is made available for use by the organism.
Methemoglobin	A compound formed from hemoglobin by oxidation of the ferrous to the ferric state with essentially ionic bonds.
Micron	A unit of length, the thousandth part of one millimeter, or the millionth part of one meter. It is equivalent to about one twenty-five thousandth of an inch.
MLD	Minimum lethal dose.
Mole (mol)	The amount of substance in a system containing as many elementary entities as there are atoms in 12 g of carbon-12. The entities may be atoms, molecules, ions, electrons, or other particles.

Molecular sieve	Particles of uniform size in certain types of supporting media that have the ability to separate the chemical components in a mixture according to molecular size.
Monocotyledonous	Of or like any seed plant having a single cotyledon.
MW	Molecular weight.
Mydriasis	Extreme or morbid dilation of the pupil of eye.
M5 Ointment	A substance that serves as a source of active chlorine in a medium that resists its removal by water or mechanical action.
M13 Individual Decontaminating and Reimpregnating Kit	A kit containing a bag filled with fuller's earth for adsorbing liquid CW agents and bags filled with chloramide powder to decontaminate droplets of V-agents and mustard on clothing.
Nausea	An unpleasant sensation, vaguely referred to the epigastricum and abdomen, and often culminating in vomiting.
Necrosis	Death of a cell or group of cells in contact with living tissue; e.g., destruction of epidermal cells.
Neuromuscular	Pertains to nerve and muscle.
Neuron	A nerve cell with its processes, collaterals, and terminals; regarded as a structural unit of the nervous system.
Neurotoxin	Substance that is poisonous or destructive to nerve tissue.

Neurotropic	Having an affinity or predilection for nervous tissue.
NR	Not reported.
Paralysis	Loss or impairment of motor function in part due to lesion of the neural or muscular mechanism; also, by analogy impairment of sensory function (sensory paralysis).
Paresis	Slight or incomplete paralysis.
Passive hemagglutination	See indirect hemagglutination.
Peptizer	A substance which hastens or facilitates the dispersal of a colloidal material in a dispersion medium. It is used to lower the final viscosity of a thickened fuel and facilitates the formation of a gel at lower temperatures than would otherwise be possible.
Percutaneous	Means "through the skin." Percutaneous effects are achieved by penetration of the skin by a chemical agent liquid, vapor, or aerosol.
Peripheral nervous system	That portion of the nervous system consisting of the nerves and ganglia outside the brain and spinal cord.
p.o.	Perorally, or the amount of a substance taken by mouth.
Pharmacological	Pertaining to the effects of drugs on living things.
Physiological	Pertaining to the science that concerns the functions of the living organism and its parts.
Phytotoxin	A toxin derived from a plant. Ricin, from the castor oil bean, is an example.

Plant growth regulator	A chemical antiplant agent which regulates or inhibits plant growth.
Polyvalent	Heterogeneous mixture containing more than one type of toxin, toxoid, or antitoxin.
Proteolytic	Pertaining to and characterized by an agent that promotes the hydrolysis of proteins into proteoses, peptones and other products by means of enzymes.
Protoxin	Inactive precursor of a toxin, formed by certain bacteria in the course of producing an exotoxin.
Psychochemical	A chemical substance affecting psychological functions.
Psychopharmacology	Study of action drugs on psychological functions.
Psychotropic	Causing a change in the mental processes in response to a stimulus.
Pyrophoric	A term applied to a fuel or compound which ignites spontaneously in air as a result of its reaction with oxygen.
Reactogenicity	Tendency to produce side reactions.
r.t.	Respiratory tract.
Riot control agent	A chemical that produces temporary, irritating or disabling effects when in contact with the eyes or when inhaled.
S.C. (or s.c.)	Subcutaneously, or the amount of substance injected under the skin.

Sedative	An agent that allays excitement.
Serum	The clear liquid which separates out from the clot and corpuscles in the clotting of blood.
Sorption	Includes both absorption and adsorption.
Spasmolytic	Checking spasms; antispasmodic.
STB	Supertropical bleach consisting of calcium hydroxide and calcium hypochlorite; used as a decontaminant.
Sublethal	Not fatal; i.e., below lethal levels.
Submerged culture	A technique in which organisms are grown while submerged in a liquid that is being agitated continuously.
Substrate	Substance upon which another substance, usually an enzyme, acts.
Suspension	The condition in which particles of a solid are dispersed through a fluid but not dissolved in it.
Synergism	The joint action of agents so that their combined effect is greater than the algebraic sum of their individual effects.
Syrette	A small container with needle attached designed for self-injection of medications such as morphine or atropine.
Systemic	Of, relating to, or common to a system; of or pertaining to the body as a whole.
Systemic poisoning	Poisoning resulting from the absorption of a toxic material into the blood stream.
Tachycardia	Excessive rapidity in the action of the heart. The term is usually applied to a pulse rate about 100/min.

Total Obscuring Power (T.O.P.)	Total obscuring power of a smoke. Area in square feet covered by the smoke from one pound of smoke-producing material spread out in a layer of such thickness and density that it will exactly obscure the filament of a standard 40-watt lamp.
Toxin	Generally, any poisonous substance of microbic, vegetable, or animal origin. Specifically, substances related to proteins; these true toxins are more or less unstable, requiring a latent period to produce symptoms and induce in suitable animals the formation of specific antitoxins.
Toxoid	Toxin treated in order to destroy its toxicity but still capable of inducing the formation of antibodies on injection.
Toxophoric	Chemical group or site in the molecule of a toxin responsible for its toxicity.
Training agent	An agent authorized for training purposes.
Tranquilizer	An agent which acts on the emotional state, quieting or calming the patient without affecting clarity of consciousness.
Tremor	An involuntary trembling or quivering.
Urticant	Causes an itching or tingling sensation.
Vaccine	A preparation of killed or attenuated infective agent used in vaccination to induce immunity. May also contain toxoids.
Vasoconstrictor	Causing constriction of the blood vessels; an agent that causes constriction of the blood vessels.

Venom	Poison or toxic substance secreted by a snake and insect.
Viable	Living.
Warhead (chemical)	That part of a missile, projectile, torpedo, rocket, or other munition which contains chemical agents.
Whetlerite	A solution for impregnating charcoal to provide protection against certain types of CW agents. It consists of cupric carbonate [$CuCO_3$:$Cu(OH)_2$], chromic oxide, silver oxide, 28% aqueous ammonia, and ammonium carbonate (114:34.6:3.2:284:142) in 390 ml H_2O.[12]

APPENDIX IV.

AGENTS AND ANTIDOTES, THEIR CODES AND DESIGNATIONS

(b)(1)

(b)(1)

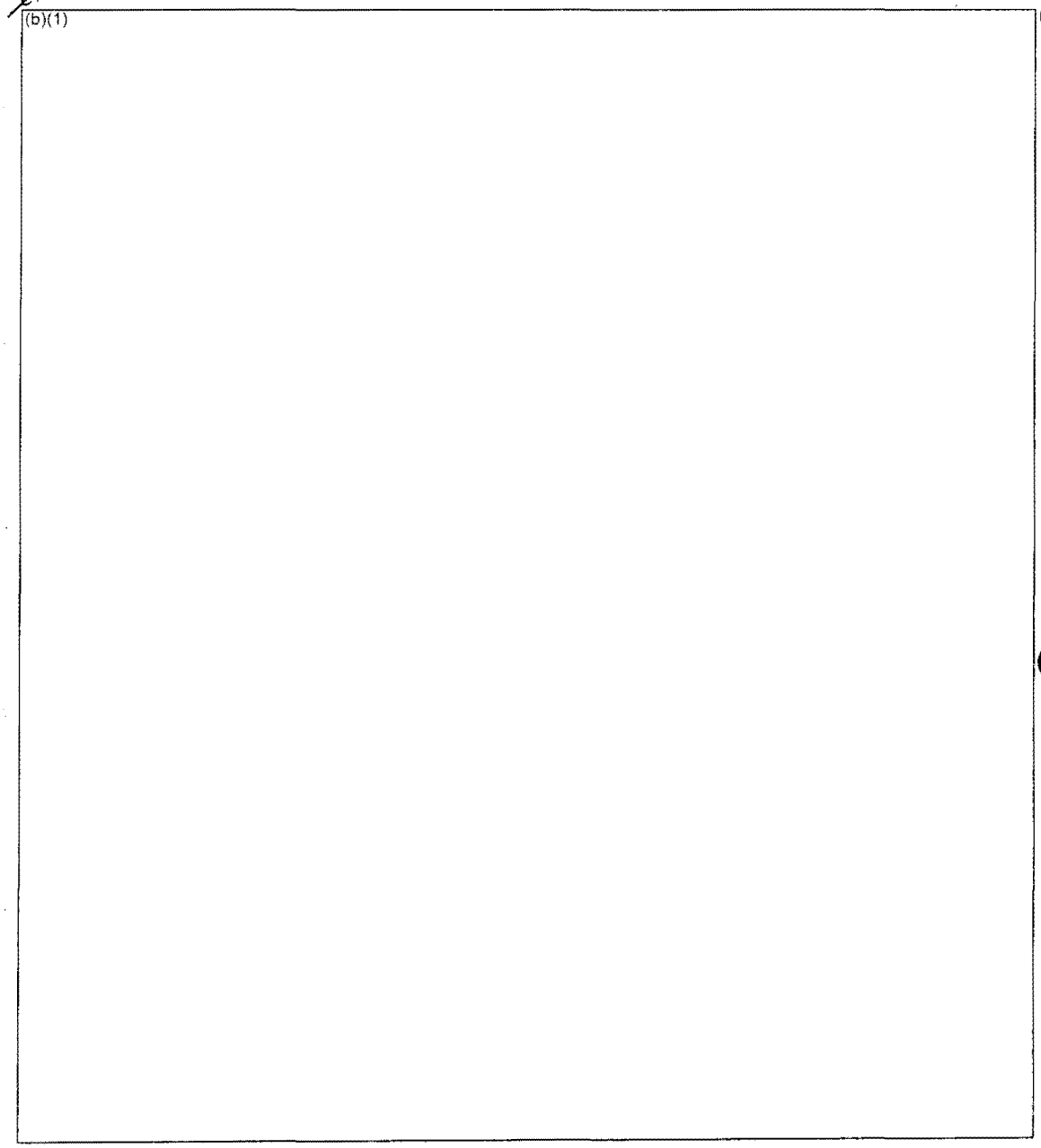
RELEASABLE TO UK, CANADA, AUSTRALIA, AND NEW ZEALAND

Classified by Cdr, USAFSTC
Exempt from GDS of EO 11652
Exemption Category: 1 & 2
Declassify on: IMPDET

(b)(1)

RELEASABLE TO UK, CANADA, AUSTRALIA, AND NEW ZEALAND

(b)(1)



RELEASABLE TO UK, CANADA, AUSTRALIA, AND NEW ZEALAND

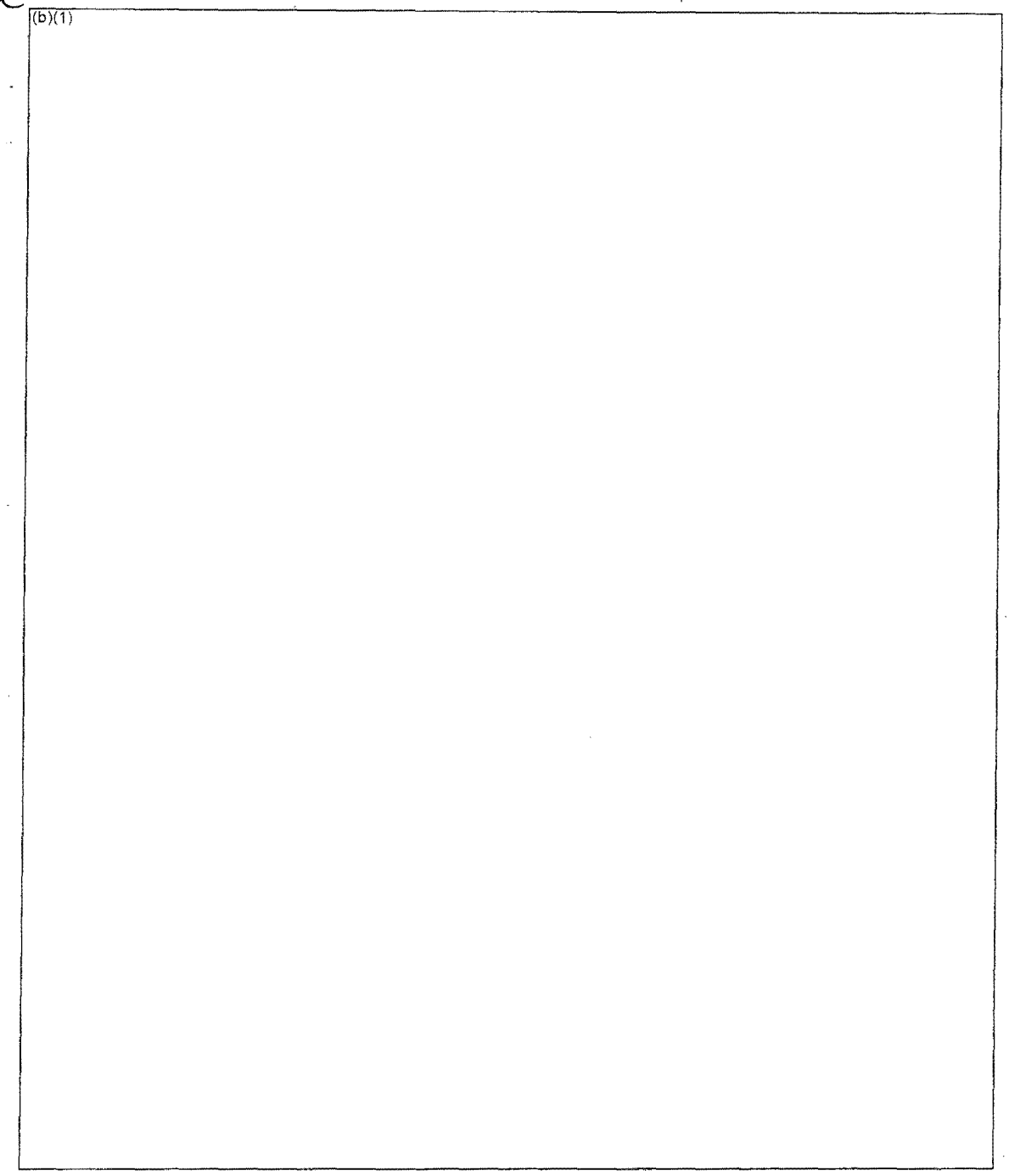
(b)(1)

RELEASABLE TO UK, CANADA, AUSTRALIA, AND NEW ZEALAND

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(b)(1)



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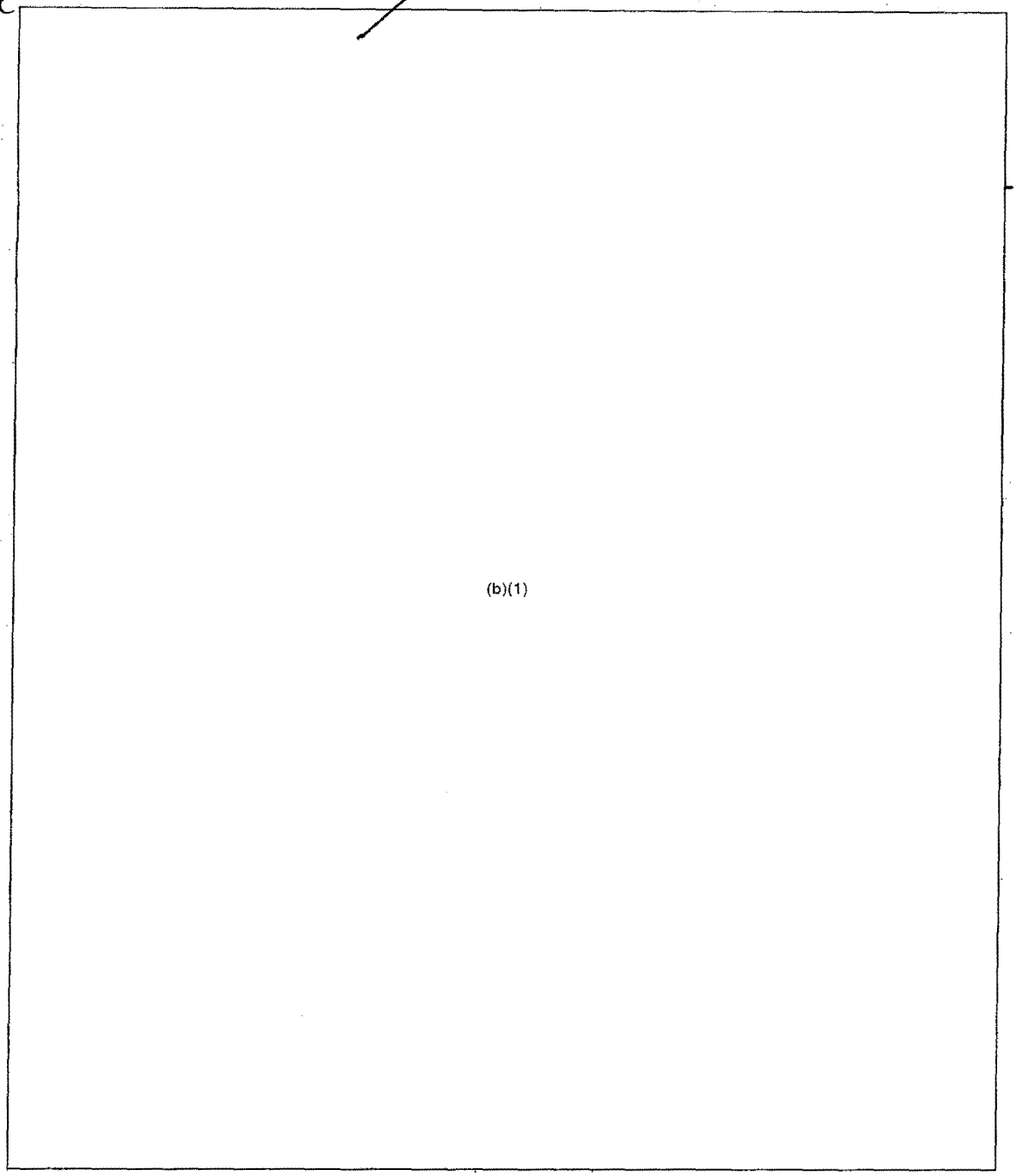

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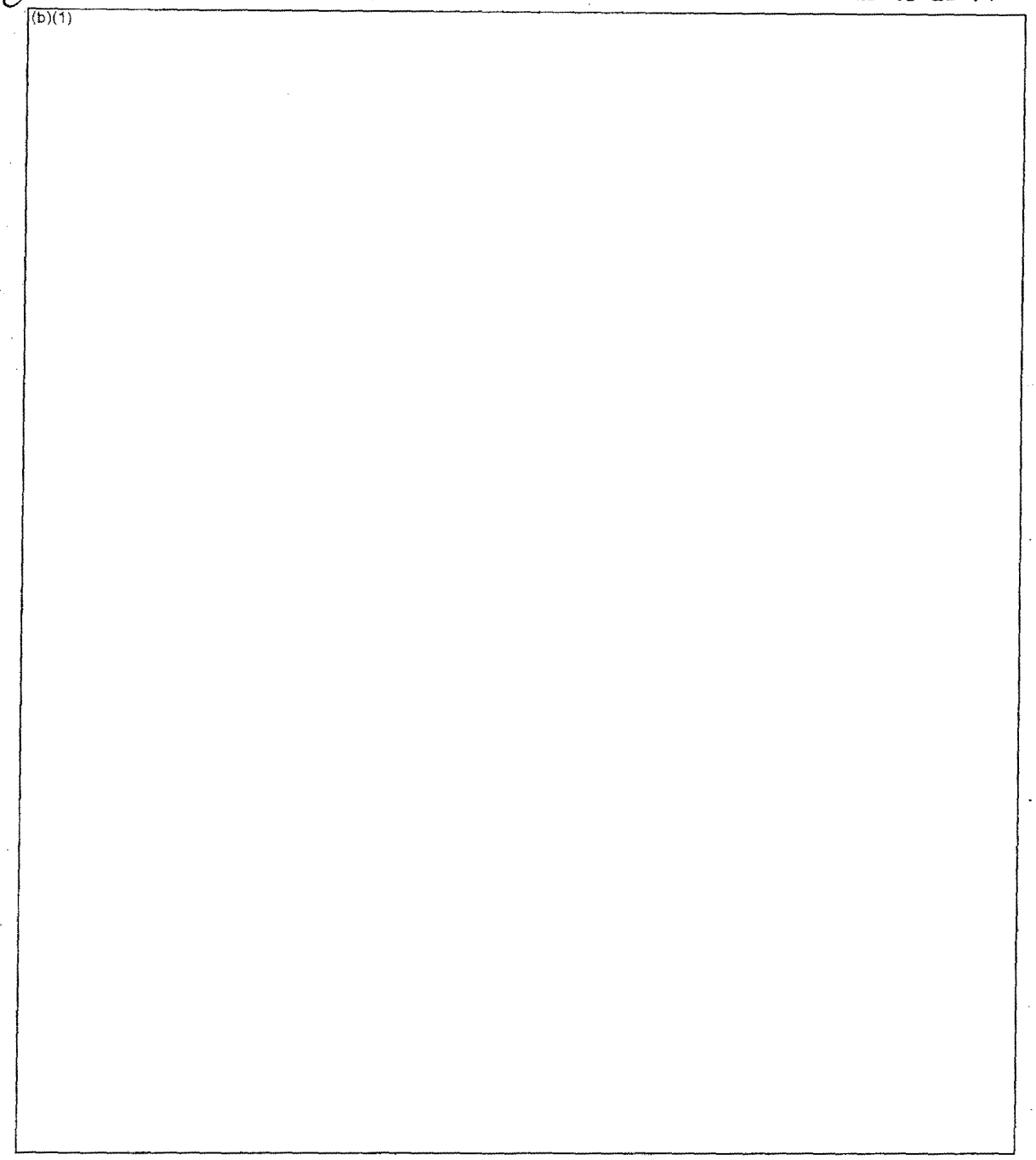

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