Let in order but file no.

TSCA SECTION 8(d) AND 4(a)
HEALTH AND SAFETY DATA REPORTING
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
DOCKET #83002 - POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS
DOCUMENTS RECEIVED FOLLOWING DECISION OF JUNE 5, 1987
(DOCKET #83002C) - FOR 1992 ONLY
$H_{1.5}$-FILE

Fiche #

40-9293578 Midwest Research Institute

(8)

Letter from D. Steele to R. Harless, EPA
~~EPA~~ (RTPNC) on the scheduling of a telecon-
~~teleconference~~.
January 8, 1992

40-9293579 Akzo Chemicals, Inc.

(1)

Letter from E. Bisinger, Inc. to Docu-
~~Document~~ Control Office, EPA
(Sanitized)
January 29, 1992

Enclosure:

(1) Analytical Protocol for the Deter-
mination of Polybrominated Diben-
~~zo~~p-Dioxins and Dibenzofurans by High-
~~High~~ Resolution Gas Chromatography/
~~phy~~ High Resolution Mass Spectrometry-
metry in Pentabromodiphenyloxide.
~~Triangle~~ Triangle Labs., Inc. for Brominated
~~nated~~ Flame Retardant Industry Panel.
~~Panel~~.
July 4, 1989

40-9293580 U.S. Environmental Protection Agency

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Letter from J. Harris to N. Rouse, Rhone-
~~Rhone~~ Poulenc, Inc.
February 19, 1992

Enclosure~~s~~:

(1) Two documents with comments on
Rhone-Poulenc's exclusion request
submission. (CBI).

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TSCA SECTION 8(d) AND 4(a)
HEALTH AND SAFETY DATA REPORTING
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
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DOCUMENTS RECEIVED FOLLOWING DECISION OF JUNE 5, 1987
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40-9293581 Hoechst-Celanese Corporation

Letter from P. Parry to J. Harris, EPA submitting the analytical testing procedure used to determine the Chlorinated Dioxin and Furan contamination levels in Chloranil.
February 24, 1992

Enclosures:

(1) Quantification of Polychlorinated Dibenzo-p-Dioxins and Furans in Chloranil by Means of GC/MS (Gas Chromatography/Mass Spectrometry.
July 15, 1991

(2) Sample Preparation for the Determination of Chlorinated Dibenzo-p-Dioxins and Furans (PCDD/F) in Chloranil by GC-MS.
July 10, 1991

40-9293582 Akzo Chemicals, Inc.

Telefax from E. Bisinger, Jr. to J. Harris, EPA concerning the submission of the final analytical protocol.
March 16, 1992

40-9293583 Chemical Manufacturers Association

Letter from H. Shah to L. Marcus, EPA
March 13, 1992

Enclosure:

(1) PBDD and PBDF Analysis of Human Blood Samples. Midwest Research Institute.
February 14, 1992

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40-9293599 Akzo Chemicals, Inc. (8E)

Letter from E. Bisinger, Jr.
to J. Harris, EPA
May 5, 1992

Enclosure:
(1) Analytical Protocol for the Determination of Polybrominated Dibenzo-p-Dioxins and Dibenzofurans by High-Resolution Gas Chromatography/Medium High-Resolution Mass Spectrometry in Pentabromodiphenylether. Triangle Labs, Inc. for Brominated Flame Retardant Industry Panel. January 29, 1991

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(4)

40-92936000 Akzo Chemicals Inc.
Letter from R. Rausch
to J. Harris, EPA
May 18, 1992
Enclosure:
(1) Results of the Dioxin
Furan Analysis on
a sample of ~~Flyral~~ PBR
& Pentabromodiphenyl Ether
Product. Triangle
Labs.

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(6) Fiche #

40-9293601 Chemical Manufacturers Association

Letter from H. Shah to J. Carra, EPA in response to EPA letter of April 16, 1992 on the analytical protocol for FF-6800 (1,2-Bis (Tribromophenoxy)-Ethane - May 15, 1992

Enclosure:
(1) Analytical Protocol for the Determination of Polybrominated Dibenzo-p-Dioxins and Dibenzofurans by High-Resolution Gas Chromatography / Medium Resolution Mass Spectrometry in 1,2-Bis (Tribromophenoxy) Ethane.

Battelle for the Brominated Flame Retardant Industry Panel, May 8, 1992

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40-9293603 Rhone-Poulenc, Inc. (9)

Letter from N. Rouse to Mme. Sylvestre on the GLP's for analytical testing.

May 11, 1992

Enclosures:

(1) Good Laboratory Practice Standards for Section 4 of TSCA. Subsection 792.3 792.29, 792.31, 792.33, 792.35, 792.41, 792.43, 792.120, 792.130, 790.62 and 790.65

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TSCA SECTION 4
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40-9293602 U.S. EPA (1)

Letter from M. Greenwood
to H. Shah, CMA on the
analytical protocol for 1,2-Bis(Tribromophenoxy)
Ethane.
April 16, 1992
Enclosure:
(1) Panel Review of the
Analytical Protocol for
1,2-Bis(Tribromophenoxy)
Ethane.

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TSCA SECTION 8(d) AND 4(a)
HEALTH AND SAFETY DATA REPORTING
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DOCUMENTS RECEIVED FOLLOWING DECISION OF JUNE 5, 1987
EXCLUSION/WAIVER FROM TESTING REQUIREMENTS (SUPELCO, INC.)
H_{1a}-FILE

			Fiche #
40-8793205	52 FR 30430, USEPA Receipt of Request for Waiver of Testing of Supelco, Inc. Action: Notice of Receipt of Request for Waiver of Testing Requirements. August 14, 1987 [83002D] [Crossreferenced to $A_2(7)$]	(1)	513666
40-8793235	52 FR 39703, USEPA Decision on Waiver Application of Supelco, Inc. Action: Decision on Waiver Request. October 23, 1987 [83002F] [Crossreferenced to $A_2(9)$]	(2)	513668
40-8793208	Supelco, Inc. Letter from L. Witting to E. Klein, EPA requesting a waiver from testing. July 9, 1987 [Crossreferenced to $E_{1d}(3)$]	(3)	513852

Request and Response

TSCA SECTION 8(d) AND 4(a)
HEALTH AND SAFETY DATA REPORTING
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
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EXCLUSION/WAIVER FROM TESTING REQUIREMENTS
(ALDRICH CHEMICAL CO., AMERIBROM, INC., ATOMCHEM, INC.,
PFISTER CHEMICAL, INC., SIGMA CHEMICAL CORP.,
GREAT LAKES CHEMICAL CORP. AND ETHYL CORP.
H_{1b}-FILE

			Fiche #
40-8793230	52 FR 37009, USEPA Receipt of Request for Exclusion From/Waiver of Testing of Ethyl Corp. and Great Lakes Chemical Corp. Action: Notice of Receipt of Requests for Exclusion/Waiver of Testing Requirements. October 2, 1987 [83002E] [Crossreferenced to $A_2(8)$]	(1)	513667
40-8793222	52 FR 43250, USEPA Receipt of Request for Exclusion From/Waiver of Testing of Certain Chemical Companies. Action: Notice of Receipt of Requests for Exclusion/Waiver of Testing Requirements. November 10, 1987 [83002G] [Crossreferenced to $A_2(10)$]	(2)	513669

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TSCA SECTION 8(d) AND 4(a)
HEALTH AND SAFETY DATA REPORTING
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
DOCKET #83002 - POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS
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(ALDRICH CHEMICAL CO., AMERIBROM, INC., ATOMCHEM, INC.,
PFISTER CHEMICAL, INC., SIGMA CHEMICAL CORP.,
GREAT LAKES CHEMICAL CORP. AND ETHYL CORP.
H_{1b}-FILE

			Fiche #
40-8893231	53 FR 3938, USEPA	(3)	513670

Toxic and Hazardous Substances Control; Decision on Exclusion/Waiver Application of seven Chemical Companies; Aldrich Chemical Co. et al.

Action: Notice of Decision on Exclusion/Waiver Requests.

February 10, 1988 [83002H]

[Crossreferenced to A_2(11)]

40-8793212	Ethyl Corporation	(4)	513857

Letter from T. Pullin to Document Control Officer, EPA
September 1, 1987

Enclosures:

(1) Letter of intent to conduct tests on Pentabromodiphenyloxide and Octabromodiphenyloxide from T. Pullin, Ethyl Corp. to Document Control Officer, EPA. September 1, 1987

(2) Application letter from T. Pullin, Ethyl Corp. to Document Control Officer, EPA for an exclusion to conduct testing on Tetrabromobisphenol A and Decabromodiphenyloxide. (Sanitized) September 1, 1987

Fiche #

40-8793212 (continued)

(a) Polybrominated Dibenzodioxins (PBrDD) and Dibenzofurans (PBrDF) in Some Flame Retardant Preparations. Chemosphere; 15(9-12): 2111-2113. 1986

[Crossreferenced to E_{1d}(8)]

40-8793213 Ameribrom, Inc. (5) 513859

Letter from A. Tillman to Document Control Officer, EPA
September 2, 1987

Enclosure:

(1) Letter request for a waiver from testing of Brominated chemicals from M. Eldan, Ameribrom, Inc. to Document Control Officer, EPA. September 4, 1987

[Crossreferenced to E_{1d}(10)]

TSCA SECTION 8(d) AND 4(a)
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EXCLUSION/WAIVER FROM TESTING REQUIREMENTS
(ALDRICH CHEMICAL CO., AMERIBROM, INC., ATOMCHEM, INC.,
PFISTER CHEMICAL, INC., SIGMA CHEMICAL CORP.,
GREAT LAKES CHEMICAL CORP. AND ETHYL CORP.
H_{1b}-FILE

			Fiche #
40-8793218	Great Lakes Corporation	(6)	513864
	Letter from C. O'Connor III of McKenna, Conner and Cuneo to Document Control Officer, EPA September 3, 1987		
	Enclosure:		
	(1) Request of Great Lakes Chemical Corporation for Exclusion and Waiver of Certain Chemicals From the Testing and Reporting Requirements of the Polyhalogenated Dibenzo-p-Dioxin/Dibenzofuran Test Rule, 40 CFR Parts 707 and 766 (52 FR 21412, June 5, 1987). (Sanitized)		
	[Crossreferenced to E_{1d}(15)]		
40-8793262	Aldrich Chemical Company	(7)	513919
	Letter from J. Organ of Foley and Lardner to C. Elkins, EPA requesting an exclusion from and waiver of testing requirements. September 3, 1987		
40-8793217	Atochem, Inc.	(8)	513863
	Letter from M. Hanley to Document Control Officer, EPA requesting an exemption from testing for Pentabromodiphenyloxide. September 3, 1987		
	[Crossreferenced to E_{1d}(14)]		

TSCA SECTION 8(d) AND 4(a)
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EXCLUSION/WAIVER FROM TESTING REQUIREMENTS
(ALDRICH CHEMICAL CO., AMERIBROM, INC., ATOMCHEM, INC.,
PFISTER CHEMICAL, INC., SIGMA CHEMICAL CORP.,
GREAT LAKES CHEMICAL CORP. AND ETHYL CORP.
H_{1b}-FILE

			Fiche #
40-8793267	Sigma Chemical Company	(9)	513920

Letter from J. Organ of Foley and Lardner to C. Elkins, EPA requesting a waiver of testing requirements.
September 3, 1987

Enclosure:

(1) Applicant of Sigma Chemical Company for Exclusions From and Waiver of Testing Requirements Under CFR Sec. 766.32.

40-8793225	Pfister Chemical, Inc.	(10)	513867

Letter from R.D. Huth to E. Mack, EPA
September 23, 1987

Enclosures:

(1) Letter requesting testing waiver for 3,4,'5-Tribromosalicylanilide and 3,5-Dibromosalicylanilide.
September 3, 1987

(2) Followup to September 3, 1987 letter.
September 9, 1987

[Crossreferenced to E_{1d}(17)]

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(ALDRICH CHEMICAL CO., AMERIBROM, INC., ATOMCHEM, INC.,
PFISTER CHEMICAL, INC., SIGMA CHEMICAL CORP.,
GREAT LAKES CHEMICAL CORP. AND ETHYL CORP.
H_{1b}-FILE

			Fiche #
40-8793268	Atomchem, Inc. Letter from M. Hanley to Document Control Officer, EPA containing information on "Rilson BESNO P40W5". September 24, 1987	(11)	513921
40-8793269	Sigma Chemical Company Letter from E. Steward to C. Elkins, EPA requesting a waiver from testing requirements. September 28, 1987 Enclosure: (1) Application of Sigma Chemical Company for Exclusions From and Waiver of Testing Requirements Under CFR Sec. 766.32.	(12)	513922
40-8793229	U.S. Environmental Protection Agency Internal EPA memorandum from R. Lee to D. Keehner on the review of the testing waiver from Great Lakes Chemical Co. October 22, 1987	(13)	513923
40-8793263	U.S. Environmental Protection Agency Internal letter from K. Wong to J. Johnson on the review of Ameribrom's waiver request. October 30, 1987	(14)	513924

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(ALDRICH CHEMICAL CO., AMERIBROM, INC., ATOMCHEM, INC.,
PFISTER CHEMICAL, INC., SIGMA CHEMICAL CORP.,
GREAT LAKES CHEMICAL CORP. AND ETHYL CORP.
H_{1b}-FILE

			Fiche #
40-8793270	U.S. Environmental Protection Agency	(15)	513925
	Letter from C. Elkins to T. Pullin, Ethyl Corp. responding to request for exclusion from testing. November 6, 1987		
	Enclosures:		
	(1) List of chemicals with waiver decisions.		
	(2) Non-CBI list of documents.		
	(3) CBI list of documents.		
40-8793271	U.S. Environmental Protection Agency	(16)	513926
	Letter from C. Elkins to D. McFadden and D.L. McAllister, Great Lakes Chemical Corp. responding to their exclusion/waiver request. November 8, 1987		
	Enclosures:		
	(1) List of chemicals and waiver decisions.		
	(2) Non-CBI documents list.		
	(3) CBI documents list.		

TSCA SECTION 8(d) AND 4(a)
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EXCLUSION/WAIVER FROM TESTING REQUIREMENTS
(ALDRICH CHEMICAL CO., AMERIBROM, INC., ATOMCHEM, INC.,
PFISTER CHEMICAL, INC., SIGMA CHEMICAL CORP.,
GREAT LAKES CHEMICAL CORP. AND ETHYL CORP.
H_{1b}-FILE

			Fiche #
40-8793272	U.S. Environmental Protection Agency Internal EPA memo from R. Lee to D. Keehner on the review of the waivers from Atomchem; Inc., Sigma Chemical Corp. and Pfister Chemical, Inc. November 13, 1987	(17)	513927
40-8793273	U.S. Environmental Protection Agency Internal EPA memo from K. Wong to J. Johnson on the process review of TBS 100 from Pfister Chemical, Inc. November 24, 1987	(18)	513928
40-8793265	U.S. Environmental Protection Agency Letter from C. Elkins to J. Klundt, Aldrich Chemical Co. in response to their request for exclusion to and waiver from testing. December 4, 1987 Enclosures: (1) List of chemicals and decision on waiver request. (2) List of CBI index for Aldrich Chemical Co. (3) List of Non-CBI index for Aldrich Chemical Co.	(19)	513929

TSCA SECTION 8(d) AND 4(a)
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(ALDRICH CHEMICAL CO., AMERIBROM, INC., ATOMCHEM, INC.,
PFISTER CHEMICAL, INC., SIGMA CHEMICAL CORP.,
GREAT LAKES CHEMICAL CORP. AND ETHYL CORP.
H_{1b}-FILE

			Fiche #
40-8793264	U.S. Environmental Protection Agency Internal EPA memo from R. Lee to D. Keehner on the review of the testing waivers from Ameribrom, Inc. and Aldrich Chemical Co. December 8, 1987	(20)	513930
40-8793274	U.S. Environmental Protection Agency Letter from C. Elkins to E. Steward, Sigma Chemical Co. responding to their exclusion/waiver request. December 11, 1987 Enclosures: (1) List of chemicals and decisions. (2) Non-CBI document list. (3) CBI document list.	(21)	513931
40-8793266	U.S. Environmental Protection Agency Letter from C. Elkins to A. Tillman, Ameribrom, Inc. on the response to the exclusion and waiver request. December 23, 1987 Enclosures: (1) List of chemicals and waiver decisions on Ameribrom's chemicals. (2) CBI list of documents. (3) Non-CBI list of documents.	(22)	513932

TSCA SECTION 8(d) AND 4(a)
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(ALDRICH CHEMICAL CO., AMERIBROM, INC., ATOMCHEM, INC.,
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GREAT LAKES CHEMICAL CORP. AND ETHYL CORP.
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			Fiche #
40-8793275	U.S. Environmental Protection Agency	(23)	513933

Letter from C. Elkins to Atomchem, Inc. responding to their waiver request.
December 23, 1987

Enclosures:

(1) List of chemicals in question and decisions.

(2) Non-CBI document list.

40-8793276	U.S. Environmental Protection Agency	(24)	513934

Letter from C. Elkins to R. Huth, Pfister Chemical, Inc. responding to their waiver request.
December 23, 1987

Enclosures:

(1) List of chemicals and decisions.

(2) Non-CBI list of documents.

(3) CBI list of documents.

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EXCLUSION/WAIVER FROM TESTING REQUIREMENTS (ROHM AND HAAS CO.)
H_{1c}-FILE

			Fiche #
40-8893232	53 FR 15282, USEPA Receipt of Request for Waiver of Testing of Rohm and Haas Co. Action: Notice of Receipt of Request for Waiver of Testing Requirements. April 28, 1988 [83002I] [Crossreferenced to A_2(12)]	(1)	513671
40-8793226	Rohm and Haas Company Letter from R.L. Keener to E.S. Klein, EPA requesting a waiver from testing requirements. September 23, 1987 [Crossreferenced to E_{1d}(17)]	(2)	513867

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TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
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~~E~~-FILE H,Q in January 1991

Fiche :

40-9193528 56FR23228, USEPA (1) 533315

Technical Amendments to Test Rules and Consent Orders.

Action: Final Rule.

May 21, 1991 [40CFR/§3002J]

[Cross-referenced to A2 (16)]

~~40-9193528~~

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TSCA SECTION 8(d) AND 4(a)
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H_{1d}-FILE

Fiche #

40-8993422 Brominated Flame Retardant Industry Panel (BFRIP) ~~(1)~~ (2) 524963

Letter from B. Biles of Arnold & Porter to C. Elkins and A.E. Conroy, EPA, concerning EPA's request for revised protocols and request for extension of time to submit revised protocols.
December 11, 1989

Enclosures:

(1) Attachment A: Letter from C. Elkins, EPA to C. Mazac of Great Lakes Chemical Corp. on the inadequacy of the analytical protocol for testing Dioxin Furans in Octabromodiphenyloxide.

(2) Attachment B: BFRIP Supplemental Report to the EPA - RAW HPLC and SEC Data.

40-9093423 U.S. Environmental Protection Agency ~~(1)~~ (3) 524964

Letter from L. Fisher to B. Biles of Arnold & Porter in response to their request of December 11, 1990 for an extension of time to submit revised protocols and test data.
January 22, 1990

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TSCA SECTION 8(d) AND 4(a)
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RESPONSES FROM ~~OCTOBER~~ January 1990 TO ~~OCTOBER~~ January 1991

H_{1d}-FILE

		Fiche #
40-9093426	Chemical Manufacturers Association Letter from G. Cox to A.E. Conroy, EPA requesting an extension of time for submitting the test protocols and data. April 6, 1990 Enclosures: (1) Letter from L. Fisher, EPA to B. Biles of Arnold and Porter (BFRIP Counsel) approving a modification for an extension of the deadline to submit revised protocols but not for data submission. January 22, 1990 (2) Letter from B. Biles of Arnold & Porter (BFRIP Counsel) to C. Elkins and A.E. Conroy, II, EPA requesting a time extension for submitting the revised protocols. December 11, 1989 (3) Fax letter from D. McAllister of Great Lakes Chemical Corp. to T. Murray, EPA explaining their position on LOQ's and Recovery of Labelled Standards and their planned action as a result of the meeting with EPA on March 14, 1990. March 20, 1990	~~(3)~~ (4) 524965

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MODIFICATION AND AMENDMENT REQUESTS AND
RESPONSES FROM ~~OCTOBER~~ January 1990 TO ~~OCTOBER~~ January 1991
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			Fiche #
40-9093427	U.S. Environmental Protection Agency Internal EPA memo from C. Elkins to L. Fisher recommending approval of the request to modify the rule by extending the due dates for submitting test protocols. This request was made in the April 6, 1990 letter from the Brominated Flame Retardant Industry Panel. May 16, 1990 Enclosure: (1) Letter approving modification. [Enclosure Not Provided to Docket]	~~(5)~~ (5)	524966
40-9093428	U.S. Environmental Protection Agency Letter from L. Fisher to G. Cox, CMA approving a modification to extend the deadline for submitting the protocols and test data but denying the request to change the rule requirements for the recovery of the internal calibration standards. May 17, 1990	~~(6)~~ (6)	524967
40-9093452	Pfister Chemical, Inc. Letter from G. Danis of Kerby, Cooper, English, Danis, Popper and Garvin to Document Control Office, EPA requesting an extension for submitting revised protocols and test results. May 22, 1990	~~(6)~~ (7)	524968

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RESPONSES FROM ~~OCTOBER~~ January 1990 TO ~~OCTOBER~~ January 1991

H_{1d}-FILE

Fiche #

40-9093491 U.S. Environmental Protection Agency

(8) 533397

Letter from L. Fisher to G. Danis of Kerby, Cooper, English, Danis, Popper and Garvin in response to their extension request dated May 22, 1990.
August 27, 1990

40-9093490 Pfister Chemical, Inc.

(9) 533398

Letter from S. Geller of Kerby, Cooper, English, Danis, Popper and Garvin to M. Wood, EPA requesting an extension of the date for submitting the protocols and the test results.
September 17, 1990

[NO EPA Response to H,d(9)]

TSCA SECTION 4
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
DOCKET #
~~DOCUMENTS RECEIVED FOLLOWING DECISION OF~~
~~F1~~-FILE (Docket # 83002K)

Fiche #

Hi e
Exclusion / Waiver Requests and Responses from Testing Requirements (ICI Americas Inc. Rhone-Poulenc, Inc. and Pfister Chemical, Inc.)

46-9/93536

56 FR 32208, USEPA (1) 533316
Receipt of Requests for Exclusion from Testing From Three Chemical Companies.
Action: Notice of Receipt.
July 15, 1991 [83002K]

[Cross-referenced to A2 (17)]

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TSCA SECTION 4
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
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Exclusion/Waiver Requests and Responses from Testing Requirements (ICI American, Inc., Rhone-Poulenc, Inc and Pfister Chemical, Inc.)

Fiche #

(2) 533399

40-9193516 ICI American, Inc.

Letter from J. F. Jadlocki to Document Control Office, EPA requesting an exclusion from testing Chloranil. (sanitized)
February 4, 1991
Enclosures:
(1) Letter from J. Carra, EPA to "company" concerning EPA's investigation of Chloranil.
December 31, 1990
(a) Study on Violet 23.

[Study Not Provided]

(2) Detailed description of the manufacture of Chloranil.

[CBI Information]

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TSCA SECTION 4
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Fiche #

40-9193517 Rhone-Poulenc, Inc. (3) 533400

Letter from N. Rouse to Document Control Office, EPA ~~regarding~~ concerning the replacements (enclosed) to the April 12, 1991 request.
May 23, 1991
Enclosures:
(1) Letter from N. Rouse, Rhone-Poulenc, Inc to Document Control Office, EPA requesting an exclusion from testing Chloranil. (sanitized)
April 12, 1991
(a) Chloranil - Process Comparison.
(b) French Patent No. 0326456 from Rhone-Poulenc Chimie on the "Procedure for Preparing Chloranil
January 16, 1989

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Fiche #

40-9193517 (Continued)

(c) U.S. Patent Application of Jean-Roger Desmurs and Isabelle Jouve for "Process for Preparing Chloranil". Attorney Docket NO. RP-137; Finnegan, Henderson, Farabow Garrett and Dunner. Undated.

(d) French ~~Patte~~ Patent NO. 0326453 from Rohne-Poulenc Chimie on the "Procedure for Preparing Chloranil. January 16, 1989

(e) Chloranil - PCDD and PCDF Analytical data.

(f) Quality Assurance Project Plan for the Determination of Halogenated Dibenzo-p-Dioxins and Dibenzofurans. Rhone-Poulenc Industrialisation March 1991

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TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
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Fiche #

40-9193517 (continued)

(9) Determination of Poly Chlorinated Dibenzo-p-Dioxins and Dibenzo-furans in Chlorand by GC/MS. Rhone-Poulenc Industrialisation. March 1991

TSCA SECTION 4
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
DOCKET # ~~DOCUMENTS RECEIVED FOLLOWING DECISION OF~~
H.E. -FILE

Exclusion/Waiver Requests and Responses from Testing Requirements (ICI American, Inc., Rhone-Poulenc, Inc and Pfister Chemical, Inc.)

Fiche #

40-9193-518

(4) 533401

Pfister Chemical, Inc.

Letter from J. Dubeck of Keller and Heckman, Counsel for Pfister Chemical requesting an Exclusion from testing 3,4,5-Tribromosalicylanilide (TBS).

June 10, 1991

Enclosures:

(1) Letter from R. Braun of Pfister Chemical, Inc. to Document Control Office, re Pfr designating Keller and Heckman as agent for Pfister Chemical.
May 9, 1991

(2) Instructions for preparation of TBS. (Rhone-Poulenc Chimie)

(3) Product specification brochures for Purified Salicylic Acid, Technical Grade (American Cyanamid Co.), Phosphorus

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Exclusion/Waiver Requests and Responses from Testing Requirements (ICI America, Inc., Rhone-Poulenc, Inc and Pfaster Chemical, Inc.)

40-9193518 (continued)

Trichloride (Mobil Chemical), Amoco Xylene (Union Oil Co. of Calif.), Sodium Carbonate, Anhydrous (Stauffer Chemical Co.), Sodium Bicarbonate (FMC Corp.), Bromine (Great Lakes Chemical Corp.) and Monochlorobenzene (Monsanto Industrial Chemicals Co.); substances used in the manufacture of TBS.

(4) Material Safety Data Sheet and Analytical Protocol for determination of TBS specifications. for TBS

(5) Thin Layer Chromatography of Brominated Salicylanilides on Diethylaminoethyl Cellulose. W.E. Skelly and K.A. Kamke. Analytical Chemistry; 39(8): 1009-1011. July 1967

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TSCA SECTION 4
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
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H/e
Exclusion / Waiver Requests and Responses from Testing Requirements (ICI American Inc. Rhone-Poulenc, Inc. and Foster Chemical, Inc.)

40-9193519 U.S. EPA

~~Re~~ (5) 533402

Letter from G. Tennin to M. Rouse, Rhone-Poulenc, Inc. requesting more information concerning their exclusion request.
June 12, 1991
Enclosure:
(1) Guidelines for Reporting Test Results of HDD and HDF ~~Test~~ Determinations in Commercial Products (CFR Parts 707 and 766)".

~~Enclosure~~ Not Provided to Docket
Ref # 1.3 (409) for Enclosure

20834 364

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Fiche #

40-92 93 604 U.S. EPA (6)

Hie

Letter from J. Carra to N. Rouse, Rhone-Poulenc, Inc. on their April 1991 request for an exclusion. April 4, 1992

20835 365

TSCA SECTION 4
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
Document Record Following DOCKET # Decision of June 5, 1987
MODIFICATION AND AMENDMENT REQUESTS AND RESPONSES
~~FOLLOWING DECISION OF~~ From December 1991 to
~~E~~-FILE December 1992

H, I

Fiche #

40-9093511 Chemical Manufacturers (R) 53340.
Association

Letter from G. Cox to M. Greenwood,
EPA requesting an extension
of time for submittal of Analytical
Protocols for three of Dispin
Chemicals.
December 21, 1990

TSCA SECTION 4
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H, f

Fiche #

40-9193538 Chemical Manufacturers Association (29) 533484

Letter from G. Cox to M. Greenwood and C. Mongrove, EPA on the deadlines for the submission of the analytical data.
February 1, 1991

20837 367

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H, B ~~Rec~~-FILE

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40-9193534 U.S. EPA

Letter from J. Cavra, EPA (2b)
to G-Cof, CMA denying their 533405
requests for an extension
of time and issuance
of a non-enforcement
statement.
February 12, 1991

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#16

Fiche #

40-91935-49 Chemical Manufacturers Association (3) 533406

Letter from G. Cox to J. Carra, EPA in response to EPA's letter of February 12 concerning EPA's denial for an extension of the deadline for protocol submission.
March 14, 1991

TSCA SECTION 4
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
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40-9193539 U.S. EPA Hlf (3a) Fiche # 533407

Letter from J. Cava to G. Cox responding to CMA's letter of February 1, 1991 concerning the deadlines for the data submissions and modification procedures.
March 20, 1991

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4,1,8 (8b) Fiche #

40-9193540 U.S. EPA 53408

Letter from J. Cassa to
E. Coy CMA in response
to their letter of March 14, 1991
concerning EPA's response to
their extension request.
April 15, 1991

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H 1.6

Fiche #

40 - 9193526 Chemical Manufacturers Association (3C) 533409

Letter from G. Cox to J. Cavna, EPA in response to EPA's letters of March 20 and April 15.

May 2, 1991

Enclosure:

(1) Analytical Testing of Certain Brominated Compounds.

20842 312

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40-9193535 — Pfeste Chemical, Inc. (4)533410

Letter from R. Braun
to L. Marcus, EPA
requesting an extension
of 90 days to submit
a revised protocol.
May 10, 1991

TSCA SECTION 4
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
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40 - 91935~~04~~ 43

H, f

~~H.S. E. PA~~

~~Letter from J. Carra to G. Cox, CMA on the~~

Chemical Manufacturers (5) 533411
Association

Letter from H. Shah to
J. Carra, EPA on a follow-up
to the May 16, 1991 meeting
on ~~the~~ timeframes and modifications.
June 14, 1991

20844 374

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Fiche #

40-91/93-5~~7~~50 Rhone-Poulenc, Inc. (G) 533412

Letter from D. Hayes of Latham and Watkins to H. Siegelbaum, EPA requesting an extension of time to submit data on Chloranil.

September 9, 1991

TSCA SECTION 4
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
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FOLLOWING DECISION OF
~~F-1a~~-FILE

H, 6

Fiche #

40-9193551

U. S. EPA

(2) 533413

Letter from J. Carra to D. Hayes of Latham and Watkins in response to their request on behalf of Rhone-Poulenc of September 9, 1991.
October 8, 1991

TSCA SECTION 8(d) AND 4(a)
HEALTH AND SAFETY DATA REPORTING
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
DOCKET #83002 - POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS
MODIFICATION AND AMENDMENT REQUESTS AND RESPONSES
(DOCKET #) January 1992 to January 199-
H_{1g}-FILE

Fiche #

40-9293563 Chemical Manufacturers Association (2)

Letter from H. Shah to J. Harris, EPA requesting guidance and modifications ~~to~~ test protocols previously approved. March 11, 1992

(3)

40-9293586 Chemical Manufacturers Association

Letter from H. Shah to J. Harris, EPA as a follow-up to the March 11, 1992 request and subsequent April 2, 1992 telephone ~~request~~ conversation on modifications to test protocols concerning precision and recovery requirements.
April 21, 1992

20847 397

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DOCKET #
MODIFICATION AND AMENDMENT REQUESTS AND RESPONSES
FROM JANUARY 1992 TO JANUARY 1993
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~~F~~H,2-FILE

Fiche #

40-9293587 Great Lakes Chemical Corporation (4)

Letter from C. Mazor to J. Harris, EPA on modifications of the protocol for Decabromodiphenyl Oxide.
April 29, 1992
Enclosures:
(1) Relevant data concerning precision and recovery results.
(2) Data from the reanalysis.

20848 378

TSCA SECTION 4
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
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~~F1a~~-FILE

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Fiche #

40-9293588 U. S. EPA (5)

Letter from G. Jenim to C. Mazac, Great Lakes Chemical Corp. on the April 24, 1992 modification request for Decabromodiphenyl Oxide.
May 19, 1992

20849 319

TSCA SECTION 4
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Fiche # (6)

40-9293589

Great Lakes Chemical Corporation

Letter from C. Mazac to J. Harris, EPA on the modifications to the protocol for Octabromodiphenyl Oxide.

April 28, 1992

Enclosures:
(1) Relevant data
(2) Data from the reanalysis.

20850 380

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H, g

40-9293 590

U. S. EPA

Fiche # (7)

Letter from G. Lemin to C. Mazac, Great Lakes Chemical Corp. in response to the April 28, 1992 ~~modification~~ request for Octabromodiphenyl Oxide.
May 19, 1992

20851 381

TSCA SECTION 4
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~~F1a~~-FILE
A-g

6) Fiche #

40-9293591 Great Lakes Chemical Corporation

Letter from C. Mayor
to J. Harris, EPA on the
modification request
of the protocol on Pentabromo-
diphenyl Oxide.
May 1, 1992
Enclosures:
(1) Tabulation sample data.
(2) Analysis results (Table).

20852 382

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~~F1a~~-FILE

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Fiche #

40-9293592 Ethyl Corporation (9)

Letter from P. Ranken to J. Harris, EPA on the ~~case~~ modification to the protocol for Tetrabromo-bisphenol-A.
May 18, 1992

Enclosures:
(1) Analytical Results for Ethyl Corporation Tetrabromo-bisphenol-A.
(2) Re-Analysis of sample TBBPA-0803S.

20853 383

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~~F1a~~-FILE

H19

Fiche #

40-9293593 Great Lakes Chemical Corporation (10)

Letter from C. Mazur to J. Harris, EPA on the modification request for the protocol ~~for~~ on Allyl Ether of Tetrabromobisphenol-A.

May 21, 1992

Enclosure:

(1) Data Tables from the Analysis of Great Lakes Allyl Ether of Tetrabromobisphenol-A.

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TSCA SECTION 4
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
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~~F1a~~-FILE

H 19

Fiche #

40-9293594 Great Lakes Chemical (11)
Corporation

Letter from C. Mazante
J. Harris on the modification
request of the postponed on
Tetrabromobisphenol-A-bis
(Ethoxylate).
May 21, 1992
Enclosures:
(1) Data on ~~Analytical~~ results.
(2) data from reanalysis

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TSCA SECTION 4
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~~F1a~~ H1g -FILE

Fiche #

40-9293595

(12)

Arnold and Porter

Letter from B. Bilek to J. Harris, EPA on the modifications to the protocol for Pentabromodiphenyl Oxide on behalf of Amerbrom, Inc and Great Lakes Chemical Corporation.

May 26, 1992

Enclosure #:

(1-) Listing of protocol sections and changes.

~~F~~

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40-92 93 596

(13)

Great Lakes Chemical Corporation
Letter from M. Eldan to J. Harris, EPA on the modification of the protocol for Tetrabromobisphenol A.
May 26, 1992

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Fiche #

40-9293597

(14)

Ameribrom, Inc.

Letter from M. Eldars to J. Harris, EPA on the modification of the protocol for Decabromo-diphenyl Oxide.

May 26, 1992

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TSCA SECTION 4
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
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40-92-93-598

Ameribrom, Inc. (15) Fiche #

Letter from M. Eldon to J. Harris, EPA on the modification of the protocol for Decabromodiphenyl Oxide.

May 26, 1992

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~~F1b~~-FILE
H1h

Fiche #

40-9293605

Plaskon Electronic (2)
Materials, Inc.
Letter requesting one
exemption from testing
Tetrabromobisphenol A.
February 3, 1992

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TSCA SECTION 4
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
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Fiche #

40-9293606 Chugai Bayeki (3)
(America) Corp.

Letter from K. Sudo
to Document Control
Offic, EPA requesting
an exclusion from testing
in "A" type Chloranil.
May 1, 1992
Enclosure:
(1) Determination of
Polychlorinated Dibenzo-p-
Dioxins and Poly Chlorinated
Dibenzofurans in Chloranil
Samples: Battelle.
February 13, 1991 (Sanitized)

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TSCA SECTION 4
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
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~~P~~H-FILE

H 1h

(4) Fiche #

40-9293607 Tokuyama Soda Co. Ltd.

Letter from M. Ueda
to J. Harris, EPA containing
additional information to
accompany the exclusion
request from Chugai Bayeki
(America) Corp.
May 25, 1992
Enclosures:
(1) Comparison of Chloranil
Manufacturing Process.
(2) Reaction Mechanism of
New Process.
(3) Pending Patent Application
of New Process.
(4) Chloranil Process Block Flow Diagram.
(5) PCDDs and PCDFs Analytical Data
of Chloranil by New Process.

1b-1

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TSCA SECTION 8(d) AND 4(a)
HEALTH AND SAFETY DATA REPORTING
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DOCKET #83002 - POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS
DOCUMENTS RECEIVED FOLLOWING DECISION OF JUNE 5, 1987
RECEIPT OF TEST DATA; DOCKET #44544
H_2-FILE

			Fiche #
40-9390420	54 FR 52449, USEPA	(1)	524801

TSCA Chemical Testing;
Receipt of Test Data.

Action: Notice.

December 21, 1989 [44544]

[Crossreferenced to A_2(13)]

40-9390421	Hoechst-Celanese Corporation	(2)	524961

Letter from R. Jourdenais to Document Control Office, EPA
November 21, 1989

Enclosure:

(1) Test Results from the Analysis of 2,3,5,6-Tetrachloro-2,5-Cyclohexadiene-1,4-dione (Chloranil).
Triangle Laboratories, Inc.

20863

TSCA SECTION 8(d) AND 4(a)
HEALTH AND SAFETY DATA REPORTING
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DOCKET #83002 - POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS
DOCUMENTS RECEIVED FOLLOWING DECISION OF JUNE 5, 1987
RECEIPT OF TEST DATA; DOCKET #44546
H_3-FILE

			Fiche #
40-9390419	55 FR 3482, USEPA	(1)	524802

TSCA Chemical Testing;
Receipt of Test Data.

Action: Notice.

February 1, 1990 [44546]

[Crossreferenced to A_2(14)]

40-9093401	Sandoz Chemicals Corporation	(2)	524962

Letter from B. Drum to L. Marcus, EPA
on the testing of 2,3,5,6-Tetrachloro-
2,5-Cyclohexadiene-1,4-dione.
January 3, 1990

Enclosure:

(1) Analysis of Test Results from the 2,3,5,6-Tetrachloro-2,5-Cyclo-hexadiene-1,4-dione (Chloranil). Triangle Laboratories, Inc. December 15, 1989

TSCA SECTION 8(d) AND 4(a)
HEALTH AND SAFETY DATA REPORTING
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
DOCKET #83002 - POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS
DOCUMENTS RECEIVED FOLLOWING DECISION OF JUNE 5, 1987
RECEIPT OF TEST DATA; DOCKET #44552
H_4-FILE

Fiche #

40-9093464 55 FR 21934, USEPA (1) 533314

TSCA Chemical Testing;
Receipt of Test Data.

Action: Notice.

May 30, 3990 [44552]

[Crossreferenced to A_2(15)]

40-9093429 A and D International, Inc. (2) 524923

Letter from C.K. Gupta to J. Canterbury,
~~Canterbury,~~ EPA
April 13, 1990

Enclosures:

(1) Analysis of Samples for the Presence of Polychlorinated Dibenzo-p-Dioxins and Dibenzofurans by High-Resolution Gas Chromatography/High-Resolution Mass Spectrometry on Chloranil.
Triangle Labs., Inc.
April 11, 1990

(2) Sample Data. Triangle Labs., Inc.
April 3, 1990

(3) Sample Data. Triangle Labs., Inc.
April 6, 1990

(4) Calibration Data. Triangle Labs., Inc.
October 4, 1989

(5) Document Control Papers. Triangle Labs., Inc.

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Fiche #

40-9093429 (continued)

(6) Polychlorinated Dibenzo-p-Dioxins and Dibenzofurans GC Column Performance and Retention Time Window Defining Mixture.
January 10, 1990

(7) Data User Manual. Triangle Labs., Inc.

(8) Analytical Procedures for the Determination of Polychlorinated Dibenzodioxins and Dibenzofurans by High-Resolution Gas Chromatography/High-Resolution Mass Spectrometry for Chloranil. Triangle Labs., Inc.
May 1989

40-9093394 Chugai Boyeki (America) Corporation (3) 524879

Letter from R. Tanaka to C. Elkins, EPA
December 26, 1989

Enclosure:

(1) Test Results of the Seven Samples of Chloranil Selected for Analytical Testing. Triangle Laboratories, Inc.

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TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
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40-9295608 Great Lakes Chemical Corporation. (R) Fiche

Letter from C. Mazur & L. Marcus, EPA
May 18, 1992
Enclosure:
(1) Analysis of Polybrominated Dibenzo-p-Dioxins and Polybrominated Dibenzofurans in 2,4,6-Tribromophenol (PH-73), Triangle Labs, Inc.
May 14, 1992

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RECEIPT OF TEST DATA; DOCKET #
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40-9293609 Great Lakes Chemical Corporation (3) Fiche

Letter from C. Mazac to L. Marcus, EPA
May 19, 1992
Enclosures:
(1) Letter from C. Mazac, Great Lakes Chemical Corp. to J. Harris, EPA concerning modifications to the protocol for Decabromo-Diphenyl Oxide.
April 24, 1992
(a) Data on test samples.
(b) Data from the analyses.
(2) Letter from G. Timm, EPA to C. Mazac, Great Lakes Chemical Corp. in response to their April 24, 1992 modification request.
May 19, 1992

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DOCUMENTS RECEIVED FOLLOWING DECISION OF
RECEIPT OF TEST DATA; DOCKET #
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40-9293609 (continued)

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(3) Determination of Polybrominated Dibenzo-p-Dioxins and Polybrominated Dibenzofurans by HRGC/MRMS in Decabromodiphenyloxide.

Battelle.
May 13, 1992

TSCA SECTION 4
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
DOCKET #
DOCUMENTS RECEIVED FOLLOWING DECISION OF
RECEIPT OF TEST DATA; DOCKET #
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(4)

Fiche

40-9293610

Great Lakes Chemical
Corporation
Letter from C. Mazante
L. Marcus, EPA
May 18, 1992
Enclosure:
(1) Analysis of Polybrominated
Dibenzo-p-Dioxins and
Polybrominated Dibenzofurans
in Tetrabromobisphenol A.
Triangle Labs, Inc.
May 14, 1992

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TSCA SECTION 4
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
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RECEIPT OF TEST DATA; DOCKET #
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40-9293611

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Great Lakes Chemical Corporation

Letter from C. Mazza to L. Marcus, EPA
May 19, 1992
Enclosures:
(1) Letter from C. Mazza to J. Harris EPA requesting modifications to test protocols on Octabromodiphenyl Oxide.
April 28, 1992
(2) Determination of Polybrominated Dibenzo-p-dioxins and Polybrominated Dibenzofurans by HRGC/MRMS in Octabromodiphenyloxide. Battelle.
May 11, 1992

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TSCA SECTION 4
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
DOCKET #
DOCUMENTS RECEIVED FOLLOWING DECISION OF
RECEIPT OF TEST DATA; DOCKET #
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40-9293612 Ethyl Corporation (4) Fiche

Letter from R. L. Smith
to L. Manura, EPA
May 29 1992
Enclosure(s);
(1) Determination of Polybrominated
Dibenzo-p-dioxins and
Polybrominated Dibenzofurans
in Octabromodiphenyloxide.
(Amended Final Report)
Battelle.
~~May 29, 1992~~
May 1, 1992

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TSCA SECTION 4
TESTING OF CHEMICAL SUBSTANCES AND MIXTURES
DOCKET #
DOCUMENTS RECEIVED FOLLOWING DECISION OF
RECEIPT OF TEST DATA; DOCKET #
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U0-9293613 Ethyl Corporation (7)

Letter from R. L. Smith
to L. Marcus, EPA
May 21, 1992

Enclosure:
(1) Determination of Polybrominated
Dibenzo-p-Dioxins and
Polybrominated Dibenzofurans
by HRGC/MRMS in
Decabromodiphenyloxide -
Battelle
May 19, 1992

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POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS #83002

HEADING	FILE #		DOCUMENT #
U.S. Environmental Protection Agency	$B_2(39)$	30. USEPA, OW, "Ambient Water Quality Criteria Document for 2,3,7,8-tetrachlorodibenzo--p-dioxin." Washington, D.C. EPA 440/5-84-007. 1984.	40-8493074
U.S. Environmental Protection Agency	$B_{1a}(1)$	31. USEPA, ORD, OHEA, ECAO. "Health Assessment Document for Polychlorinated Dibenzo--p-Dioxins." September, 1985.	40-8593014
U.S. Environmental Protection Agency	$B_2(40)$	32. USEPA, OSW. "Health and Environmental Effects Profile for Tetra-, Penta-, and Hexachlorodibenzo-p-dioxins and Tetra-, Penta-, and Hexachlorodibenzo-p-furans." August, 1985.	40-8493075
U.S. Environmental Protection Agency	$B_2(51)$	33. USEPA, OSW. "Health and Environmental Effects Profile for Brominated Dibenzo-p-dioxins and Brominated Dibenzo-p-furans." August, 1985.	40-8593087
U.S. Environmental Protection Agency	$B_2(42)$	34. USEPA, ODW. "Drinking Water Criteria Document for 2,3,7,8-Tetrachlorodibenzo-p-dioxin." March, 1985.	40-8593077
U.S. Environmental Protection Agency	$B_{1a}(3)$	35. USEPA. Economic analysis of proposed call-in under TSCA section 8(c) of allegations of significant adverse reactions for chemicals potentially contaminated with polyhalogenated dibenzo-p-dioxins and polyhalogenated dibenzofurans. OPTS. October, 1985.	40-8593016

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HEADING	FILE #	POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS #83002	DOCUMENT #
U.S. Environmental Protection Agency	$B_{1a}(2)$	36. USEPA. Economic analysis for requirement under TSCA section 8(d) for submission of unpublished health and safety studies for chemicals potentially contaminated with polyhalogenated dibenzo-p-dioxins and polyhalogenated dibenzofurans. October, 1985.	40-8593015
U.S. Environmental Protection Agency	$B_2(53)$	37. Versar, Inc. List of chemicals contaminated or precursors to contamination with incidentally generated polychlorinated and polybrominated dibenzodioxins and dibenzofurans. EPA Contract No. 68-02-3968, Task No. 48. 1985.	40-8593092

POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS #83002C

HEADING	FILE #		DOCUMENT #
Albro, P.W. et al.	$B_4(1)$	1. Albro et al. "A radioimmunoassay for chlorinated dibenzo-p-dioxins." Toxicology and Applied Pharmacology. 50:137-146. 1979.	40-7993020
Bandiera, S. et al.	$B_4(3)$	2. Bandiera et al. "Polychlorinated dibenzofurans (PCDFs): Effects of structure on binding to the 2,3,7,8-TCDD cytosolic receptor protein, AHH induction and toxicity." Toxicology. 32: 131-144. 1984.	40-8493021
Bandiera, S. et al.	$B_4(2)$	3. Bandiera et al. "Competitive binding to cytosolic 2,3,7,8-TCDD receptor: Effects of structure on the affinities of substituted halogenated biphenyls - a QSAR analysis." Biochem. Pharmacol. 32:3803. 1983.	40-8393162
Bellin, J.S. et al.	$B_4(4)$	4. Bellin J.S., Barnes D.G., "Health hazard assessment for chlorinated dioxins and dibenzofurans other than 2,3,7,8-TCDD." Presented at the Symposium on advances in health risk assessment for systemic toxicants and chemical mixtures. Cincinnati, Ohio. October 25, 1984.	40-8493002

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POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS #83002C

HEADING	FILE #			DOCUMENT #
U.S. Environmental Protection Agency	B_4(31a)	5.	Bomberger et al. "Hexachlorobenzene: Chemistry of formation and identified sources." SRI draft report to USEPA, Office of Pesticides and Toxic Substances. Contract No. 68-02-3976. 1984.	40-8493063
Bradlaw, J.A. et al.	B_4(5)	6.	Bradlaw J.A., Casterline J.L., "Induction of enzyme activity in cell culture: A rapid screen for detection of planar polychlorinated organic compounds." Journal of Association of Official Analytical Chemistry. 62:904-916. 1979.	40-7993022
Dow Chemical USA	B_4(10)	7.	Crummet et al. Review and Trends in the Analysis for PCDD/PCDF. Dow Chemical Company Analytical Laboratories. 1986. (CMA Submission 2/19/86)	40-8593001
Cull, M.R. et al.	B_4(7)	8.	Cull et al. "Polychlorodibenzo-p-dioxins and Dibenzofurans in Technical Pentachlorophenol Results of a Collaborative Analytical Exercise." Chemosphere, 13: 10:1157-1165. 1984.	40-8493163
Czuczwa, J.M. et al.	B_4(9)	9.	Czuczwa et al. "Polychlorinated Dibenzodioxins and Dibenzofurans in Sediments from Siskiwit Lake, Isle Royale." Chemosphere, 14: 6/7:623-626. 1985.	40-8593165

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POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS #83002C

HEADING	FILE #		DOCUMENT #
Czuczwa, J.M. et al.	$B_4(8)$	10. Czuczwa J.M., Hites R.A. "Environmental Fate of Combustion-Generated Polychlorinated Dioxins and Furans." Environ. Sci. Technol., 18:6:444-450. 1984.	40-8493164
Germany (Federal Republic of), Federal Health Office	$B_4(12)$	11. Dioxins '84: Report on Dioxins. Update to November, 1984. Compiled by the Federal Health Office, Federal Environmental Agency, Federal Republic of Germany.	40-8493167
Dow Chemical USA	$D_{2C}(1)$	12. Dow Chemical Company. Direct testimony of David T. Buzzelli before EPA in re: Docket No. 415 et al. Exhibit 810. October 14, 1980.	40-8093125
U.S. Environmental Protection Agency	$B_4(29a)$	13. Dynamac Corporation, Environmental Control Division. Pre-Regulatory Analysis of Flame Retardants. EPA Contract No. 68-01-6239. May 7, 1982.	40-8293166
Environmental Defense Fund	$B_4(11)$	14. Environmental Defense Fund and National Wildlife Federation. Petition to EPA to initiate rulemakings to prevent and reduce environmental contamination by dioxins and furans. October 22, 1984.	40-8493034
U.S Environmental Protection Agency	$B_4(29)$	15. Esposito et al. USEPA, "Dioxins," Cincinnati, Ohio. USEPA Industrial Environmental Research Laboratory, EPA 600/2-80-197. 1980.	40-8093046

POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS #83002C

HEADING	FILE #		DOCUMENT #
Gierthy, J.F. et al.	$B_4(13)$	16. Gierthy et al. "Application of an in vitro keratinization assay to extracts of soot from a fire in a PCB containing transformer." In press. Fundamental and Applied Toxicology. 1985.	40-8493040
Helder, T.H. et al.	$B_4(14)$	17. Helder T.H., Seinen W., "Standardization of an ELS bioassay for PCDDs and PCDFs." Chemosphere 14:183-193. 1983.	40-8593042
Hoar, S.K. et al.	$B_4(15)$	18. Hoar et al. "Agricultural herbicide use and risk of lymphoma and soft tissue sarcoma." Journal of the American Medical Association, 256: 9:1141-1147. September, 1986.	40-8693168
Hutzinger, D. et al.	$B_4(16)$	19. Hutzinger et al. "Polychlorinated dibenzo-p-dioxins and dibenzofurans: A bioanalytical approach." Chemosphere 10:19-25. 1981.	40-8193044
Knutson, J.C. et al.	$B_4(17)$	20. Knutson J.C., Poland A., "Keratinization of mouse teratome cell line XB produced by 2,3,7,8-tetrachlorodibenzo-p-dioxin: an in vitro model of toxicity." Cell 22:27-36. 1980.	40-8093048
Mason, G. et al.	$B_4(18)$	21. Mason et al. "Polychlorinated dibenzofurans (PCDFs): Correlation between in vivo and in vitro structure-activity relationships." Toxicology, 37:1. 1985.	40-8593169

POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS #83002C

HEADING	FILE #		DOCUMENT #
McKinney, J. et al.	B_4(20)	22. McKinney et al. "Structural specificity and the dioxin receptor." In: Chlorinated Dioxins and Related Compounds: Impact on the Environment," by Hutzinger et al., Ed. Pergamon Press, Oxford, p. 367. 1982.	40-8293004
McKinney, J. et al.	B_4(19)	23. McKinney et al. "Development and reliability of a radio-immunoassay for 2,3,7,8-tetra-chlorodibenzo-p-dioxin." In: Impact of Chlorinated Dioxins and Related Compounds on the Environment. Hutzinger, eds. Oxford: Peragamon Press, pp. 67-69. 1981.	40-8293051
U.S. Environmental Protection Agency	B_4(31b)	24. Midwest Research Institute (MRI). Guidelines for the determination of polyhalo-genated dioxins and dibenzo-furans in commercial products. EPA Contract No. 68-02-3938; MRI Project No. 8201-A(41). 1985.	40-8593052
Moore, J.A. et al.	B_4(21)	25. Moore et al. "Comparative toxicity of 3 halogenated dibenzofurans in guinea pigs, mice, and rhesus monkeys." N.Y. Academy of Science Annual, 320; pp. 151-163. 1979.	40-7993170
Patterson, D.G. et al.	B_4(22)	26. Patterson et al. "2,3,7,8-Tetrachlorodibenzo-p-dioxin levels in adipose tissue of exposed and control persons in Missouri." Journal of the American Medical Association. Vol. 256. 19:2683-2686. November 21, 1986.	40-8693171

POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS #83002C

HEADING	FILE #		DOCUMENT #
Poland, A. et al.	$B_4(24)$	27. Poland A., Knutson J.C., "2,3,7,8-Tetrachlorodibenzo-p-dioxin and related halogenated aromatic hydrocarbons: Examination of the mechanism of toxicity." Annual Review Pharmacology and Toxicology. 22:517. 1982.	40-8293058
Safe, S. et al.	$B_4(25)$	28. Safe et al. Binding to the 2,3,7,8-TCDD receptor and AHH/EROD induction: In vitro QSAR. Banbury Report 18: Biological mechanisms of dioxin action. Cold Spring Harbor Laboratory. 1984.	40-8493059
Schwetz, B.A. et al.	$B_4(26)$	29. Schwetz et al. "Toxicology of chlorinated dibenzo-p-dioxins." Environmental Health Perspectives. 5:87-89. 1973.	40-7393172
Thoma, H. et al.	$B_4(28)$	30. Thoma et al. "Polybrominated Dibenzodioxins and Furans from the Pyrolysis of some Flame Retardants." Chemosphere, Vol. 15, No. 5, pp. 649-652. Pergamon Press. 1986.	40-8693173
Thoma, H. et al.	$B_4(28)$	31. Thoma et al. "Polybrominated Dibenzofurans (PBDF) and Dibenzodioxins (PBDD) from the Pyrolysis of neat Brominated Diphenylethers, Biphenyls and Plastic Mixtures of these compounds." Chemosphere (In Press).	40-8793003

POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS #83002C

HEADING	FILE #		DOCUMENT #
U.S. Environmental Protection Agency	$B_4(30)$	32. USEPA, OWRS, OSWER. "Dioxin Strategy," Washington, D.C. Office of Water Regulations and Standards and Office of Solid Waste and Emergency Response in conjunction with the Dioxin Strategy Task Force. 1983.	40-8393073
U.S. Environmental Protection Agency	$B_4(31)$	33. USEPA, OW. "Ambient Water Quality Criteria Document for 2,3,7,8-tetrachlorodibenzo--p-dioxin." Washington, D.C. EPA 440/5-84-007. 1984.	40-8493074
U.S. Environmental Protection Agency	$B_{1C}(1)$	34. USEPA, ORD, OHEA, ECAO. "Health Assessment Document for Polychlorinated Dibenzo--p-Dioxins." September, 1985.	40-8593014
November 4, 1986	$E_{1C}(2)$	35. USEPA. Letter from Richard Griesemer, Chairman, Dioxin Toxic Equivalency Methodology Subcommittee, and Norton Nelson, Chairman, Executive Committee, to Lee M. Thomas, Administrator, EPA, dated November 4, 1986. SAB-EC-87-008.	40-8693175
June 3, 1986	$E_{2C}(1)$	36. USEPA. OPTS. OTS. Personal Communication from Dr. Stephen Billet, Chief, EPA Hazardous Waste Methods Evaluation Branch, Las Vegas Laboratory, to Dr. Peter Tong, OTS, HERD, CREB, re: Chemical Screening Methods for the Detection of PHDDs and PHDFs. June 3, 1986.	40-8693177

POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS #83002C

HEADING	FILE #		DOCUMENT #
U.S. Environmental Protection Agency	$B_{1c}(2)$	37. USEPA. OPTS. OTS. ETD. Economic analysis of final section 8(a) reporting rule for chemicals potentially contaminated with polyhalogenated dibenzo-p-dioxins and polyhalogenated dibenzofurans. December, 1986.	40-8693157
U.S. Environmental Protection Agency	$B_{1c}(4)$	38. USEPA. OPTS. OTS. ETD. Economic analysis of final data call-in under TSCA section 8(c) of allegations of significant adverse reactions for chemicals potentially contaminated with polyhalogenated dibenzo-p-dioxins and polyhalogenated dibenzofurans. December, 1986.	40-8693159
U.S. Environmental Protection Agency	$B_{1c}(3)$	39. USEPA. OPTS. OTS. ETD. Economic analysis for requirement under TSCA section 8(d) for submission of unpublished health and safety studies for chemicals potentially contaminated with polyhalogenated dibenzo-p-dioxins and polyhalogenated dibenzofurans. December, 1986.	40-8693158
U.S. Environmental Protection Agency	$B_4(31d)$	40. Versar, Inc. List of chemicals contaminated or precursors to contamination with incidentally generated polychlorinated and polybrominated dibenzodioxins and dibenzofurans. EPA contract No. 68-02-3968, Task No. 48. 1985.	40-8593092

HEADING	FILE #	POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS #83002C	DOCUMENT #
U.S. Environmental Protection	$B_{1C}(6)$	41. USEPA. OPTS. OTS. ETD. Economic analysis of final section 4 testing rule for Agency chemicals potentially contaminated with polyhalogenated dibenzo-p-dioxins and polyhalogenated dibenzofurans. January, 1987.	40-8793204

INDEX TO FEDERAL REGISTER REFERENCES

POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS #83002

HEADING	FILE #		DOCUMENT #
Albro, P.W. et al.	$B_2(2)$	1. Albro et al. "A radioimmunoassay chlorinated dibenzo-p-dioxins." Toxicology and Applied Pharmacology. 50:137-146. 1979.	40-7993020
Bandiera, S. et al.	$B_2(3)$	2. Bandiera et al. "Polychlorinated dibenzofurans (PCDFs): Effects of structure on binding to the 2,3,7,8-TCDD cytosolic receptor protein, AHH induction and toxicity." Toxicology. 32:131-144. 1984.	40-8493021
Bellin, J.S. et al.	$B_2(3a)$	3. Bellin J.S., Barnes D.G., "Health hazard assessment for chlorinated dioxins and dibenzofurans other than 2,3,7,8-TCDD." Presented at the Symposium on advances in health risk assessment for systemic toxicants and chemical mixtures. Cincinnati, Ohio. October 25, 1984.	40-8493002
U.S. Environmental Protection Agency	$B_2(40a)$	4. Bomberger et al. "Hexachlorobenzene: Chemistry of formation and identified sources." SRI draft report to USEPA, Office of Pesticides and Toxic Substances. Contract No. 68-02-3976. 1984.	40-8493063
Bradlaw, J.A. et al.	$B_2(4)$	5. Bradlaw J.A., Casterline J.L., "Induction of enzyme activity in cell culture: A rapid screen for detection of planar polychlorinated organic compounds." Journal of Association of Official Analytical Chemistry. 62:904-916. 1979.	40-7993022

POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS #83002

HEADING	FILE #			DOCUMENT #
Coggan, D. et al.	$B_2(10)$	6.	Coggan D., Achesson E.D. "Do phenoxy herbicides cause cancer in man?" The Lancet (8280), 1057-1059. 1982.	40-8293028
(The) Dow Chemical Company	$D_{2a}(1)$	7.	Dow Chemical Company. Direct testimony of David T. Buzzelli before EPA in re: Docket No. 415 et al. Exhibit 810. October 14, 1980.	40-8093125
Environmental Defense Fund	$E_{3a}(1)$	8.	Environmental Defense Fund and National Wildlife Federation. Petition to EPA to initiate rulemakings to prevent and reduce environmental contamination by dioxins and furans. October 22, 1984.	40-8493034
U.S. Environmental Protection Agency	$B_2(37)$	9.	Esposito et al. USEPA, "Dioxins," Cincinnati, Ohio. USEPA Industrial Environmental Research Laboratory, EPA 600/2-80-197. 1980.	40-8093046
Fingerhut, M.A. et al.	$B_2(17)$	10.	Fingerhut et al. "Review of exposure and pathology data for seven cases reported as soft tissue sarcoma among persons occupationally exposed to dioxin-contaminated herbicides." In Public Health Risks of the Dioxins. Wm. Lowrance, Ed., Rockefeller University, 87-204. 1984.	40-8393038
Fingerhut, M.A. et al.	$B_2(17a)$	11.	Fingerhut et al. "The NIOSH Occupational Dioxin Registry," in Public Health Risks of the Dioxins. Wm. Lowrance, Ed., Rockefeller University, 361-366. 1984.	40-8393039

POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS #83002

HEADING	FILE #		DOCUMENT #
Gierthy, J.F. et al.	$B_2(18)$	12. Gierthy et al. "Application of an in vitro keratinization assay to extracts of soot from a fire in a PCB containing transformer." In press Fund. Fundamental and Applied Toxicology, ~~Toxicology~~, 1985.	40-8493040
Hajdu, S.I.	$B_2(19)$	13. Hajdu S.I. "Classification and pathological diagnosis of soft tissue sarcoma." In Public Health Risks of the Dioxins. Wm. Lowrance, Ed. Rockefeller University, 205-216. 1984.	40-8393041
Honchar, P.A. et al.	$B_2(21)$	14. Honchar P.A., Halperin W. "2,4,5-Trichlorophenol and soft tissue sarcoma." The Lancet 1 (8214), 268-269. 1981.	40-8193043
Helder, T.H. et al.	$B_2(20)$	15. Helder T.H., Seinen W., "Standardization of an ELS bioassay for PCDDs and PCDFs." Chemosphere 14:183-193. 1983.	40-8593042
Hutzinger, O. et al.	$B_2(22)$	16. Hutzinger et al. "Polychlorinated dibenzo-p-dioxins and dibenzofurans: A bioanalytical approach." Chemosphere 10:19-25. 1981.	40-8193044
Kimbrough, R.D.	$B_2(24)$	17. Kimbrough R.D., "The toxicity of polychlorinated polycyclic compounds and related chemicals." CRC Current Review Toxicology. p. 455. 1974.	40-7493047
Knutson, J.C. et al.	$B_2(25)$	18. Knutson J.C., Poland A., "Keratinization of mouse teratome cell line XB produced by 2,3,7,8-tetrachlorodibenzo-p-dioxin: an in vitro model of toxicity." Cell 22:27-36. 1980.	40-8093048

POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS #83002

HEADING	FILE #		DOCUMENT #
McKinney, J. et al.	$B_2(26)$	19. McKinney et al. "Development and reliability of a radioimmunoassay for 2,3,7,8-tetrachlorodibenzo-p-dioxin." In: Impact of Chlorinated Dioxins and Related Compounds on the Environment. Hutzinger, eds. Oxford: Peragamon Press, pp. 67-69. 1981.	40-8293051
U.S. Environmental Protection Agency	$B_2(48a)$	20. Midwest Research Institute (MRI). Guidelines for the determination of polyhalogenated dioxins and dibenzofurans in commercial products. EPA Contract No. 68-02-3938; MRI Project No. 8201-A(41). 1985.	40-8593052
Poland, A. et al.	$B_2(30)$	21. Poland A., Knutson J.C., "2,3,7,8-Tetrachlorodibenzo-p-dioxin and related ~~halogenated~~ halogenated aromatic hydrocarbons: Examination of the mechanisms of ~~the mechanism of~~ toxicity." Annual Review Pharmacology and Toxicology. 22:517. 1982.	40-8293058
Safe, S. et al	$B_2(31)$	22. Safe et al. Binding to the 2,3,7,8-TCDD receptor and AHH/EROD induction: In vitro QSAR. "Banbury Report 18: Biological mechanisms of dioxin action." Cold Spring Harbor Laboratory. 1984.	40-8493059
Sawyer, T.W. et al.	$B_2(33)$	23. Sawyer T.W., Safe S. "In vitro AHH induction by polychlorinated biphenyl and ~~dibenzo-~~ dibenzofuran mixtures: ~~additive~~ effects." Chemosphere ~~Vol. 14~~ Vol. 14 No. 1, pp. 79-84. ~~1985~~ 1985.	40-8593062

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POLYHALOGENATED DIBENZO-p-DIOXINS/DIBENZOFURANS #83002

HEADING	FILE #		DOCUMENT #
Agent Orange Work Group	$B_2(1)$	24. The Agent Orange Workgroup (AOWG) Report to the Domestic Council of the President's Cabinet. October, 1985.	40-8593019
U.S. Air Force, School of Aerospace Medicine	$B_2(34)$	25. United States Air Force. Project Ranch Hand II. An epidemiologic investigation of health effects in Air Force personnel following exposure to herbicides. Update II, November 29, 1985. USAF School of Aerospace Medicine, Brooks Air Force Base, Texas.	40-8593067
U.S. Environmental Protection Agency	$B_2(46)$	26. USEPA. Office of Public Affairs, Press Advisory dated June 10, 1985.	40-8593082
U.S. Environmental Protection Agency	$B_{1a}(5)$	27. USEPA. Economic analysis of proposed section 4 testing rule for chemicals potentially contaminated with polyhalogenated dibenzo-p-dioxins and polyhalogenated dibenzofurans. OPTS. October, 1985.	40-8593018
U.S. Environmental Protection Agency	$B_{1a}(4)$	28. USEPA. Economic analysis of proposed section 8(a) reporting rule for chemicals potentially contaminated with polyhalogenated dibenzo-p-dioxins and polyhalogenated dibenzofurans. OPTS. October, 1985.	40-8593017
U.S. Environmental Protection Agency	$B_2(38)$	29. USEPA, OWRS, OSWER. "Dioxin Strategy," Washington, D.C. Office of Water Regulations and Standards and Office of Solid Waste and Emergency Response in conjunction with the Dioxin Strategy Task Force, 1983.	40-8393073

HEADQUARTERS
UNITED STATES MILITARY ASSISTANCE COMMAND, VIETNAM
APO SAN FRANCISCO 96222
Chemical Operations Division

MACCOC7 4 October 1968

MEMORANDUM FOR RECORD

SUBJECT: Press Release on the Herbicide Policy Review - Background

1. A background briefing for selected correspondents was held at 1500 hours on 20 September 1968. The press was represented by key correspondents including CBS, NBC, UPI, AP, New York Times, Washington Post and BBC.

2. The Mission Agencies were represented by Mr. Eugene Rosenfeld, press representative of the American Embassy, Mr. George Anderson, Political Military Office of the American Embassy and Colonel John Moran, Chemical Operations Division, J3, MACV.

3. Mr. Rosenfeld served as moderator of the background briefing. He opened the briefing by stating that comments by the press would be attributed only to the U. S. Mission, Saigon. He requested that questions on management and economics be directed to Mr. Anderson and questions on technology, effects, and military operations be directed to Colonel John Moran.

4. The important queries of the press and responses thereto are outlined below:

a. Question - What is the purpose of employing herbicides in South Vietnam?

Answer - One of the most important problems in combat operations in South Vietnam is finding and observing the enemy in this nation of 65,000 square miles of area which is over 1/3 forest and jungle. Defoliating herbicides have the capability of improving the vertical visibility from 70 to 90 percent in 4 to 6 weeks. The improvement in visibility lasts for 12 to 16 months. Horizontal visibility is improved from 40 - 60 percent. Thus, militarily important terrain features such as enemy and friendly lines of communication, enemy base areas and avenues of approach, and friendly defensive perimeters are treated with defoliating herbicides to maintain surveillance of the enemy in these key terrain features, and to bring fire power against the enemy should he attempt to employ his forces in these areas. Crop destroying herbicides are utilized to deny food to enemy units in food scarce areas remote from population centers. This action causes the enemy to utilize combat forces for the production of food or the transport of food increasing his logistical burden and lowering his morale.

MACCOC7 4 October 1968
SUBJECT: Press Release on the Herbicide Policy Review - Background

Previous newspaper articles have discussed crop destruction on the macro or total country basis; this is not the intent of the program. Crop targets are destroyed only in the vicinity of known enemy units located in food scarce areas in the upper highlands of South Vietnam. Thus crop destruction should only be analyzed on the micro basis. No crop destruction missions are conducted in the agriculturally rich delta area. Very few crop destruction operations are conducted in III Corps and those conducted are in mountainous areas of the northern provinces of this Corps. Most crop destruction missions are conducted in the Western provinces of II Corps and the Southern provinces of I Corps. The crop destruction program is conducted as part of the total food denial program. Other crop denial programs include selective harvesting, storage, and distribution, combined with constant policing of the avenues of commerce to deny food to the enemy. In 1967 herbicide operations were credited with destroying 120,000 tons of food - 80,000 tons of rice and 40,000 tons of broad leaf crops. This represents only 1½ percent of South Vietnam's food producing capability.

b. Question - Are there not many claims in connection with the program and if so what is the amount of these claims?

Answer - This question was answered by Mr. Anderson who stated that there are claims in connection with the program and payment is administrated by the GVN. However, there is no information available on the amount of these claims. Colonel Moran then explained that claims are almost an inherent part of herbicide operations throughout the world since herbicides are used so extensively in industrial and agricultural operations. Colonel Moran noted that in 1959, 85,000 square miles in the United States were treated. By 1965, this treatment had grown to 185,000 square miles. These treatments included vegetation control along railroad lines, power lines and forest reserves. Of particular interest is the commercial treatment of deciduous trees of the woodlands of the south to accelerate the growth of pine trees. Most of the above treatment is accomplished by aerial spray. Treatments of railroad lines and power lines are especially notable for producing accidental crop destruction claims. In 1967 industrial and agricultural herbicide operations in the United States caused claims amounting to approximately 100,000dollars in the state of North Carolina alone. It is interesting to note that in 1965, treatment of herbicide in the United States represented nearly 5 percent of the total area, while treatment of South Vietnam in 1967 amounted to only approximately 3½ percent.

c. Question - How effective was the ecological study by Dr. Tschirley? Was it not conducted mostly by air?

Answer - The ecological study by Dr. Tschirley is being released

today and your comments and conclusions can be drawn from that study which speaks for itself. Much of the ecological observations were made from low level helicopter flights, however Dr. Tschirley and ecologists and foresters from the Biological Laboratory, Fort Detrick, and USAID were inserted into several areas of III Corps where ground observations of herbicide areas were made. It is believed that these insertions were adequate and contributed significantly to the general body of knowledge of the effect of herbicide treatment on the ecology of SVN.

d. Question - What do the field commanders think of the herbicide program?

Answer - The field commanders have reported that the herbicide programs assist in providing improved observation on enemy LOC's, avenues of approach and base areas and assist in securing our own LOC's. They continue to recommend targets for treatment in various militarily important areas of SVN.

e. Question - Are these materials toxic to man, animals and insects?

Answer - We have no knowledge of any instances when herbicides used in SVN have been harmful to man, animals, fish or insects. All herbicides used in SVN are used extensively in the United States and the rest of the world for industrial and agricultural vegetation control. They are generally no more toxic than aspirin. It is possible, however, that the lack of vegetation resulting from defoliation operations may cause some animals to migrate to other areas.

f. Question - Are the agents persistent in the soil?

Answer - The agent used for crop destruction persists in the soil only 24 - 48 hours, after which the field can be plowed and replanted with expectation of greater crop yield due to the weed control provided by the herbicide treatment. The defoliation agent persists in the soil from 2 - 4 months. During the ecological study actual soil samples were taken to determine persistency and the above persistency data were substantiated.

g. Question - What part does the GVN play in the management and control of the program?

Answer - This question was answered by Mr. Anderson who explained that the United States supports the GVN in this program. No targets are flown without GVN approval. That is, the GVN initiates the military operations order to attack the target. Further, all herbicide in-country is

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under GVN control and issued from GVN depots on a mission by mission basis.

5. The background briefing lasted one hour. At the close of the briefing the CBS representative stated that the Herbicide Program was completely supportable and should be told to the people of the United States. He stated that it was a good story and requested that a tape along the lines outlined above be made for release in the United States. Mr. Rosenfeld answered that such a request would be pursued with appropriate officials. After departure of the correspondents Mr. Rosenfeld stated that the background briefing was a complete success, noting the exceptionally thorough knowledge of the program on the part of the participants.

6. The BBC representative indicated a negative attitude along the following lines:

a. Dr. Tschirley's report stated that it was a bad time of the year to conduct an ecological study.

b. The observation in the study had been conducted mostly from the air.

c. The effect of herbicide operations on the water table had not been properly researched.

Other than the above no other correspondents appeared to have a hostile attitude toward the program.

John Moran

JOHN MORAN
Colonel, USA
Chief, Cml Opns Div

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THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN 48640

9 July 1968

SUBJECT: HERBICIDE M-3393

The enclosed data covers a herbicide developed along the lines of research work done at Ft. Detrick, Maryland, to produce a herbicide more effective than those now being used by the military in Vietnam and other areas.

The document contains technical data and economic evaluations so that the need for a large scale field trial for this product might be properly judged.

It would seem from the data presented on this product, M-3393, sometimes referred to as Super-Orange, that serious consideration should be given to a large scale test. This test would prove beyond a doubt, in substantiating the data, whether or not this product would provide an adequate substitute for existing herbicides or be a satisfactory alternate for those currently used.

Your study of the document is more than appreciated.

Yours truly,

A. P. Beutel, Vice President
and Director of Government Affairs

lsr

INTRODUCTION:

As a result of the Joint Industry/Military meeting in May of 1965, relative to enlisting industry competences in helping to solve problems connected with the conflict in Vietnam, Dow introduced TORDON® to the Department of Defense in a series of meetings starting in August of 1965. The first meeting was held in the office of the Director of Research and Engineering for the Department of Defense. Dr. Chalmers W. Sherwin, Dr. Nicholas Samaras, Mr. Ted Hayward, and Dr. Charles Minarik represented D.O.D.

Following these presentations, it was suggested by D.O.D. that Dow take the TORDON message to the field in Vietnam. Mr. Clyde Bryant and Dr. Keith Leasure of Dow subsequently spent time in Vietnam and in Thailand reviewing the possibilities for use of this new highly active herbicide. In their discussions with the Field Commanders, it became obvious that TORDON 101 MIXTURE (a commercial formulation) would fill the need for a product to be used in situations where Orange was not completely satisfactory. Following this action, TORDON 101 MIXTURE (or White as it was then called by the Military) was used in operational quantities.

In August of 1966, Dow proposed to several groups in the Department of Defense that oil soluble esters of TORDON could be combined with Orange to make a broader spectrum potentially longer lasting defoliant for general use in the theatre of operations. D.O.D. suggested that evaluations should be made at an early date to examine the potential effectiveness of this combination. It was mutually agreed that it would be desirable to have some small scale evaluations conducted in forested areas similar to those in Vietnam prior to undertaking an operational evaluation.

Several combinations and ratios of TORDON ester with Orange have since been evaluated in numerous tests in Texas and Puerto Rico by the USDA with ARPA funds. Tests were also conducted in Hawaii by Dow in cooperation with Dr. Minarik's group from Fort Detrick. Later, tests were also applied in Malaysia in a land clearance operation in cooperation with the International Rubber Research Institute.

During the August of 1966 discussions on this new product, D.O.D. suggested that if small scale field evaluations were favorable, Dow should come back with a proposal in regard to moving this product into operational channels. Consequently, we have asked for this meeting with you today to present the information we have to date and the proposal.

DEPARTMENT OF (ALTH, EDUCATION, AND WEI \RE

FDA - Moore TCDD NIEHS (7)

MEMORANDUM OF MEETING

January 16-17, 1979

Between: EPA Dioxin Implementation Plan (DIP) Collaborators

U. S. Environmental Protection Agency (EPA)
4th and M Streets, SW
Washington, D.C. 20460

FDA represented by: David Firestone, Ph.D.
HFF-147

Attendees: See attached List of Participants. Dr. Patrick O'Keefe participated in place of Dr. Meselson; Drs. Moore, Spaulding and Upholt did not attend.

Observers (Incomplete list): Jerry Burke, James Sphon, FDA (first day only); Lester Brown, House of Representatives Oversight Committee; David Graham, U.S. Forest Service; Anthony Malanoski, USDA; and Ms. Marian Parks, Rachel Carson Trust. In addition, an NBC-TV news team was present.

Subject: Dioxins

Agenda: See attached Draft Agenda.

The meeting was convened by EPA to discuss the results of a Method Validation Study, analytical criteria for TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin) determination, use of ^{37}Cl-labelled TCDD to fortify environmental samples to check recovery during sample cleanup and potential sources for TCDD contamination of environmental samples.

Summary of Meeting

Various aspects of an Interlaboratory Method Validation Study for TCDD were discussed. The major participants in the Validation Study were Wright State University (Dr. Tiernan), Dow Chemical Co. (Dr. Crummett), and the University of Nebraska (Dr. Gross). TCDD-fortified samples (beef fat and human milk) were extracted at the EPA Pesticide Monitoring Laboratory, Bay St. Louis, Mississippi, using a standard "acid-base" procedure developed at that laboratory several years ago. Pooled extracts were subdivided and distributed to collaborators who performed the GC-MS analyses according to individual protocols and depending upon the available mass spectrometers at each participating laboratory.

Laboratories received multiple standards equivalent to 0, 9, 25, 49 and 81 ppt fortifications as well as single standards at 0.5, 1, 4, 16, 36

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and 64 ppt. The laboratories also received 26 samples each of extracts from beef fat and human milk, fortified prior to cleanup with TCDD over the range mentioned above.

The results of the study showed that the methodology was unsuitable for detecting and quantitating TCDD in beef fat and milk samples with less than 9 ppt of TCDD. In addition, the reliability of the methodology was not established for quantitation of TCDD in human milk. The results demonstrated that EPA is currently unable to proceed, using this methodology, with its Human Milk Sampling Project (analysis of human milk samples from 2,4,5-T use areas in the Pacific Northwest and from specific control areas), because expected low levels of contamination of human milk require detection and quantitation of TCDD in the range of 0.1-5 ppt.

Although the validation study was concerned with detection and quantitation of TCDD signals by mass spectometry, no effort was expended on consideration of the problem of TCDD confirmation (definition of criteria for confirmation, and determination of the lower limit at which confirmation of TCDD can be carried out).

Mass spectrometric analyses of sample extracts were not performed using a specific protocol. This was demonstrated, at least in part, by an average 50% recovery of TCDD in beef fat extracts by labs A and B (results were uncorrected for loss of ^{37}Cl-labelled TCDD during cleanup) versus 98% recoveries of TCDD in the beef fat extracts by lab C (U. of Nebraska; correction for loss of ^{37}Cl-labelled TCDD during cleanup made by the ratio method - measurement of MS signals at m/e 322 (native TCDD) and m/e 328 (^{37}Cl-TCDD)).

EPA Dioxin Implementation Plan (DIP)

Mr. Halloway opened the 2 day meeting with a brief review of EPA's concerns with dioxin. In May, 1971, environmental uses of 2,4,5-T were restricted to forest areas, rice growing and rights-of-way. In middle 1973, notice was issued to hold hearings on the future use of 2,4,5-T. In July, 1974, EPA withdrew from the hearing, largely because of the unavailability of methodology for detecting and quantitating TCDD in the lower ppt range with confidence. The agency initiated the Dioxin Implementation Plan (DIP) in September 1974 to develop and validate methodology for TCDD as well as to determine the environmental burden of TCDD from various sources.

Human Milk Sampling Project

Mr. Halloway, and later Mr. Reising, presented a review of the status of Human Milk Sampling Project, initiated by EPA in 1978. A total of 105

samples were collected from the Pacific Northwest (where 2,4,5-T is used) and two other areas. Twenty samples each were collected from North California and Oregon, and 18 samples were collected from the state of Washington. Twenty two samples were obtained from an urban area where 2,4,5-T was not used for 2 years (Santa Cruz, California) and 25 samples were obtained from the Anchorage, Alaska area where 2,4,5-T is not used at all.

Cleanup of the samples was begun at the EPA Pesticide Monitoring Laboratory. Fifty of the samples were initially fortified with 10 ng of ^{37}Cl-TCDD per 10 g sample to check recoveries during cleanup; additional samples were fortified with 2.5 ng of ^{37}Cl-TCDD to reduce the level of native TCDD contamination from the ^{37}Cl-TCDD standard, since the standard was not isotopically pure.

MS analysis of extracts of the human milk samples would probably be futile at present, since the methodology to be used for analysis of the milk samples (see additional discussion below) was found not to be sensitive enough for meaningful analysis of the milk samples. Thus, the results of the Interlaboratory Method Validation Study for TCDD, discussed at the meeting, indicated that the methodology under examination was not suitable for human milk samples containing less than 9 ppt, whereas results of earlier analyses of human milk from the Pacific Northwest indicated that detection of TCDD in the range of 0.1-5 ppt was required.

General Review of TCDD Methodology by EPA Collaborators

A discussion of analytical methodology for TCDD followed. Dr. Crummett (Dow Chemical Co.) remarked that Dow has worked to improve cleanup procedures, and has applied new methodology to analysis of fish and particulate matter from combustion processes. He pointed out that a large number of TCDD isomers are to be found in combustion products. Dr. Shadoff (Dow Chemical Co.) noted that Dow is developing improved procedures for analyses of milk for TCDD. He outlined a cleanup procedure under development which uses cellulose gauze as adsorbent for cleanup of 15 g milk samples. The milk is added to the gauze and extracted in a Soxhlet apparatus with hexane (the milk and milk fat are held on the gauze). If a 30 g starting sample is required, 2 gauzes (15 g milk on each gauze) can be extracted. Additional cleanup includes the use of HPLC after several alumina columns. GC-MS is used to analyze the extracts. Dr. Shadoff said that he intends to detect less than 1 ppt of TCDD, if possible.

Dr. Shadoff discussed the pros and cons of low resolution and high resolution MS analysis. He said that fats are completely resolved by high resolution MS but are a problem with low resolution MS. He noted that suitable cleanup permits use of a relatively inexpensive low resolution mass spectrometer.

Dr. Shadoff noted that the scheme using cellulose gauze currently gives only 30% recovery efficiency, but hoped that this would improve with more experience. He noted that 2,3,7,8-TCDD was not strongly bound to milk so that neutral procedures (procedures not requiring use of acid or base) would be satisfactory for cleanup.

Dr. Gross (U. of Nebraska) observed that the acid-base cleanup procedure of Dr. Dupuy (EPA Pesticide Monitoring Laboratory) provides 70-80% recoveries of TCDD with 15% standard deviation. Dr. Firestone noted that if other dioxins were to be analyzed, cold alkali treatment could be used for sample dissolution, since hot alkali rapidly destroys some dioxins.

Dr. Shadoff continued with a discussion of the protocol used by Dow(Lab B) for MS analysis of sample extracts in the Interlaboratory Method Validation Study for TCDD (analysis of standards and milk and beef fat extracts prepared at the EPA Pesticide Monitoring Laboratory). He said that extract solutions in glass ampoules were transferred to a small vial, evaporated to dryness, taken up in solvent (10 µl) and analyzed by high resolution MS (9000 resolving power). A portion of extract solution was examined at m/e 322 (0.3 mass unit sweep). The extract solution was again evaporated to dryness and taken up to another known volume and a portion of extract was then examined at m/e 320. The standards provided by Dr. Dupuy were used to calibrate the mass spectrometer, and the data reported for various sample extracts were uncorrected for ^{37}Cl-TCDD recovery. The sample extract was consumed in 2 injections:

(1) analysis at m/e 322 - 5-10 µl injected
(2) analysis at m/e 320 - 5-8 µl injected

Dr. Gross (U. of Nebraska) noted that he analyzed over 200 samples during the year 1977 under an EPA contract. He said that 2 classes of samples, environmental unknowns and method validation samples, were included in the samples analyzed by him. Extracts were taken from the ampoule as received and an aliquot removed (using a 50 µL syringe to measure the sample volume). One quarter of the sample was injected into the high resolution mass spectrometer and 3/4 of the sample was held for further use as required. Packed column GC was used with an MS 50 high resolution instrument, sweeping across a narrow mass range (peak matching) to profile the 322 TCDD peak and the adjacent DDE peak to see if the 321.9836 TCDD signal was subject to interference from the DDE signal. A 60-100 sec. time period was used to collect the TCDD signal, and the ratio of the native TCDD signal (m/e 322) versus the internal standard ^{37}Cl-TCDD signal (m/e 328) was determined. (Another injection would be required to monitor the 320 and 326 ions.)

Dr. Gross noted that some 100 samples were extracted at the U. of Nebraska using the EPA acid-base procedure, providing recoveries of 70-80%±15%.

Dr. Gross said that the sensitivity of his MS instrument is better than the detection limit observed with samples (50 femtograms of TCDD can be detected with the MS 50), but interfering peaks (PCBs, DDE, etc.) produce signals which overlap the TCDD peak. Thus, adequate cleanup is most important. He noted that an interfering peak in a Japanese herbicide procuced a "TCDD-like" signal which required 30,000 resolving power to separate the signal from the TCDD signal. He noted that the EPA ^{37}Cl-TCDD standard contained a samll amount of native TCDD (<1%), but this produced about a 1% signal at 322 due to the imperfect labeling.

Dr. Gross said that he corrected for the 322 signal due to the ^{37}Cl-TCDD standard. He noted that with the ratio method, one relies on the fact that no interference occurs at m/e 328 (the ^{37}Cl-TCDD peak). However, a PCB molecular ion interference occurs at m/e 328 (due to heptachlorobiphenyl) requiring 44,000 resolving power to separate the heptachlorobiphenyl signal from the ^{37}Cl-TCDD signal. He noted that the heptachlorobiphenyl elutes ahead of TCDD on a packed column; with poor resolution from TCDD, recoveries would be over 100%. He added that if the ^{37}Cl-TCDD had a 0.6% native TCDD impurity, then 2.5 ng (^{37}Cl-TCDD added to sample) X 0.006 = 15 pg (10 g sample). Therefore, the detection limit would be about 1.5 ppt due to the presence of the native TCDD in the ^{37}Cl-TCDD internal standard. However, interferences due to ion signals at the exact mass of native TCDD prevent going to the 1.5 ppt limit resulting from interference due only to the ^{37}Cl-TCDD internal standard. Dr. Gross added that he usually used a resolving power of 11,000±1000.

Dr. Shadoff pointed out that scores of compounds had exact masses within 25 ppm of the mass of TCDD.

Dr. Dupuy (EPA Pesticide Monitoring Laboratory, Bay St. Louis, Mississippi) reviewed the procedures and cleanup techniques used for preparation and distribution of sample extracts for MS analysis. Dr. O'Keefe described the steps in the neutral procedure developed by him and used to examine a limited number of EPA samples. He noted that he used direct probe MS at Harvard (10,000 resolution), calculating TCDD by the ratio technique and analyzing samples at both m/e 320 and m/e 322. Dr. O'Keefe said that he completed analysis of a number of mother's milk samples and some Seveso (Italy) samples for the National Institute of Environmental Health Sciences (NIEHS), but the results of these analyses were under review by the agency and have not been released as yet.

Dr. Tiernan (Wright State U.) said that sample extracts received by him from EPA were evaporated to dryness, dissolved in benzene or xylene (total volume, 10 µl), and 2-3 µl were injected into the GC-MS (AEI MS-30 mass spectrometer). All volumes must be known since internal standards were not used. A special sweep circuit (30 X/sec) at 0.3-0.5 amu was used to monitor the 322 peak of TCDD. The m/e 328 peak was also monitored (due to ^{37}Cl-TCDD added to the samples before cleanup by EPA). Dr. Tiernan noted

hat the data supplied to EPA was not corrected for ^{37}Cl-TCDD recovery. He added that a new "scan" capability was available (stepping and scanning at 10X/sec) so that up to 4 peaks could be analyzed with more residence time at m/e 320 and 322 versus m/e 326 and 328. He said that capillary gas chromatography was impractical for analysis of large numbers of extracts.

Robert Harless (EPA Research Triangle Park, N.C.) discussed his recent work involving development of methodology for various samples including fish samples. He said that the EPA (acid-base) cleanup method was satisfactory for most sample preparation if done with care. He noted that sample cleanup must be very good for analysis of samples containing 1-20 ppt of TCDD. He observed that the EPA sample of ^{37}Cl-TCDD (used as internal standard) was contaminated with 1 pg of "native" TCDD per ng of sample, so a correction is required. He said that he is using a Varian 311-A mass spectrometer with a capillary column gas chromatograph, and he was able to detect as low as sub-ppt amounts of TCDD with suitable sample cleanup. Mr. Harless observed that PCB is the predominant interference, and said that capillary columns, much improved of late, afford high resolution for elimination of interferences.

Mr. Harless said that he could perform MS analyses of 4 samples per day, each sample in duplicate, analyzing up to 8 ions per sample. Since multiple ion scanning reduces sensitivity, it was used only for confirmation of TCDD in samples containing more that 100 ppt of TCDD. Thus, highly contaminated samples were monitored for ions due to loss of COCl as well as for the usual ions (that is, the 257, 259, 320, 322 and 328 ions were monitored simultaneously (10,000 resolution) with extracts from samples containing more than 100 ppt of TCDD).

Dr. Taylor (Wright State U.) referring to the Interlaboratory Method Validation Study results, observed that EPA did not demonstrate the feasibility of determining less than 10 ppt of TCDD in fat and milk samples.

Dr. Shadoff said that use of 10 ng of ^{37}Cl-TCDD was unsatisfactory; a smaller amount would be better. Dr. Shadoff then discussed the use of ^{13}C-TCDD as an internal standard (2 ng of ^{13}C-TCDD is added to milk samples and is superior to ^{37}Cl-TCDD (less interference).

EPA Neutral Cleanup:

Dr. Dupuy compared the standard acid-base cleanup procedure to a neutral procedure developed in his laboratory. He said that the neutral procedure provided "cleaner" extracts. Catfish and carp extracts were checked (320 and 322 ions). All interferences were eliminated.

The procedure involves sodium sulfate-dry ice blending, acetonitrile extraction, hexane extraction (TCDD is in the acetonitrile layer), chroma-

tography on a large Florisil Column and chromatography on two alumina columns. He said that 2 samples per man per day can be prepared for MS analysis.

Analytical Criteria for TCDD Determination

Dr. O'Keefe observed that m/e 320 and m/e 322 values must be in agreement or the results should not be reported. Dr. Shadoff questioned whether a 2.5 to 1 signal to noise ratio was sufficient, and prefered at least 5:1 signal to noise ratio. Dr. Shadoff noted that low resolution MS results must be confirmed by high resolution MS.

Mr. Harless outlined the following criteria used in his lab for TCDD determination:

1. Capillary GC-MS with correct retention time for TCDD
2. Co-injection of sample and "native" TCDD standard
3. Molecular ion Cl-isotope ratio correct (m/e 320 / m/e 322) to ± 20-30 %)
4. Capillary column GC/high resolution MS multiple ion monitoring response (simultaneous response for elemental composition of m/e 320, m/e 322 and m/e 328).
5. Response of m/e 320 and m/e 322 greater than 2.5 X noise level.

Additional criteria for confirmation of TCDD residues of some Michigan fish samples are as follows:

1. Capillary column GC/high resolution MS used to monitor m/e 257, 259, 320, 322 and 328 (multiple ion simultaneous response of M^+ and M^+-COCl)
2. Capillary column GC/high resolution MS multiple ion simultaneous response for m/e 320, 322, 324 and 328
3. Capillary column GC/high resolution MS "peak matching analysis" (in real time) of m/e 320 at 10,000 resolution
4. Neutral cleanup of sample followed by GC/MS using above criteria

Mr. Harless said that his capillary GC columns provided 100,000 effective plates, sufficient for separation of PCB from ^{37}Cl-TCDD and "native" TCDD peaks.

Dr. Crummett pointed out the problems associated with distinguishing between 2,3,7,8-TCDD and other TCDD isomers, and the general unavailability of TCDD standards for analytical use.

Results of Interlaboratory Method Validation Study

The results of the Interlaboratory Method Validation Study for TCDD were reviewed by Mr. Robert G. Heath, EPA statistician, on Tuesday. It was

noted that a series of beef fat (5 g) and human milk (10 g) samples, fortified at 0, 0.5, 1, 4, 9, 16, 25, 36, 49, 64 and 81 ppt with TCDD, were extracted at the EPA Pesticide Monitoring Laboratory and portions of pooled extracts were sent to participating laboratories. (Dow, U. of Nebraska, Wright State analyzed most of the samples; some samples were also analyzed by Harvard and the EPA Health Effects Laboratory, Research Triangle Park, N.C.)

The results demonstrated that the cleanup and quantitation methodology was not suitable for analysis of human milk and beef fat samples with less than 9 ppt of TCDD. In addition, the reliability of the methodology for quantitation of TCDD in human milk was not established. Thus, it seems apparent that EPA is currently unable to proceed with its Human Milk Sampling Project, since expected low levels of contamination of human milk require detection and quantitation of TCDD in the range of 0.1-5 ppt.

Dr. Shadoff asked whether it was possible to send samples to collaborators who would apply their own cleanup procedures. Dr. Firestone said that a coordinated method development plan should be drawn up immediately to validate a suitable procedure capable of determining 0.1-5 ppt of TCDD in human milk samples. Otherwise, it was fruitless to proceed with analysis of EPA's human milk samples. Dr. Firestone also pointed to the need for various TCDD standards (TCDD isomers) which were currently unavailable, and reminded EPA and USDA scientists that they promised to allot funds to the National Cancer Institute program for synthesis of needed dioxin standards. However, to date, only FDA has contributed funds to the synthesis program. In addition, Dr. Firestone pointed out that the EPA Interlaboratory Method Validation Study only considered the detection and quantitation of TCDD but did not address itself to the problem of TCDD confirmation, although Mr. Harless had discussed criteria for confirmation which were applied in his laboratory to some samples containing relatively high levels of TCDD.

David Firestone, Ph.D.

Attachments

HFF-420 Williams
HFA-224
HFF-1 Kennedy
HFF-1 Novitch
HFF-1 Miller
HFC-1 Hile
HFF-2 Schaffner
HFF-100 Kolbye
HFF-140 Howard
HFF-141 Burke
HFF-147 Cornelissen (2)
Firestone (2)
Kamps
HFF-300 Quinn
HFF-401 Jellinek

NIEHS: Dr. John Moore
USDA: Dr. R. Ross, Dr. J. Spaulding
EPA: Mr. R. Reising, Mr. T. Holloway, Ms. C. Offutt, Dr. E. Johnston

DFirestone:naw 1/24/79

PRELIMINARY LIST OF PARTICIPANTS
DIOXIN IMPLEMENTATION PLAN COLLABORATORS MEETING
January 16-17, 1979

Dr. Warren Crummett
Dow Chemical Company
Midland, Michigan

Dr. Aubry Dupuy
Environmental Protection
Agency
Bay St. Louis, Missouri

Dr. Michael Gross
University of Nebraska
Lincoln, Nebraska

Mr. Robert Harless
Environmental Protection
Agency
Research Triangle Park,
North Carolina

Mr. Robert Heath
Environmental Protection
Agency
Washington, D.C.

Ms. Maureen Hinkle
Environmental Defense
Fund
Washington, D.C.

Mr. Thomas Hollaway
Environmental Protection
Agency
Washington, D.C.

Mr. Edwin Johnson
Environmental Protection
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Dr. William Lawrence
Weyer Haeuser Company
Centralia, Oregon

Dr. Matthew Meselson
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Wright State University
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Dr. Thomas Tierman
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Dayton, Ohio

Dr. William Upholt
Environmental Protection
Agency
Washington, D.C.

20905

DRAFT AGENDA

DIOXIN IMPLEMENTATION PLAN
COLLABORATORS MEETING

U.S. Environmental Protection Agency
Waterside Mall, Room 3906
4th & M Street, S.W.
Washington, D.C. 20460

January 16-17, 1979

Tuesday, January 16, 1979

9:30 AM	I	Introductory Comments	Edwin L. Johnson Deputy Ass't Admin. for Pesticide Programs
10:00 AM	II	Status of Dioxin Implementation Plan	Thomas Hollaway, Section Head Special Pesticide Review Division
		A. Overview of Past Activities	
		B. Summary of Recent Developments	
10:30 AM		BREAK	
	III	Recent Developments Under The Dioxin Implementation Plan	
		A. Analytical Aspects	
10:45 AM		1. Analytical Methodology - Part 1	Carolyn Offutt Dioxin Project Manager, EPA
11:00 AM		2. Analytical Methodology - Part 2	Collaborators and Contract Laboratory Reports
12:00 NOON		LUNCH	
1:00 PM		2. Analytical Methodology - Part 2 (Con't)	
1:45 PM		3. Evaluation of Analytical Method Validation Study	Bob Heath, Benefits and Field Studies Division, EPA
2:30 PM		BREAK	
2:45 PM		4. Contamination of ^{37}Cl-TCDD with Native TCDD	Collaborators and Contract Laboratory Reports
3:30 PM		5. Analytical Criteria for TCDD Determinations	Carolyn Offutt, Dioxin Project Manager, EPA

20906

Wednesday, January 17, 1979

III Recent Developments of Dioxin Implementation Plan (cont'd)

B. Monitoring Aspects

9:00 AM	1. Pacific Northwest Human Milk Study	Richard Reising Special Pesticide Review Division, EPA
9:45 AM	2. Sources of Dioxin Contamination	Collaborators and Contract Laboratory Reports
10:15 AM	BREAK	
10:30 AM	2. Sources of Dioxin Contamination (con't)	Collaborator and Contract Laboratory Reports
11:30 AM	3. Additional Monitoring Studies	Collaborators and Contract Laboratory Reports
12:00 AM NOON	LUNCH	
1:00 PM	C. Use of Dioxin Implementation Plan Monitoring Date in the RPAR Process	Harvey Warnick, 2,4,5-T Project Manager, EPA Mary Reece 2,4,5-TCP Project Manager, EPA
2:45 PM	BREAK	
3:00 PM - 4:30 PM	IV. Future of the Dioxin Implementation Plan	Carolyn Offutt, Dioxin Project Manager, EPA

20907

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

MEMORANDUM OF TELEPHONE CONVERSATION

January 18, 1979

Between: Ms. Maureen Hinkle
Environmental Defense Fund
Washington, D. C.

and: David Firestone, Ph.D.
Analytical Chemistry & Physics Branch, HFF-147

Subject: Dioxins in Human Milk

Ms. Hinkle called to relate to me that she was drafting a letter to the Environmental Protection Agency concerning analysis of human milk samples, one of the subjects discussed at the January 16-17, 1979 meeting of the EPA Dioxin Implementation Plan (DIP) collaborators at EPA headquarters in Washington, D.C. (see memo of meeting, EPA Dioxin Implementation plan, 1-16/17-79, D.Firestone). Ms Hinkle was a participant in the DIP meeting.

The DIP meeting was held to review, among other topics, the results of analysis of fortified human milk samples in order to validate dioxin (2,3,7,8-tetrachloro-dibenzo-p-dioxin) methodology for human milk samples collected from donors in the Pacific Northwest and other areas.

Ms. Hinkle said that the results of the method validation study demonstrated that the methodology was unsuitable for analysis of samples for dioxin below the 9 ppt level required for human milk samples. She said that she would make 3 recommendations in her letter to EPA:

(1) that EPA identify a Federal laboratory which would conduct continuing analytical investigations and would be capable of performing required analyses;

(2) that EPA establish a Federal laboratory to conduct long-term dioxin research and also provide a team to investigate environmental episodes; and

(3) set up an expert committee including personnel from EPA, FDA, Fish and Wildlife and a private laboratory (i.e. U. Nebraska; M. Gross) to advise on matters involving dioxin methodology.

David Firestone, Ph.D.

20908

cc:

HF-1 (Kennedy)
HFY-1 (Novitch)
HFY-3 (Elder)
HFF-1 (Miller)
HFC-1 (Hile)
HFF-2 (Schaffner)
HFF-100 (Kolbye)
HFF-140 (Howard)
HFF-141 (Burke)
HFF-144 (Sphon)
HFF-147 (Corneliussen, Kamps, Firestone)
HFF-300 (Quinn)
HFF-401 (Jelinek)
HFF-420 (Williams)

NIEHS: Dr. John Moore
USDA: Dr. R. Ross; Dr. J. Spaulding
EPA: Mr. R. Reising; Mr. T. Hollaway; Ms. C. Offutt; Mr. E. Johnson

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BRIEFING NOTES FOR PRESENTATION
TO DEPCOMUSMACV, 7 DEC 67

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HISTORY

Started in 1962 - and has grown as shown on this chart.

AIRCRAFT -- HERBICIDE -- COVERAGE

To give an idea of what this means geographically the area covered in 1962 - 1965 - and the present requirements. The rapid growth in requirements for defoliation and crop destruction may be the cause of some of the problems which we will discuss later.

PRESENT REQUIREMENTS

1967 - Approved projects which are presently being flown. There are 66 projects presently approved which require 5,350 C123 sorties to complete. - There are also 24 projects in the approval process which, if approved, will require an additional 3,000 sorties.

CAPABILITIES

Because requirements have always exceeded the capability to deliver, herbicide for the program has been ordered on basis of the ability of the aircraft to deliver spray sorties.

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~~NOT UNDER G~~ -

~~SECRET~~ DOWNGRADED AT 3 YEAR INTERVALS
DECLASSIFIED AFTER 12 YEARS

~~SECRET~~

On 23 October 1966 when the RANCH HAND Operation was being moved from ~~TSN~~ to Bien Hoa, 7th Air Force stated that 12 aircraft would deliver 450 sorties a month or 1.2 sorties/day/aircraft.

On 20 December 1966 - MACV stated the FY "68" requirement for herbicide will be adjusted to reflect a requirement for 11.9 million gallons based on 24 aircraft.

On 16 January 1967 - the detailed analysis of this requirement was presented to CINCPAC, and was computed on a sortie rate of 1.333/aircraft/pay for 24 aircraft. This sorties rate was agreed upon at a conference in 7th Air Force and was passed along as the planning figure.

19 May 1967 - J3 requested eight spray systems to be used in the UH-1 series helicopters. These systems have been shipped from the manufacturer, and should be in Vietnam during December. It is estimated that these systems will use approximately 96,000 gallons of herbicide per month.

13 July 1967 - 7th Air Force stated the 23 October 1966 commitment could not be met, and recommended a sortie rate of 1.0 sorties/day/possessed aircraft. A reduction of more than 1/4 of the planned program.

As a result of the 7th Air Force statement, COMUSMACV was briefed and on 23 July 1967 COMUSMACV stated that we cannot let the sortie rate remain at the level 7th Air Force indicated and requested that adequate support be provided RANCH HAND operations to achieve 612 sorties/month.

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24 July 1967 - New herbicide requirements were sent to CINCPAC to support 612 sorties/month FY "68" and 864 sorties/month FY "69" and following years. This reflected the seven additional aircraft at the same sortie rate as requested for the 17 aircraft presently in the program.

14 August 1967 - 7th Air Force said additonal support has been given to the RANCH HAND Operation. Maintenance cancellations were reduced, and still recommended a sortie rate of one per possessed aircraft per day.

26 August 1967 - COMUSMACV stated that JCS has prepared plans to increase herbicide production. Stated the difficulty in trying to order herbicide on the basis of possessed aircraft. Stated that additonal aircraft should be utilized in the RANCH HAND Operation to maintain 612 sorties per month for FY "68" and to achieve 864 sorties per month for FY "69" and the following years. This letter to 7th Air Force was answered by messages dated 18 November 1967 and 3 December 1967 which will be discussed later in the briefing.

4 November 1967 - 7th Air Force sent a message referring MACV herbicide requirements, as stated in July 1967, gave current delivery capabilities, and stated that eight additional aircraft would be needed in the herbicide operation to utilize the programmed herbicide, and stated that the resultant degradation of the airlift or herbicide operation must be the decision of COMUSMACV.

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18 November 1967 - 7th Air Force gave experience factors which indicate that:

17 Aircraft presently assigned will give 506 sorties/month.

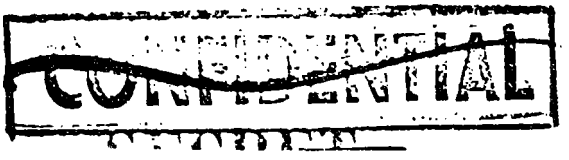
21 Aircraft would provide 625 sorties/month.

24 Aircraft scheduled for CY 68 will deliver 714 sorties/month.

28 Aircraft would provide 833 sorties/month.

Since July the requirements for herbicide for ground base spray have increased greatly. 30,000 gallons/month were programmed but 100,000 gallons were issued for this purpose in October and 200,000 gallons were issued in November. As a result of this data we were prepared to recommend that four additional C123 aircraft be converted to the spray capability from the airlift and be used for the dual spray/airlift role. At this time, a meeting to discuss this question was held between the MACV J3 and General Blood of 7th Air Force to determine the answers to certain questions pertaining to this recommendation.

On 3 December 1967 a message was received from 7th Air Force referring to the COMUSMACV Letter of 26 August 1967 and stating that the requirements of high priority airlift are too great to permit any diversion of airlift capability, that Thailand based spray aircraft should not be considered as possible augmentation of the 7th Air Force herbicide capability, it is not practical to employ aircraft in a dual role of cargo aircraft and herbicide spray aircraft; that seven additional aircraft have been approved for RANCH HAND. These aircraft are



scheduled to arrive in-country between February 1968 and July 1968. The message further stated that eight additonal UC-123 aircraft have been requested by 7th Air Force, but the prospects of approval are not bright. The CDR, 7th Air Force, concluded that the number of UC-123s for herbicide spray will not be increased beyond the seven scheduled for delivery by July 1968.

There are not likely to be sufficient aircraft to fulfill all the requests for herbicide. Proven limitations of tempreature, wind, weather and distance to target make a 1.0 daily sortie rate per aircraft realistic. Recommended that 7th Air Force continue to be furnished a priority listing of herbicide missions so that the available spray effort may be best used to support MACV objectives. It cannot be foreseen that all the expenditures now contemplated by MACV in the FY "69 - 70" time period will be within the capability of expected airframes.

HERBICIDE AVAILABILITY

The MACV requirement for 11.9 million gallons of herbicide per year caused all civilian production of herbicide ORANGE to be diverted to the military in an attempt to supply the RVN needs. Procurement of Herbicide WHITE was increased to substitute for ORANGE, and we have now been assured that our requirements will be supplied. On 31 July 1967 the Deputy Secretary of Defense approved the ORANGE expansion program. A combination of ORANGE production at a government-owned facility with commercial tetrachlorobenzene production expansion is the route to be followed.

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The government facility will be located at Welden Springs, Missouri. The production will be 8,000,000 million gallons of ORANGE per year and will come on stream about December 1969.

PRIORITIES

During July when it became apparent that difficulties were arising concerning the requirements for herbicide operation vs capability to deliver, the senior tactical commanders were asked to submit a one-time evaluation of the effectiveness of area defoliation. Each tactical commander asked for more herbicide support and made these specific comments. Shortly before this evaluation, General Larsen told me that defoliation is the best weapon I have, but I can't get enough of it. In November 1967 during a conference at III MAF, the commanding general stated his desire for defoliation in the Con Thien Area.

Crop destruction generally has first priority because of the seasonal nature and the targets of opportunity. There was never a question from the tactical commanders about the importance of crop destruction. A recent RAND Study attacks the overall effectiveness of crop destruction, but does not consider the subject from the standpoint of the immediate assistance it gives the tactical commander. This subject will be discussed later under problems.

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Since the requirements have always exceeded the delivery capabilities, 7th Air Force has tried to fly spray sorties in accordance with priorities established by MACV. These priorities have been determined by following the MACV Campaign Plan, and receiving priorities each month from the senior tactical commanders. As an example, 400 sorties have been flown recently into War Zone D in preparation for a coming operation. This area will be well cleared by defoliants and this will furnish an excellent opportunity to determine the value of area defoliation to combat operations.

At present the highest priority is being given to the area around Con Thien. This request by the Commanding General, III MAF in support of DYE MARKER has been given such high priority that sorties in other areas are being lost so the planes can be immediately available at Danang when a break in the weather permits flying in the high priority area.

During January - April 1967 the highest priority was given to the area south of the DMZ. This area should be retreated and kept clear because the FACs in this area have stated that defoliation has been helpful in spotting ground movement.

PROBLEMS

Delays in processing Requests - greatest problem in the program. It is not unusual for three to five months to elapse from

the time a project is originated until it is approved for execution. It is not uncommon for these projects to be held at the AMEMB for two months, and recently, USAID held projects for as long as five weeks. These excessive delays together with the length of time it takes the herbicide to work make the program very unresponsive to any immediate needs. These delays have caused us to try the large area concept whereby large areas are approved for defoliation and crop destruction without specific targets designated. Then when the tactical commander determines that he has a valid target, the coordinates are checked with JGS and MACV and the project can be scheduled for flight in a few days.

Recently, USAID has nonconcurred in this large area concept. Although all CORDS and civilian personnel in responsible positions in the immediate area agreed with the projects, USAID said that blanket authorization constitutes a waiving, not an exercise of responsibility. They said although they were sympathetic to the requirement for shortening the lead time on authorizations, they contend that a change in sign-off procedures will accomplish the same goal without an abdication of responsibility. They held this project five weeks before making this comment. Because of these unacceptable delays, one field force commander has requested that the approval of helicopter spraying be delegated to the field force commanders. General Vien, JGS, has concurred in this change, and a letter is now at the AMEMB asking Ambassador Bunker to agree with this delegation of authority.

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Rubber Danage - about April 1967 some frenchmen complained to the AMEMB that herbicide apray had damaged their rubber plantations. There had been some rubber damage because RANCH HAND planes had sprayed out of target into and near rubber plantations. The claim was made that damage had been done to 22 rubber plantations. The AMEMB organized a team to inspect these plantations. 16 of the plantations were inspected, and evidence of herbicide damage was present in seven plantations. The extent of the damage could not be determined until the rainy season. This would give some indication of how many of the affected trees would recover. In July 1967 the AMEMB sent another team into the field to look at these trees and the two specialists sent by the AMEMB could not agree on the results.

In spite of the differences in opinion, MACV has agreed to extend the buffer zones around rubber plantations from two kilometers to five kilometers. It was emphasized that this concurrence in the buffer zones was given to help alleviate a sensitive political situation and to assist the newly elected government of RVN.

During this inspection and the following reports there was much discussion of drift of herbicides and drift of the vapors of herbicide. These points were never proven, but AMEMB has now proposed a message to SECSTATE stating that significant damage has been done to rubber trees, and has explained the questionable drift issue as a reason for the damage.

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presented for damages. She said that it appears unlikely that any of the farmers will be compensated because the petitions were automatically shelved. She said the inspections to obtain proof of damage by defoliants are very difficult because of the lack of experts to investigate and the bureauatic red tape. She stated that undoubtedly, military benefit was derived from the defoliation, and undoubtedly, defoliation undercut GVN RD programs. But what was missing in this situation was any hard-nosed weighing of the one against the other.

Ambassador Locke directed that this situation be looked into, and it was found that 3000 petitions did not exist. Some claims for damage, although they had been held up for a while, are now being processed. Several USAID agricultural men had looked at the crops where damage was claimed and there was no definite conclusion that the damage was caused by herbicides. An inspection of a manioc field indicated that only manioc was affected, none of the weeds or surrounding rubber trees. It is not normal for herbicide to be so selective as this situation indicated. The closest RANCH HAND planes had been within four kilometers of the area while treating War Zone D. However, the people were convinced that the herbicide was the root of all their problems, and the agricultural advisers could not tell them what was wrong with the manioc.

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AMBASSADOR KOMER'S PROPOSAL

Ambassador Komer has suggested that MACV declare certain populated areas out of bounds for the use of herbicides. The banning of herbicides in these areas will not affect the program because projects in populated areas are not approved. The areas shown on this chart are suggested as areas where herbicides will be prohibited, and we are now looking more closely to see if these areas can be enlarge without diminishing the tactical effects of the herbice program. There may be some locations in these areas where the tactical commander will want to use ground-based or helicopter spray for local security; therefore, we want to clear these areas with the tactical commanders before the definite bans are placed on the use of herbicides. Under this proposal there will be an escape clause which will permit the use of herbicides in those cases of extreme military necessity.

CONCLUSIONS

1. The tactical commanders are not receiving the defoliation and crop destruction support requested.

2. The 17 C123s are not using the herbicide programmed - herbicide stocks are building up.

3. The seven additional C123 aircraft to be available in FY "69" will not utilize the herbicide ordered for FY "69" and the following years.

4. CDR 7th Air Force concludes that the number of C123s for herbicide will not be increased beyond the seven scheduled for delivery by July 1968.

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5. MACV could be embarressed if plant expansion is carried out and the programmed herbicide cannot be used.

6. The herbicide program is not as responsive to the tactical commanders as it should be because of the excessive time required to approve the projects.

7. Criticism of the herbicide program by civilian agencies and the press, whether fact or fancy, has caused added restrictions to be placed on the program.

RECOMMENDATIONS

1. That the FY "69" and following years' MACV requirements for herbicide be reduced by 150,000 gallons per month to reflect the 714 sorties to be provided by 7th Air Force.

2. That COMUSMACV and the US Ambassador appoint a joint MACV, AMEMB, GVN High Level Team of Tactical, Political, Agricultural and Economic Experts to study the GVN/MACV herbicide program and make appropriate recommendations. This study should determine:

Effectiveness of crop destruction

Effectiveness of defoliation

Means to expedite requests

Damage caused by herbicides

Political and economic ramifications

Excluded areas

[redacted]

MACV JOINT MESSAGEFORM

RESERVED FOR COMMUNICATION CENTER

STAFF DISTRIBUTION

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TYPE TRANSMISSION: TO / INFO	
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AIR MAIL	
COURIER: X	
PRECEDENCE	
ACTION TO: PRIORITY/COURIER	
INFO	
DTG 130830ZApr69	

C/S	SJS X 8
J1	J2 X 4
J3 A3	J4
J5	J6
AG	CHAP
CICV	CIIB
CSD	COMPT
CORDS	FWMAO
HC	HIST
IG	JOIR
MACDC	MACMA
MACOI	MACSA X 1
PROTOCOL	SJA
SOG	SURG
TNG	DMA
DODSPECREP	OSD/ARPA
TMA	DCPGLNO
IFFVLNO X 1	IIFFVLNO X 3
III MAFLNO X 1	5TH SFLNO

FROM: COMUSMACV

TO: CMDR TAF TAN SON NHUT (COURIER) 10

CG III MAF/SA I CTZ DA NANG

CG I FFORCEV/SA II CTZ NHA TRANG

CG II FFORCEV/SA III CTZ LONG BINH

CG DMAC CAN THO

[redacted] 22625 (J3)

Subj: Use of Defoliants ORANGE and WHITE (U)

Ref: COMUSMACV 21348 DTG 090845 (C)

1. (C) Policy requiring use of WHITE on targets within 10 km of active rubber plantations is hereby suspended until further notice.

2. (C) ORANGE as defoliant of choice should be used on all targets. Current stock of WHITE must be conserved to permit immediate resumption of its use in event policy reinstated.

GP4

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REGRADED ORDER SEC ARMY BY TAG PER 04038

DRAFTER	TYPED NAME, TITLE, PHONE AND OFFICE SYMBOL	RELEASER	SIGNATURE
	DAVID M. PARKER Major, USA Cml Opns Officer MACJ3-09/2815		TYPED NAME AND TITLE EDWARD BAUTZ, JR., BG, USA ACofS, J3

SECURITY CLASSIFICATION [redacted]	PAGE NO 1	NO OF PAGES 1	COPY NO 1-A

MACV FORM 237 (2-69) (MACV Staff Memorandum 105-10)

20923

HEADQUARTERS
UNITED STATES MILITARY ASSISTANCE COMMAND, VIETNAM
APO SAN FRANCISCO 96222
Chemical Operations Division

MACCOC7 4 October 1968

MEMORANDUM FOR RECORD

SUBJECT: Press Release on the Herbicide Policy Review - Background

1. A background briefing for selected correspondents was held at 1500 hours on 20 September 1968. The press was represented by key correspondents including CBS, NBC, UPI, AP, New York Times, Washington Post and BBC.

2. The Mission Agencies were represented by Mr. Eugene Rosenfeld, press representative of the American Embassy, Mr. George Anderson, Political Military Office of the American Embassy and Colonel John Moran, Chemical Operations Division, J3, MACV.

3. Mr. Rosenfeld served as moderator of the background briefing. He opened the briefing by stating that comments by the press would be attributed only to the U. S. Mission, Saigon. He requested that questions on management and economics be directed to Mr. Anderson and questions on technology, effects, and military operations be directed to Colonel John Moran.

4. The important queries of the press and responses thereto are outlined below:

a. Question - What is the purpose of employing herbicides in South Vietnam?

Answer - One of the most important problems in combat operations in South Vietnam is finding and observing the enemy in this nation of 65,000 square miles of area which is over 1/3 forest and jungle. Defoliating herbicides have the capability of improving the vertical visibility from 70 to 90 percent in 4 to 6 weeks. The improvement in visibility lasts for 12 to 16 months. Horizontal visibility is improved from 40 - 60 percent. Thus, militarily important terrain features such as enemy and friendly lines of communication, enemy base areas and avenues of approach, and friendly defensive perimeters are treated with defoliating herbicides to maintain surveillance of the enemy in these key terrain features, and to bring fire power against the enemy should he attempt to employ his forces in these areas. Crop destroying herbicides are utilized to deny food to enemy units in food scarce areas remote from population centers. This action causes the enemy to utilize combat forces for the production of food or the transport of food increasing his logistical burden and lowering his morale.

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MACCOC7 4 October 1968
SUBJECT: Press Release on the Herbicide Policy Review - Background

Previous newspaper articles have discussed crop destruction on the macro or total country basis; this is not the intent of the program. Crop targets are destroyed only in the vicinity of known enemy units located in food scarce areas in the upper highlands of South Vietnam. Thus crop destruction should only be analyzed on the micro basis. No crop destruction missions are conducted in the agriculturally rich delta area. Very few crop destruction operations are conducted in III Corps and those conducted are in mountainous areas of the northern provinces of this Corps. Most crop destruction missions are conducted in the Western provinces of II Corps and the Southern provinces of I Corps. The crop destruction program is conducted as part of the total food denial program. Other crop denial programs include selective harvesting, storage, and distribution, combined with constant policing of the avenues of commerce to deny food to the enemy. In 1967 herbicide operations were credited with destroying 120,000 tons of food - 80,000 tons of rice and 40,000 tons of broad leaf crops. This represents only 1½ percent of South Vietnam's food producing capability.

b. Question - Are there not many claims in connection with the program and if so what is the amount of these claims?

Answer - This question was answered by Mr. Anderson who stated that there are claims in connection with the program and payment is administrated by the GVN. However, there is no information available on the amount of these claims. Colonel Moran then explained that claims are almost an inherent part of herbicide operations throughout the world since herbicides are used so extensively in industrial and agricultural operations. Colonel Moran noted that in 1959, 85,000 square miles in the United States were treated. By 1965, this treatment had grown to 185,000 square miles. These treatments included vegetation control along railroad lines, power lines and forest reserves. Of particular interest is the commercial treatment of deciduous trees of the woodlands of the south to accelerate the growth of pine trees. Most of the above treatment is accomplished by aerial spray. Treatments of railroad lines and power lines are especially notable for producing accidental crop destruction claims. In 1967 industrial and agricultural herbicide operations in the United States caused claims amounting to approximately 100,000dollars in the state of North Carolina alone. It is interesting to note that in 1965, treatment of herbicide in the United States represented nearly 5 percent of the total area, while treatment of South Vietnam in 1967 amounted to only approximately 3½ percent.

c. Question - How effective was the ecological study by Dr. Tschirley? Was it not conducted mostly by air?

Answer - The ecological study by Dr. Tschirley is being released

today and your comments and conclusions can be drawn from that study which speaks for itself. Much of the ecological observations were made from low level helicopter flights, however Dr. Tschirley and ecologists and foresters from the Biological Laboratory, Fort Detrick, and USAID were inserted into several areas of III Corps where ground observations of herbicide areas were made. It is believed that these insertions were adequate and contributed significantly to the general body of knowledge of the effect of herbicide treatment on the ecology of SVN.

d. Question - What do the field commanders think of the herbicide program?

Answer - The field commanders have reported that the herbicide programs assist in providing improved observation on enemy LOC's, avenues of approach and base areas and assist in securing our own LOC's. They continue to recommend targets for treatment in various militarily important areas of SVN.

e. Question - Are these materials toxic to man, animals and insects?

Answer - We have no knowledge of any instances when herbicides used in SVN have been harmful to man, animals, fish or insects. All herbicides used in SVN are used extensively in the United States and the rest of the world for industrial and agricultural vegetation control. They are generally no more toxic than aspirin. It is possible, however, that the lack of vegetation resulting from defoliation operations may cause some animals to migrate to other areas.

f. Question - Are the agents persistent in the soil?

Answer - The agent used for crop destruction persists in the soil only 24 - 48 hours, after which the field can be plowed and replanted with expectation of greater crop yield due to the weed control provided by the herbicide treatment. The defoliation agent persists in the soil from 2 - 4 months. During the ecological study actual soil samples were taken to determine persistency and the above persistency data were substantiated.

g. Question - What part does the GVN play in the management and control of the program?

Answer - This question was answered by Mr. Anderson who explained that the United States supports the GVN in this program. No targets are flown without GVN approval. That is, the GVN initiates the military operations order to attack the target. Further, all herbicide in-country is

under GVN control and issued from GVN depots on a mission by mission basis.

5. The background briefing lasted one hour. At the close of the briefing the CBS representative stated that the Herbicide Program was completely supportable and should be told to the people of the United States. He stated that it was a good story and requested that a tape along the lines outlined above be made for release in the United States. Mr. Rosenfeld answered that such a request would be pursued with appropriate officials. After departure of the correspondents Mr. Rosenfeld stated that the background briefing was a complete success, noting the exceptionally thorough knowledge of the program on the part of the participants.

6. The BBC representative indicated a negative attitude along the following lines:

a. Dr. Tschirley's report stated that it was a bad time of the year to conduct an ecological study.

b. The observation in the study had been conducted mostly from the air.

c. The effect of herbicide operations on the water table had not been properly researched.

Other than the above no other correspondents appeared to have a hostile attitude toward the program.

John Moran

JOHN MORAN
Colonel, USA
Chief, Cml Opns Div

15

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN 48640

9 July 1968

SUBJECT: HERBICIDE M-3393

The enclosed data covers a herbicide developed along the lines of research work done at Ft. Detrick, Maryland, to produce a herbicide more effective than those now being used by the military in Vietnam and other areas.

The document contains technical data and economic evaluations so that the need for a large scale field trial for this product might be properly judged.

It would seem from the data presented on this product, M-3393, sometimes referred to as Super-Orange, that serious consideration should be given to a large scale test. This test would prove beyond a doubt, in substantiating the data, whether or not this product would provide an adequate substitute for existing herbicides or be a satisfactory alternate for those currently used.

Your study of the document is more than appreciated.

Yours truly,

A. P. Beutel, Vice President
and Director of Government Affairs

lsr

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INTRODUCTION:

As a result of the Joint Industry/Military meeting in May of 1965, relative to enlisting industry competences in helping to solve problems connected with the conflict in Vietnam, Dow introduced TORDON® to the Department of Defense in a series of meetings starting in August of 1965. The first meeting was held in the office of the Director of Research and Engineering for the Department of Defense. Dr. Chalmers W. Sherwin, Dr. Nicholas Samaras, Mr. Ted Hayward, and Dr. Charles Minarik represented D.O.D.

Following these presentations, it was suggested by D.O.D. that Dow take the TORDON message to the field in Vietnam. Mr. Clyde Bryant and Dr. Keith Leasure of Dow subsequently spent time in Vietnam and in Thailand reviewing the possibilities for use of this new highly active herbicide. In their discussions with the Field Commanders, it became obvious that TORDON 101 MIXTURE (a commercial formulation) would fill the need for a product to be used in situations where Orange was not completely satisfactory. Following this action, TORDON 101 MIXTURE (or White as it was then called by the Military) was used in operational quantities.

In August of 1966, Dow proposed to several groups in the Department of Defense that oil soluble esters of TORDON could be combined with Orange to make a broader spectrum potentially longer lasting defoliant for general use in the theatre of operations. D.O.D. suggested that evaluations should be made at an early date to examine the potential effectiveness of this combination. It was mutually agreed that it would be desirable to have some small scale evaluations conducted in forested areas similar to those in Vietnam prior to undertaking an operational evaluation.

Several combinations and ratios of TORDON ester with Orange have since been evaluated in numerous tests in Texas and Puerto Rico by the USDA with ARPA funds. Tests were also conducted in Hawaii by Dow in cooperation with Dr. Minarik's group from Fort Detrick. Later, tests were also applied in Malaysia in a land clearance operation in cooperation with the International Rubber Research Institute.

During the August of 1966 discussions on this new product, D.O.D. suggested that if small scale field evaluations were favorable, Dow should come back with a proposal in regard to moving this product into operational channels. Consequently, we have asked for this meeting with you today to present the information we have to date and the proposal.

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SUMMARY OF MAJOR EVENTS AND PROBLEMS
(Reports Control Symbol CSHIS-6)

UNITED STATES ARMY CHEMICAL CORPS

Fiscal Year 1955

Security classification will be reviewed by issuing office
1 December 1956

Historical Office
Office of the Chief Chemical Officer

December 1955

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REVIEW ON: OCT 1987

SUMMARY OF MAJOR EVENTS AND PROBLEMS

United States Army Chemical Corps (U)

REMAINDER OF BOOK

Fiscal Year 1957

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DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C.

U. S. Army Chemical Corps Historical Office
Army Chemical Center, Maryland

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SUMMARY OF MAJOR EVENTS AND PROBLEMS
(Reports Control Symbol CSHIS-6)

UNITED STATES ARMY CHEMICAL CORPS

Fiscal Year 1957

U. S. Army Chemical Corps Historical Office

August 1957

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Summary of Major Events and Problems
Fiscal Year 1957

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capability than any other ground munition system. Although all 4.5-inch rocket battalions in the Army had been disbanded, the data from the tests would be readily translated to other munitions of the same kind,[82] and would prove particularly appropriate for guidance in CCFRA project 7-57, "Tactical Employment of the 115-mm. Area Toxic Rocket." This study project would determine concepts and tentative doctrine for the tactical employment of the 115-mm. Area Toxic Rocket, T-238.[83]

(S) Project CCFRA 3-56, "The Tactical and Strategical Evaluation of RW," also completed in FY 1957, was forwarded to CONARC with the recommendation that it be distributed to all combat developments organizations. The Field Requirements Agency concluded that most targets suited for radiological attack would be dealt with most efficiently by explosive RW munitions rather than non-explosive. The exception, and these would be limited, would be those cases requiring minimum physical destruction but maximum personnel casualties. The study also pointed out that the non-explosive RW system stood out over the other weapons of minimum destruction, BW and CW, in that it was less affected by meteorological conditions, produced longer periods of denial, and was less subject to personnel protective measures.[84]

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82 (1) Interv, Hist Off with Mr Joseph Schaeffer, CCB, 16 Aug 57. (2) Quart Rev, Class Sup, Jan - Mar 57, p. 5.

83 (1) Schaeffer interv, 16 Aug 57. (2) Quart Rev, Class Sup, Apr - Jun 57, p. 4.

84 Quart Rev, Class Sup, Apr - Jun 57, p. 4.

Risk to US Armed Forces of BW Attacks

(S) In December 1954 the Corps established a project, CD-22, to study the susceptibility of man to aerosols of an infectious agent. This was the first BW volunteer program. In 1955 and 1956 volunteers were exposed to aerosols of Coxiella burnetii, the cause of Q fever, disseminated from a prototype munition in the test sphere at Fort Detrick and on the test field at Dugway Proving Ground. The program was carried on under supervision of The Surgeon General. As a result of this highly important work the Corps determined that a prototype munition which generated aerosols could infect soldiers in the field.[180]

(S) These studies were so successful that the Corps decided to continue and expand them into a more comprehensive study. The Chemical Corps and the Medical Corps drew up an agreement to define the portions of the program for which each would be responsible. Under this agreement The Surgeon General set up a special medical unit at Fort Detrick to operate the hospital facility, and in addition to provide assistance on the medical aspects of the program. In October 1956 the Chemical Corps Technical Committee established Project 4-11-01-006, Risk to US Armed Forces of BW Attacks, under which the Chemical Corps and Medical Corps would proceed. The objective of this project was to determine the risk of American soldiers to biological agents and to develop appropriate biological protective measures.[181]

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180 CmlC Consolidated R&D Annual Proj Rpt, Project 4-11-01-005, Vulnerability of Military Personnel to BW Attack.

181 (1) CCTC Item 2963, Establishment of Project 4-11-01-005, Vulnerability of Military Personnel to BW Attack, 9 Dec 54. (2) CCTC Item 3162, Memorandum, Joint Medical Service Chemical Corps Agreement on Responsibilities for the Conduct of Research and Development for Defense Against Biological Warfare, 21 Feb 56, as amended by CCTC Item 3215, 22 Aug 56. (3) CCTC Item 3240, Establishment of Project 4-11-01-006, Risk to US Armed Forces of BW Attacks, 26 Oct 56.

SUMMARY OF CBR MATERIEL ITEMS

(U)

March 1959

U.S. Army Chemical Corps Historical Office
Army Chemical Center, Maryland

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SUMMARY OF MAJOR EVENTS AND PROBLEMS
(Reports Control Symbol CSHIS-6)

UNITED STATES ARMY CHEMICAL CORPS

Fiscal Year 1958

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Fiscal Year 1958

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eight FY 1959 and 1960 Test and Field Experiment Project Proposals for inclusion in the Combat Development Objectives Guide (CDOG) 1958.[74] The stature of this publication, and of the Combat Developments program in general, was increased during the year when the Department of the Army assumed control of the publication of CDOG. Previously, it had been a USCONARC responsibility.[75]

(U) During FY 1958 the Chemical Corps expended a great deal of effort in the field of radiological warfare. During the year Lt. Gen. Carter B. Magruder, Deputy Chief of Staff for Logistics, approved a refined and consolidated statement of the RW mission of the Chemical Corps.[76] This statement read:

> The Chemical Corps is the responsible technical staff agency for the Department of the Army for the conduct of Radiological Warfare and Radiological Defense. This responsibility includes research and development not specifically assigned other services, the development of technical doctrine, the determination of requirements for and the determination of the basis of issue of equipment in conjunction with the combat development system, and provision of technical staff and field guidance. These responsibilities include technical coordination within the Department of the Army and for the Department of the Army with other governmental agencies on radiological effects or matters related thereto, except for medical aspects. In discharging these responsibilities the Chief Chemical Officer is the technical staff representative to advise on the technical aspects of radiological warfare employment and defense. He shall lend support and assistance to other staff agencies and units as appropriate. These responsibilities will be performed and coordinated within the framework of normal staff

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74 Ltr, CCmlO to CG USCONARC, 14 Apr 58, sub: CmlC FY 59 and FY 60 Test and Field Experiment Project Proposals for Inclusion in CDOG 58.

75 (1) Hilbers-Gaston-Waxman interv, 16 Jan 59. (2) DA ltr, 10 Mar 58.

76 Memo, DCSLOG to CCmlO, 17 Jun 58, sub: Chemical Corps Radiological Warfare Mission.

relationships and responsibilities. As used herein Radiological Warfare is the employment of agents or weapons to produce residual radioactive contamination as distinguished from the initial effects of a nuclear explosion (blast, thermal, and initial nuclear radiation); Radiological Defense encompasses defensive measures to be taken against radiological warfare and initial nuclear radiation.[77]

(U) The Chief Chemical Officer initially had requested this action in March 1957, and the ensuing time had been spent in the preparation and the staffing of a paper entitled "Study of the Chemical Corps Mission Responsibilities in the Radiological Warfare Field." Staff officers in the Office of the Chief Chemical Officer (OCCmlO) found parts of the RW mission in as many as eighteen different documents ranging from DF's and memoranda to notes of verbal agreements made over the telephone. In approving the mission statement General Magruder directed the Chief Chemical Officer (1) to take whatever steps were necessary to develop Chemical Corps officers as the U. S. Army experts in radiological warfare and (2) to prepare and staff with appropriate Department of the Army agencies such changes to DA publications as might prove necessary.[78]

(C) Many studies and projects sought to fill existing doctrinal gaps in the RW area. Most of these were the work of the Field

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77 This mission statement, as approved by General Magruder, appeared in OCCmlO,"Study of the Chemical Corps Mission Responsibilities in the Radiological Warfare Field."

78 (1) Interv, Hist Off with Maj Howard Schade, OACCmlO for P&D, 16 Jan 59. (2) Interv, Hist Off with Lt Col Paul Cerar and Mr Norris Sills, OACCmlO for P&D, 12 Feb 59. (3) Quart Hist Rpt, OACCmlO for P&D, Apr - Jun 58.

in rear areas.[89]

(S) Among the completed Chemical Corps Board projects was CCB 2-56, An Evaluation of the Guided Missile Program as Related to the Delivery of CBR on Ground Troops (C). The objectives of this project, assigned in April 1956, were the determination of the potential usefulness of guided missiles and the Honest John rocket for the delivery of CBR agents and the recommendation of the best CBR agent - guided missile combinations to provide an optimum CBR offensive capability against ground targets. The Board considered those agents and missiles that were slated for use until 1965. CCB 2-56 concluded that guided missiles had an excellent potential for the delivery of chemical and biological antipersonnel agents on tactical targets and all biological agents on strategic targets. A guided missile - RW agent combination was not feasible. The report contained a list of eight missile-agent combinations and recommended that first priority be given to the development of chemical and biological warheads with self dispersing, interchangeable bomblets and that the Chemical Corps should make every effort to obtain requirements for chemical and/or biological warheads for the aforementioned list of missiles. The report especially praised the unique potentials of the Matador B/Regulus II missile for anticrop and antianimal BW attack.[90]

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89 (1) Ibid. (2) CCFRA FY 58 Progress Rpt.

90 (1) CCB Progress Rpt, FY 58. (2) Quart Hist Rpt, CACCmlO for P&D, Oct - Dec 57.

(S) Another Board project completed in FY 1958 was CCB 5-57, Retention of Mustard as an Authorized Agent. The study, as approved by the Chief Chemical Officer, recommended the retention of HD as a standard agent, H as a substitute standard agent, HT as limited standard, and that HN-1 be made obsolete. The study further advised that the retention of mustard be revaluated at that time when V agents proved acceptable for combat use.[91]

(C) Included in the studies (as contrasted with projects) completed by the Chemical Corps Board in FY 1958 was a BW Agent Requirement study which determined the number of BW missiles required, the quantity of lethal BW agent to be recommended to the Army and Air Force for use in a single mission, and the estimated number of BW missions per month which the Army and Air Force might be expected to carry out. One of the conclusions of the study rejected the E120 Bomblet in favor of the development of a flettnor rotor for use in ballistics missiles and Boeing dispensers. Another study explored the concepts of employment of antipersonnel BW. The Board concluded that this form of BW could make major contributions to military operations in both general and limited wars and under nuclear or non-nuclear conditions. Moreover, its varying degree of lethality made antipersonnel BW an ideal weapon for attacking enemy troops mixed with friendly or potentially friendly civilians. This study was well received by staff chemical officers and by Army

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91 CCB Progress Rpt, FY 58.

planners in general. A similar report on the employment of CW also was well received.[92]

(S) Progress continued in two important projects which the Chemical Corps Board initiated last year. These were CCB 3-57, Field Experiments of Effectiveness of CW Munitions against Hard Targets, whose objective was self evident, and CCB 1-57, Tactical Troop Test of CBR Defensive Means. The second project, better known as JACKPOT, would determine the capability of troops to continue their mission under CBR attack. JACKPOT, carried out in collaboration with the Human Resources Research Office, George Washington University, had an expected completion date in FY 1959.[93]

(U) Several other fiscal 1958 actions in the field of Combat Developments were worthy of mention. One project, carried out at the Chemical Corps Training Command, concerned the development of work measurement criteria for the operation of an M2A1 impregnation plant with its ultimate effect on personnel allotments in the appropriate TOE. These criteria, based on the 2-shift, 24-hour operation of 1 platoon, revealed that the plant had less productivity than had been determined by a similar test during World War II, a fact largely attributed to the increased weight of uniforms. The test also disclosed a probable 50 percent increase

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92 (1) CCB Progress Rpt, FY 58. (2) Interv, Hist Off with Mr Joseph S. Schaeffer, CCB, 22 Jan 59.

93 (1) See Summary of Major Events and Problems, FY 57, pp. 52 - 54, for background of these two projects. (2) Quart Hist Rpt, CCB, Apr - Jun 58. (3) CCB Progress Rpt, FY 58.

responsibilities of the former 42d Laboratory in the evaluation of foreign equipment and materiel.

(C) During the year the 51st and the 52d Chemical Detachments (TI) were inactivated and the fate of the 503d Chemical Detachment (TI) in Camp Zama, Japan, was in doubt as the year ended.

(S) Collection activity during the year included the completion of the program sponsored by the Assistant Chief of Staff, Intelligence (ACSI), and the CIA for the interrogation of Hungarian refugees.[149] CCIA personnel interviewed nine of these people who had some experience with industrial or military chemical activities. The resulting information, some new and some confirmatory, included: (1) that Hungary was actively interested in offensive CW, especially mustard, (2) that it could not sustain chemical warfare without Soviet assistance, and (3) that the USSR and its satellites would initiate CW and RW if they felt the conditions warranted it.

(S) The Canadian Joint Intelligence Bureau asked the CCIA to participate in the interrogation of an escaped Polish Major who had had experience with the chemical branch of his country's armed forces. Not only did the interrogation result in some valuable information, but it was an indication of the good rapport that exists between this country and the Dominion of Canada.

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149 Summary of Major Events and Problems, FY 57, p. 86.

(C) An exchange of protective masks was arranged with Switzerland. Three U.S. M9A1 masks were sent to that country in return for three Swiss masks. The latter were tested by the Technical Intelligence Office at Army Chemical Center and the results sent to Chemical Corps agencies and to the Swiss government.

(S) The CCIA continued to improve techniques for the collection of information. Chemical Corps delegates to the 12th Tripartite Conference held in September in England were briefed on the subject, and CCIA provided increased guidance to collectors in the field.

(U) The year saw a number of changes in intelligence publications. A consolidated Combat Equipment Technical Intelligence Bulletin, in which the Chemical Corps was allocated almost 100 pages, replaced DA Pamphlet 30-12-1, Foreign Military Weapons and Equipment Reference Handbook, first published in 1955. The Army eliminated four types of publications -- Intelligence Collection Guide, Specific Request for Information, Intelligence Collection Memo, and Summary of Current Needs -- and replaced them generally with four others -- DA Long Range Intelligence Needs, DA Short Range Intelligence Needs, DA Consolidated Statement of Intelligence Requirements, and DA Technical and Scientific Intelligence Guide.

(S) Among the important CBR Intelligence Studies produced by CCIA were "Soviet Development and Production of G and V Agents," which concluded that the USSR had a 6 or 7 year lead over the United States in the former agent and 4 in the latter; "Economic Import to Crop and Animal Losses"; and "Role of the Soviet Chemical Service in Support of Nuclear Warfare." Other studies appeared on all known Soviet Bloc chemical units

(U) The research and development funds received from other agencies were as follows:

Source	Amount as of 30 June 1957 [156]	Amount as of 30 June 1958 [157]
Navy	$1,064,904	$634,754
Air Force	1,066,778	297,670
Ordnance	333,147	14,500
Surgeon General	405,204	150,000
Quartermaster	122,735	175,000
Armed Forces Special Weapons Project	289,616	249,016
Walter Reed	---------	104,399
Corps of Engineers	---------	27,000
Working Funds	---------	791,971

(C) At the start of FY 1958 the Corps was conducting its research and development program through 38 projects in the CW-RW area, 21 in the BW area, and 3 in the testing area. In order to keep the project program in agreement with the Department of the Army program, the Research and Development Command realigned the program in November, 1957, decreasing the number of projects in the CW-RW area from 38 to 19. In January 1958, the Command decreased the number of BW projects from 21 to 16, the action

156 CCTC Item 3323.

157 CCTC Item 3422.

The most promising group of the anti-crop agents was that composed of certain esters of 4-fluorophenoxyacetic acid, which are effective against rice, cereal grains, and certain broad-leaved plants. Negotiations were started with industry for the production of these compounds in pilot plant quantities. (SECRET)

The search for new plant pathogens was continued largely by liaison with the U. S. Department of Agriculture, and by studying new outbreaks of plant disease. Final research tests were conducted on a pathogen for rice and a pathogen for potatoes. (SECRET)

As important as the development of agents is the development of immunological and chemoprophylatic measures for the protection of troops and civilians. An important vaccine which has been sought by Camp Detrick scientists had been a new vaccine which would protect humans against anthrax. The old vaccine, which helped to prevent sheep and cattle from contracting the disease, actually caused the disease in a few cases. For this reason the vaccine could not be given to human beings. At Camp Detrick, after research extending over several years, Dr. George Wright developed a new vaccine which does not transmit the disease and may therefore be given to humans. The vaccine was tested on over one thousand people without ill effects, and is currently being assessed among the wool and hair workers in Philadelphia. This vaccine is an important guard against enemy use of anthrax as a BW agent

in any future war.[86] (SECRET)

The development of agents is but one phase of the Corps' BW program. Satisfactory munitions which are capable of delivering the agents are also under constant development. In 1953 the Corps inaugurated the ST. JO program to determine the potential military worth of selected agent-munition combinations, with particular emphasis on the E6124 1/2-lb. bomblet filled with Agent N. In this program Agent N and the bomblets were developed under high priority, a large quantity of the bomblets were procured and filled, and the munitions were tested logistically and operationally. In FY 1955 the original program was successfully completed. The only tasks remaining were a few supplementary tests, such as cold weather test and additional field assessments.[87] (SECRET)

In the past, plans for biological warfare had been carried out under the assumption that humans were susceptible to BW agents. This assumption was based on two facts; the medical evidence that man was susceptible to the

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86

(1) Draft of Speech, "The Role of Science for Peace and National Security" by Maj Gen William Creasy, before the Western N. Y. Section of the ACS, 18 Jan 55. (2) Annual Chemical Corps Research and Development BW Project Program, 31 Dec 54.

87

(1) The Ralph M. Parsons Co. Special Assessment Branch Report No. 3 Summary Report of the ST. JO Program. (2) Annual Chemical Corps Research and Development BW Project Program, 31 Dec 54. (3) Fourth Quarter FY 1955 Program Review - Primary Program 15B, Chemical Corps BW Program.

Biological Warfare Research and Development [46]

For the first time since the Chemical Corps embarked on a BW program, permission has been granted for the use of human volunteers in the evaluation of agents. A plan, drawn up at Camp Detrick, for the quantitative assessment of BW agents and vaccines has been approved by the Surgeon General and the Secretary of the Army. It is being planned to have the work carried on under contract in a medical school.[47] (SECRET)

The funds available for BW during the fiscal year amounted to $25,440,000. By 30 June, $21,966,000 (86%) were obligated. The failure to fully obligate the funds were due to delays caused by earlier attempts to place the entire BW program under contract. Approval was obtained from higher authority to continue obligation of 1954 funds through 30 September 1954.[48] (CONFIDENTIAL)

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46 Unless otherwise noted, the section on BW is based on an interview with Dr. Charles Phillips, Camp Detrick, 28 Jul 54. The Eighth Annual Report, Cml C Biol Labs, was not scheduled for publication until 16 Sep 54, and was therefore not available for this Summary History.

47 DF, DC CmlO to Hist O, CCCmlO, 3 Jun 54, sub: Summary List for Historical Report.

48 Review and Analysis of Chemical Corps Program, 4th Qtr FY 1954.

In April 1953, the Chief Chemical Officer gave an over-riding priority to the development of a liquid suspension of the agent, B. anthracis. This agent had entered the Chemical Corps BW program in World War II when extensive laboratory research and pilot plant development were carried on, and a production plant erected at Vigo, Indiana. In the post war period practically all investigations on the offensive use of the agent ceased, but attempts were continued to prepare a vaccine for the protection of human beings. In September 1951, the agent was placed seventh on the priority list of antipersonnel agents drawn up by the Joint Chiefs of Staff, and major emphasis was directed toward the first five agents. Later the potentiality of B. anthracis was reappraised with the result mentioned above. In June 1953 pilot plant production began and during the fiscal year considerable progress was made.[49] (TOP SECRET)

B.anthracis is to be used in combination with the ½-pound E61 bomb now being developed.[50] The bomb, designed for clustering in

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49 Seventh Annual Rpt, Cml C Biol Lab, 1 Jul 53.

50 The bomb is described in:
(1) Technical Progress FY 1954, Summary Report of Technical Progress in the US Army Chemical Corps BW Program, pp.115-117.
(2) Annual Chemical Corps Research and Development BW Project Program, 31 Dec 53, Project 4-04-14-006.

SUMMARY OF MAJOR EVENTS AND PROBLEMS
(Reports Control Symbol CSHIS-6)

Fiscal Year 1954

TOP SECRET ANNEX

Historical Office
Office of the Chief Chemical Officer

September 1954

Plans and Operations

In August 1953 the Chief of Army Field Forces notified the Chief Chemical Officer that a requirement existed for a tactical BW weapons system.[1] Commanders of CONUS Armies subsequently received instructions from OC AFF to include this concept in maneuvers and CPX's, and to submit appropriate comments and recommendations so that firm doctrine might be established.[2] (TOP SECRET)

Chemical annexes to the Engineer Barrier Plans for Western Europe (fourth edition) were 90 per cent complete at the end of the fiscal year. These annexes dealt with the tactical use of agents and logistic considerations in a withdrawal before advancing Soviet forces in Germany. This information was not communicated to other North Atlantic Treaty Organization (NATO) nations, because severe political complications might result from premature disclosure of American plans.[3] (TOP SECRET) (U.S. EYES ONLY)

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1 Ltr, C,AFF to CCmlO, 5 Aug 53, sub: AFF Initial Position on Tactical BW.

2 See SECRET part of this Summary for reports on Exercise FLASH BURN and SPEAR HEAD, held in April and May 1954, for some results of this directive.

3 Interv, Hist O, OCCmlO with Lt Col Samuel E.Baker, C, P&O Br, OCCmlO, 3 Jun 54.

In FY 1954 the Joint Chiefs of Staff approved, in principle, the shipment of toxics to United States Army Forces in the Far East (USAFFE). This approval carried with it the implied approval of shipments to American forces in Europe (USAREUR). As of 1 July 1954 no toxics had been shipped to either area.[4]

(TOP SECRET)

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4 Intervs, Hist O, OCCmlO with Lt Col. Martin L. Denlinger, Asst C, PT&I Div, OCCmlO and Lt Col. Charles A. Morgan, Jr, Mat Div, OCCmlO, 17 Sep 54.

Supply[5]

During the period 7-20 November 1953, a joint Chemical Corps-Air Force logistic exercise, EXERCISE BROWN DERBY, was conducted to determine the capabilities and limitations of the planned support system for supply of biological munitions to an overseas Air Force. A secondary objective was to evaluate personnel, equipment, training procedures, and command responsibilities. (TOP SECRET)

Production Development Laboratory, Pine Bluff Arsenal, manufactured a simulated agent, filled and clustered bombs with the administrative and logistical support of Pine Bluff Arsenal. Midwest Chemical Depot shipped the munitions to the Air Force under the supervision of Chemical Corps Technical Escort Detachment. Air Materiel Command, in operational control of the exercise, provided special equipment for moving the munitions to Barksdale Field, Shreveport, Louisiana, where they were loaded into two Military Air Transport Service cargo aircraft for shipment to the Air Proving Ground Command, Eglin Air

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5 This section taken from:
(1) DF, CMLRE, Brig Gen C.E.Loucks, DepC CmlO, to Hist O, OCCmlO, 24 Nov 53, sub: Summary List for Historical Report.
(2) TOP SECRET supplement to Quart Hist Rpt, Materiel Div, OCCmlO, Jan-Mar 54, dtd 4 May 1954.

Air Force Base, the exercise forward air base. (TOP SECRET)

Upon the arrival of the munitions Air Proving Ground and Air Research Development Command assessed the condition of the munitions, using a Chemical Corps procedure. (TOP SECRET)

Exercise BROWN DERBY conclusively demonstrated that Chemical Corps-Air Force logistic plans are workable. Since Production Development Laboratories is able to supply munitions on a four-day notice,[6] the exercise proved the logistic capability of the Chemical Corps and the Air Force to make an antipersonnel biological attack within a few days, in case of necessity. (TOP SECRET)

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6 See below p.8

an aimable adapter, is the tail-ejection type and utilizes combustion gases of a fast propellant powder to form an aerosol from agents in a liquid suspension. A series of drop tests were conducted at Holloman Air Force Base from June 1953 to January 1954 as part of the fuze development. A surveillance program of the agent container was begun early in 1954 and in April the first series of tests using lethal-type agent in the bomb were held at Dugway under field conditions. The bomb produced aerosol in sufficient quantity to kill up to 50 per cent of the exposed animals and seventy to eight-eight per cent of the bombs functioned when they were dropped in clusters. The second series of tests were in progress at the close of the fiscal year.[51] (TOP SECRET)

The Production Development Laboratories, Pine Bluff Arsenal (formerly X-201 Plant) were placed on an operational ready standby basis on March 15. At this plant significant quantities of filled bombs can be produced four days after receipt of order.[52] (SECRET)

Among the BW antipersonnel agents in the pilot plant state of development are Bacterium tularense, Venezuelan equine encephalomyelitis, Brucella melitensis, and Botulinum toxin. In the laboratory phase are Pasteurella pestis, and Psittacosis virus. A number of

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51 Summary List for Historical Report.

52 Ibid.

potential agents are also being screened.[53] (TOP SECRET)

By order of G-4 of the Army all research in antianimal BW, with the exception of the studies on rinderpest in Kenya, British East Africa, and the completion of the foot and mouth disease research facilities at Plum Island, was terminated as of 30 September 1953.[54] This action brought to an end, in the Chemical Corps, the projects on the diseases of poultry, swine, horses and ruminants. The defense phases of the projects in Kenya and at Plum Island (Fort Terry) were continued until 30 June 1954 to permit the Department of Agriculture to budget for and continue this work. The Chemical Corps will maintain a detail of officers with appropriate technical background at Fort Terry to keep the Corps informed of developments. Because of the directive to terminate the research in this area of the BW program, very little progress can be reported during the past year.[55] (SECRET)

53
(1) Technical Progress FY 1954, pp.3-55.
(2) Annual BW Project Report.

54
Ltr, OCCml0 to CG, Cml C R&E Comd, 18 Sep 53, sub: Antianimal Biological Warfare Defensive Program, w/Incl (Cnt#3, G-4/FI-53879, 16 Sep 53, sub: Antianimal and Anticrop Biological Warfare R & D Program, w/3 Incls).

55
A summary of the progress in antianimal research may be found in:
(1) Technical Progress FY 1954, pp.67-72.
(2) Annual BW Project Report.
(3) Eighth Annual Report of Camp Detrick. (In preparation)

Considerable progress, on the other hand, was made in the development of anticrop agents. Research resulted in improved field evaluation of potential agents, addition of 4-fluorophenoxyacetic acid as a standard-type agent, and demonstration of the high efficiency of the Aero 14A Airborne Spray Tank. (SECRET)

Whereas the previous chemical anticrop agents, butyl 2,4-dichlorophenoxyacetic acid and butyl 2,4,5-trichlorophenoxyacetate were useful for curtailing the growth of broadleaf plants, the new standard-type agent, 4-fluorophenoxyacetic acid, reduces the yields of wheat and rice materially when applied in militarily feasible quantities. The agent is produced industrially by chemical companies and is available on the open market.[56] (SECRET)

An important advance in field evaluation was the development of a miniature spraying system for disseminating liquid agents from an L-19 airplane. This system makes practicable the testing of undiluted agents on field grown crops. An effort is being made to mount the system on a truck, which can then be used at Camp Detrick. (CONFIDENTIAL)

In conjunction with the Navy, tests were made of the Aero 14A

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56 Chemical anticrop agents are discussed in:
(1) Technical Progress FY 1954, pp.56-58.
(2) Annual BW Project Report.

(FOUO) From all this information the group sought to develop simple, practical measures for improving the assessment program, without disrupting morale, projects, or organizations. Its report took the form of a series of conclusions, refined by sufficient discussion to prevent misunderstanding, and followed by recommendations and suggestions.

(FOUO) On 19 June 58 General Creasy distributed the report and directed his commanders to implement it. By following the recommendations of the Committee, the Corps hoped to improve its ability to define and to meet objectives and to provide greater responsiveness from the assessment program.[159]

Technical Operations

V-Agents[160]

(C) During the year the Corps standardized a new toxic agent, VX. The history of the V-type agents goes back several years, when chemists at Imperial Chemicals, Ltd., searching for new insecticides, came across compounds that were extremely toxic to humans. The discovery of V-agents by industrial chemists working with insecticides is reminiscent of the discovery of the G-agents in the same manner in 1936. Imperial Chemicals sent samples

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159 (1) Assessment and Related Problems. A Report to the Chief Chemical Officer, US Army, by the Ad Hoc Committee on Assessment, 1 Apr 58. (2) Ltr, CCmlO to Distribution, 19 Jun 58, sub: Report of Ad Hoc Committee on Assessment.

160 This section is based on the following: (1) CCTC Item 3386, Classification of Persistent Agent, VX, as a Standard Type, 12 Dec 57. (2) Meeting of the Engineering and Production Committee, USA CmlC Advisory Council, 26 - 27 May 58, pp. 74 - 83.

of the compound to the Porton Laboratories of the British Army, and early in 1953 a British scientist brought the information to the Army Chemical Center. Chemical Corps chemists then began experimenting with this class of compound, working closely with British and Canadian chemists. The men nicknamed the compounds "V-agents" because of their venomous nature.

(S) Since 1953 the Chemical Warfare Laboratories (CWL) have synthesized approximately 50 V-type agents. Toxicity tests indicated that one class, the phosphonothioates, were the most percutaneous toxic compounds yet discovered. VX, for example, applied to the skin of an animal is approximately 1,000 times more toxic than GB, and when inhaled is 2 - 3 times more toxic.

(S) After synthesizing and examining a large number of compounds the Corps had to choose the one best suited for military purposes. Factors that had to be considered were toxcity, difficulty of manufacture, methods of dispersion, ease of detection, treatment of casualties, persistency on the battlefield, stability during storage, rapidity of action, solubility in water, and methods of decontamination. The Corps selected VX, O-ethyl, S-2-diisopropylaminoethyl methyl phosphonothioate, as the outstanding compound of the group. VX is an odorless liquid, slightly denser than water, at times it is as clear as water, but at other times it is the color of straw. It is so toxic that 3 - 4 milligrams (a drop the size of a pinhead) on the bare skin may cause death. It may act in as little as fifteen minutes or take as long as two hours. It evaporates so slowly that it remains on the ground for days, making the area extremely dangerous. Hot soapy water, or dilute alkali may be used for decontamination. Medical

was ready for classification as a standard BW antipersonnel agent. In case germ warfare would be resorted to in the future, it was probable that B. tularense would be an agent of retaliation employed by the United States.[168]

Operation LAC

(C) Operation LAC, which received its name from the initials of the words, "Large Area Coverage," was the largest test ever undertaken by the Chemical Corps. The test area covered the United States from the Rockies to the Atlantic, from Canada to the Gulf of Mexico. In brief, the Corps dropped a myriad of microscopic particles from a plane, and determined the distance and direction these particles traveled with the wind. The Corps wanted to learn these things: would it be feasible to contaminate a large area by this method using, for example, BW organisms, and if so, what logistics would be involved.

(S) The first test took place on 2 December 1957. A C119 "flying boxcar," loaned to the Corps by the Air Force, flew along a path leading from South Dakota to International Falls, Minnesota, dispersing fluorescent particles of zinc cadmium sulfide into the air. A large mass of cold air moving down from Canada carried the particles along. Meteorologists expected the air mass to continue south across the United States, but instead it turned and went northeast, carrying the bulk of the material

168 (1) Technical Study No. 6, Military Effectiveness of Bacterium Tularense (c), Program Co-ordination Office, Fort Detrick. (2) CCTC Item 3458, 27 Aug 58.

into Canada. The test was incomplete, but it was partially successful since some stations 1200 miles away in New York State detected the particles.

(S) Dugway ran a second trial in February 1958. This time the "polar outbreak," as the Canadian cold air masses are generally called, continued on to the Gulf of Mexico, carrying fluorescent particles with it. As the air mass moved south the front broadened so that the line of particles 200 miles long at the aircraft's path had spread out to 600 miles at the Gulf.

(C) The sampling scheme set up by Dugway was quite elaborate. Scientists at Fort Detrick devised a collecting device consisting of a filter and a pump to draw the air through the filter. The filter trapped fluorescent particles in the inspirated air. A special counting device was used to ascertain the number of particles on the filter. The Civil Aeronautics Authority co-operated by having its personnel at 63 CAA stations collect samples, and the Weather Bureau did the same at 112 stations. The stations mailed the 2200 filters employed in each test to Dugway, where technicians made the count.

(S) During the spring of 1958 Dugway conducted two additional tests, this time with the wind blowing haphazardly instead of steady from the north. In the first, the plane flew south from Toledo, Ohio, and then turned west to Abilene, Texas. In the second, the course ran from Detroit to Springfield, Illinois, then west to Goodland, Kansas. Sampling stations on both sides of the flight path reported particles, proving that random flight over a target area would disperse small particles widely.

(C) These tests proved the feasibility of covering large areas of a country with BW agents. Many scientists and officers had believed this was possible, but LAC provided the first proof. While the tests were a great step forward, they did not provide the Corps with nearly as much data as the Corps would like to have had in order to predict the behavior of particles released in clouds. To obtain additional data the Corps planned further tests for the next fiscal year.[169]

One-Shot Flame Thrower

(U) During World War II one of the problems that arose in the use of flame throwers was the servicing that had to be done in theaters of operation before weapons could be used. The Corps decided that one way of by-passing this obstacle was to design a single shot flame thrower that could be shipped from the United States ready for use. Engineers worked on the weapon but did not perfect it in time for battle. Development continued until 1949, when the Corps, forced to economize, cancelled the project.

(U) During the Korean War the experiences of American troops in flame warfare caused the Corps to take up the one-shot weapon again. Aerojet General Corporation, under contract, devised a new model consisting essentially of a U-shaped aluminum tube 3½ inches in diameter, jacketed

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169

(1) Presentation by Clair B. Olsen, Meeting of the Dissemination and Field Testing Committee, USA CmlC Advisory Council, 6 - 7 - 8 Nov 57, pp. 14 - 20. (2) Presentation by Dr William W. Dorrell, Meeting of the Dissemination and Field Testing Committee, USA CmlC Advisory Council, 22 - 23 - 24 May 58, pp. 30 - 41.

(S) In keeping with the policy to assign development work to the arsenals and in consideration of the special facilities available, Materiel Command assigned the Directorate for Biological Operations production development work on the agent B. tularense which was prepared for standardization during fiscal year 1958. In all, 47 batches (2200 gallons each) of agent were prepared under an Industrial Preparedness Measure, and producibility was improved. At the same time work progressed on establishing a munitions filling capability for the agent,[233]

(S) Budgetary limitations and some undecided policy matters prohibited the Chemical Corps from engaging in active anticrop research during FY 1958. This lack of research was reflected in curtailed activity in the production field. Edgewood Arsenal continued to produce two of the naturally occuring plant disease agents, SX and TX, under a reduced program. But at the end of the fiscal year there was a sufficient amount of agent in refrigerated storage to meet Air Force requirements for operational capability under plan AMC 12-58. Although the anticrop program differed from the antipersonnel program in that anticrop production was current, munitions filling and assembly under the anticrop operational plan, as under the antipersonnel plan, was not scheduled to take place until immediate need arises. In case of need, munitions hardware was on hand, including some stocks already located in overseas bases, for approximately 4,000 M115 biological bombs;

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233 (1) Marcus-Vuicich, interv, 28 Jan 59. (2) CCTC Item 3458, 27 Aug 58.

on notification, the agent could be processed, packaged, and air shipped for final munitions assembly at overseas bases, thus providing immediate operational capability. During fiscal year 1958, production development work was being done under contract on one other naturally occuring plant disease agent, rice blast. The Chemical Corps was able to perform this production development work and much of the other work in the anticrop program during fiscal year 1958 only because funds were made available through Industrial Preparedness Measures.[234]

Industrial Mobilization Planning

(S) Industrial Mobilization planning and current procurement tended, in the Chemical Corps, to become less and less separate entities and more and more mutually supporting activities. As indicated above,[235] capability, including mobilization capability, is frequently dependant upon current procurement and production since capability develops and is maintained through the operation of current production processes. This dependance has been administratively recognized by increased emphasis placed on programming mobilization activities as an extension of current programming. Current

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234 (1) Vincent-Hewitt interv, 28 Jan 59. (2) OCCmlO, Estimate of CBR Situation, 1959. (3) Project Invertebrate (C) rpts, USA Cml Acts, E, 1957 Summer Season, dtd Dec 57; 1957 - 1958 Winter Season, dtd Jun 58; 1958 Summer Season, dtd Oct 58. (4) Quart Hist Rpts, MATCOM, Sep - Dec 57, Jan - Mar 58, Apr - Jun 58.

235 See above, pp. 132 - 33, 135 - 36.

planning reduction was $367,000 or 43.6 man years, and it was accomplished by reorganization of the procurement districts and reductions within the headquarters as discussed above. The $235,000 reduction in the maintenance of industrial reserve equipment meant the elimination of twenty-six personnel spaces by 1 November 1957 and a total of forty spaces by 1 January 1958. A $432,000 reduction in budget project 2240.4, maintenance of public housing, resulted in lowering the standards of maintenance to the expenditure of no more than fifty cents per square foot.[237]

(C) The long-range effect of the new concept was to reduce the Chemical Corps mobilization production base. At the beginning of fiscal year 1958, the Chemical Corps production base consisted of:

59 arsenal plants and lines;
9 GOCO plants;
74 package plants (including packages of special tooling);
1,574 pieces of production equipment in Industrial Equipment Reserve;
38,842 items of inspection gages and equipment;
production capacity allocated in 175 commercial facilities.

It was at once apparent that seventeen arsenal manufacturing units, more than five GOCO plants, and fourteen packages of production equipment and tooling would be excess to the new requirements. It was also apparent that production capacity allocated in commercial facilities would be curtailed; for example, sufficient requirements existed to use only two of the five planned protective mask suppliers. An exhaustive survey made during the fiscal year revealed

237
(1) Vincent-Hewitt interv, 28 Jan 59. (2) Quart Hist Rpt, MATCOM, Jul - Sep 57.

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SUMMARY OF MAJOR EVENTS and PROBLEMS United States Army Chemical Corps (U)

FISCAL YEAR 1960

April 1961

OCMH, SC No. 6 6104

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SUMMARY OF MAJOR EVENTS AND PROBLEMS
(Reports Control Symbol CSHIS-6)

UNITED STATES ARMY CHEMICAL CORPS

Fiscal Year 1960

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Fiscal Year 1960

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(C) In CMLCD 57-5, Exploitation of Tactical Chemical Warfare, approv by the Chief Chemical Officer in December 1959, the Chemical Corps Board concluded that appropriate use of chemical warfare would substantially enhance the effectiveness and versatility of the Army's capabilities and would give to the artillery the unique advantage of target effects gradatio General Stubbs also approved another CCB project, CMLCD 57-4, Exploitation Tactical BW, and decided that it should serve as a source document for futur related projects. USCONARC agreed to the recommendations of CMLCD 57-5, stating that it would direct Combat Development agencies to include where appropriate in their organizational and operational concept studies a consideration of Chemical Warfare. This USCONARC did, advising that BW, as well as CW, should be considered.[109]

(C) The Chemical Corps Board began developing the concepts of both of the above projects with the assignment of CMLCD 60-6, Concepts for Use of Chemical Warfare in Support of Army Operations, and CMLCD 60-17, Concepts for Use of Antipersonnel BW Munitions in Support of Army Operations. The former study was designed to analyze the potential role of chemical weapons in limited and general warfare without regard to time frames and to develop concepts for its employment in the Army of the future -- 1965 and beyond. The purpose of the latter project was the development of concepts for the present use of antipersonnel BW munitions as well as techniques for their

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109

(1) Ltr CG USCONARC to CCmlO 23 Aug 60, sub: Combat Development Project Report CMLCD 57-5, Exploitation of Tactical Chemical Warfare. (2) Ltr, USCONARC to Dist, 2 Nov 60, First Quarter FY 1961, Review of Combat Developments.

employment in support of the Army of the future.[110]

(U) The Chemical Corps Board acquired another test project CMLCD 59T1, Field Experiment of Operations within CW Contaminated Areas, which was to evaluate the hazards of conducting tactical operations within areas contaminated by chemical agents and to develop and test procedures which would permit troops to operate in such areas with minimum risk and with least loss of effectiveness. The U.S. Army Chemical Corps Training Command also received a test project, CMLCD 58T7, Concept and Technique for Use of Diffusion Type Protective Materiel, which had as its objective the development and testing of concepts for using diffusion-type collective protection material to provide tactical troops with optimum CBR protection.[111]

(U) As was the case last year, the Chemical Corps Board devoted a substantial portion of its FY 1960 effort to the mission of briefing high level agencies, Defense Department and otherwise, on various aspects of CBR warfare. These briefings have been well received, and the number of requests for repeat performances attest to their favorable reception. According to General Sullivan, the Board's President, this briefing mission was a significant accomplishment of his command during FY 1960, one that contributed greatly to the overall enhanced reputation of matters CBR so evident during the course of the year.[112]

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110 (1) Quart Hist Rpts, OACCml0 for P&D, Oct - Dec 59, Jan - Mar 60. (2) Sawyer interv, 10 Oct 60.

111 Quart Hist Rpt, OACCml0 for P&D, Jan - Mar 60.

112 (1) Interv, Hist Off with Brig Gen William E.R. Sullivan, 7 Oct 60. (2) Sawyer interv, 10 Oct 60.

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(U) Something of an innovation in the area of R&D advanced planning techniques appeared during FY 1960 in the form of joint R&D - user seminars, which consisted of map exercises. The first of these, Project SCORPION, was carried out in conjunction with the Marine Corps in May, 1960, and concentrated on elevated line source dissemination (i.e., airborne spraying) of selected agents in simulated tactical situations.[172]

Fourteenth Tripartite Conference

(C) The Tripartite conferees on toxicological warfare met for their fourteenth annual session during the period 14 - 26 September 1959, at Army Chemical Center. The three delegations, representing the United Kingdom, Canada, and the United States respectively, organized themselves jointly into eight subdivisions, corresponding to the eight basic aspects of CBR on the agenda. Among the recommendations approved by the conference were: (a) an increased effort in the area of genetic research as an aid in the development of new or improved BW agents, (b) high priority research and development for BW and CW alarm systems, (c) emphasis on incapacitating CW agents, (d) combat development exercises to determine problems of living and fighting in a toxic environment, (e) establishment of uniform BW aerosol assessment procedures by a Tripartite working group, (f) consideration by CW/BW research workers of the problem of the effect of radiation exposure on subsequent CW/BW

172
Interv, Hist Off with Mr. Howard M. Trussell, Adv Pl Div, Hq, RDCCM, 28 Oct 60. Project SCORPION is more fully discussed in pp. 54 - 56 above.

attack, (g) study of fallout prediction methods through the production of particles comparable to fallout for use in experiments.[173]

Dispersal Systems

(C) The major accomplishment of the year in this realm was the standardization early in the fourth quarter of the T-238 toxic rocket as the Rocket, Gas, 115-mm, M55, authorized to carry either GB or VX fillings. The rocket, designed to serve as an optimum area ground dissemination source, had been under development by Ordnance, in conjunction with the Chemical Corps, since [illegible] ground dissemination source, [illegible] the Korean War. The weapon consists of a fin-stabilized solid fuel rocket 78 inches long, the forward third of which constitutes the warhead, carrying approximately 11 pounds of agent. It is fired from a multi-tube launcher capable of handling 45 rounds simultaneously.[174] During the early months of FY 1960 the rocket successfully passed the engineering test phase, but the user tests, carried out by the Field Artillery Board, resulted in two wild rounds and a report recommending corrective changes in both rocket and launcher. The modifications were accomplished in time for check testing in March, 1960, following which the Artillery Board declared itself ready to recommend standardization. With the completion of this action in April, the Chemical Corps became possessed for the first time of a standard munition with a VX

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173 Final Report, 14th Tripartite Conference on Toxicological Warfare, pp. 23 - 54.

174 CCTC Item 3704, Classification of Rocket, Gas, 115-mm., M55 (T238) as a Standard-A Type..., 4 Apr 60.

(C) The E130R2 bomblet turned out to be the crucial difficulty in gaining type classification status for both the improved Honest John warhead and the toxic warhead being developed for the Little John rocket. It proved to need additional work in the area of fuze function; moreover, a tendency toward buildup of unacceptable pressures when the sphere was loaded made its appearance. While these problems remained to be ironed out, type classification of the two warheads had to be deferred.[178]

(C) Perhaps the most promising new development in the field of dispersal systems during FY 1960 was the commencement of a program to utilize Army combat surveillance drones as line source agent disseminators. Drones available for planning and development estimates would provide the Chemical Corps with spray tank carriers capable of speeds from 200 to over 500 knots, and with payload capacities varying from 200 up to perhaps 1,600 pounds of BW or CW agent. The prospect of more efficient line source dissemination was particularly interesting to the Chemical Corps because that method, though more dependent on weather conditions than point source dispersal, provides better coverage. Moreover, the prospect of reduction in the size of future Army missiles makes these point source vehicles less promising for the purposes of CBR warfare.[179]

178
(1) Quart Presentations, RDCOM, to CCmlO, FY 60. (2) Capasso interv, 4 Nov 60.

179
(1) Interv, Hist Off with Mr J. Rex Pimlott, Dev Div, RDCOM, 4 Nov 60. (2) Quart Presentation, RDCOM, to CCmlO, 2d Qtr, FY 60.

Agents

(C) During the first half of the fiscal year a concerted effort was made by the Chemical Corps, backed by an additional allotment of Army R&D funds, to type classify a new incapacitating agent by the beginning of calendar 1960. The effort, designated Project NEW YEAR in August 1959, centered on Sernyl (EA 2148), which was selected as the most suitable candidate agent for early standardization. The agent was a discarded experimental anesthetic turned over to the Corps by Parke, Davis and Company; it possessed both mental and physical incapacitating characteristics, depending on the dose level. The availability of information on mass production methods and clinical experience was a major factor in its selection.[182] In December 1959, however, it was learned that the minimum effective dosage was regarded as too high for practical field use. In consequence the type classification program for Sernyl was dropped.[183]

(S) While the hopes for Sernyl were disappointed, the general program for development of new incapacitating agents continued to enjoy high priority. A BW research effort to select a fast-acting incapacitating agent centered attention on staphylococcus enterotoxin as a promising candidate.[184]

182
(1) Briefing Notes, Dir Ind Opns Eng, ENCOM, 1 Jul - 30 Sep 59, p. 5.
(2) Quart Hist Rpt, CML, Jul - Sep 59.

183
(1) Quart Presentations, RDCOM, to Ch, R&D, DA, 2d and 3d Qtrs, FY 60.
(2) Interv, Hist Off with Dr Olin H. Borum, Research Div, RDCOM, 4 Nov 60.

184
Technical Program Review and Analysis, Bio Labs, FY 60, p. 5.

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Meanwhile, research in the field of CW incapacitators tended to concentrate on EA 2277 (CS 4030), one of a group of hallucinatory benzilic acid derivatives with capabilities as incapacitating agents. Toxicity studies of this compound on sub-primates were carried out, and the first tests on human volunteers were undertaken before the end of the year.[185] Research and development on viral-rickettsial incapacitators was most advanced in the case of Venezuelan equine encephalomyelitis, so much that it was scheduled for type classification before the end of the year. The agent is a virus occurring naturally as a disease of horses. In humans it causes one to four days of fever followed by three to eight days of incapacitation. There is no specific therapy for the disease. In the course of the year it was found that the strain of the virus originally scheduled for type classification in the wet-suspension form did not respond suitably to production methods. The ultimate decision reached at the end of the year was to recommend type classification for another strain. Final action was scheduled for early in FY 1961. Because of the pressure of this work on Biological Laboratories' facilities, a planned program for completing development of dry Q fever, a rickettsial incapacitating agent, was deferred for the remainder of the year.[186] A gradually increasing emphasis on

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185
(1) Quart Hist Rpt, CWL, Mar - Jun 60. (2) Borum interv, 4 Nov 60.

186
(1) Technical Program Review and Analysis, Bio Labs, FY 60, pp. 14 - 15. (2) CCTC Item 3762, Classification of the Virus of Venezuelan Equine Encephalomyelitis.., 1 Aug 60 (S).

viral-rickettsial research was a general characteristic of the year, indicated in such developments as the satisfactory completion of screening research on Rickettsia rickettsii, the causative agent of Rocky Mountain spotted fever, and the initiation of research on the pantropic strain of the Rift Valley fever virus and the two rickettsiae causing endemic and epidemic typhus respectively.[187]

(S) Development of lethal BW agents reached a milestone in FY 1960 when dry Pasteurella tularensis, a new form of the causative organism of tularemia, was type classified early in the year. A wet-suspension form had been classified the year before.[188] Generally speaking, dry agents are regarded as representing an improvement over liquid suspensions in that they are more adaptable to storage, shipping, and logistic exigencies. Research into practical drying methods for living agents began during the Korean War, and led to the conclusion that freeze-drying techniques, when modified to yield an easily milled pellet, were most suited to producing viable dry living agents of acceptable particle size and storage characteristics. Work on dry P. tularensis began in 1958 and was substantially complete by the end of FY 1959. The method adopted involves freezing droplets of a stabilized concentrated liquid culture of the agent with liquid Freon, drying the resultant pellets, and reducing the dried

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187
(1) Technical Program Review & Analysis, Bio Labs, FY 60, pp. 4 - 5.
(2) Ltr, C, Prog Coord Off, Bio Labs, to Hist Off, sub: Historical Information, FY 1960, 16 Dec 60.

188
Cf. Summary of Major Events and Problems, FY 59, pp. 98 - 99, which includes a general discussion of tularemia as a BW agent.

product to a particle diameter of about 5.5 microns through a two-stage milling operation. The stabilizer used is a protective suspension containing skim milk, sucrose, and thiourea, which serves as a coating for the organisms throughout the process. A gram of the packaged product contains about 14.7×10^9 viable cells and has a three year storage stability when stored in a dry nitrogen atmosphere at $-18^{\circ}C$. From the logistical point of view especially, successful completion of this development of the first standard dry live agent constitutes a major breakthrough in BW. Type classification of the dry agent was completed on 29 September 1959.[189]

(C) Work on lethal CW agents centered largely on the V agents. As a byproduct of study of the behavior of V agents in solution a new highly toxic compound was identified, a product of the hydrolysis of VX in neutral or slightly alkaline solutions. The new item, designated EA 2192, reacts irreversibly with cholinesterase and has an LD_{50} comparable to VX, but it requires additives before it will penetrate the skin. Further study of the compound was scheduled.[190] Research on certain highly toxic substances, notably the carbamates (typified by EA 1464) and the natural toxins found in clam siphons and the Japanese puffer fish, continued through the year. Additional quantities of the latter were isolated, and a new determination was made for the

189
(1) CCTC Item 3632, Classification of Dry Pasteurella Tularensis ... as a Standard-A Type BW Antipersonnel Agent (S), 4 Sep 59. (2) Quart Presentation, RDCCM, to Ch, R&D, DA, 3d Qtr, FY 60.

190
Quart Hist Rpts, CWL, Jan - Mar 60, Apr - Jun 60.

empirical formula of puffer poison. Much of this work was done on contract.[191]

Alarms

(C) One of the most urgently desired items in the R&D program, pending the future development of a universal alarm system, is a practical and portable field point source alarm for nerve gases. The E41 type of automatic alarm under development during FY 1960 through a contract with Radio Corporation of America is a miniaturized version of the E21, previously accepted by the Navy but rejected by the Army as too large for field use. The weight limitation placed on the developers was thirty pounds, including batteries (except for batteries needed to supply heat when operating in temperatures below 32°F). While the original concept of the E41 alarm envisaged a warning system for G agents, a V agent capability was added. Considerable emphasis was placed during the year on interchangeability of the supplied battery power source with the 24-volt power source of combat vehicles and the ability of the battery unit to be recharged using standard equipment already in the field.[192] As insurance against possible failure of the E41 under development to meet DA requirements, the Chemical Corps undertook parallel development in its own laboratories of a simplified version. By the middle of FY 1960 progress in this effort was sufficient to justify the letting of a new contract, this time with Aircraft Armaments, to carry the work forward to the point where evaluation tests could be

191
(1) Borum interv, 4 Nov 60. (2) Consolidated R&D Annual Project Rpt, 31 Dec 59, Subproject 4C08-03-016-07.

192
CCTC Item 3611, Military Characteristics for Chemical Warfare Agent Point Detection Alarm, 30 June 59.

repeatedly rejected proposals to produce toxics and other items whose production involves great hazards. The combination of this reluctance and low peacetime volume and variety of chemical procurement has meant, throughout the Corps' history, that the Corps must maintain its own facilities to insure the retention of "know-how" and capability. During FY 1960, preparations were in hand to acquire a contractor to operate an agent production and filling plant now under construction, but, although it appeared that the Chemical Corps would be able to make this unusual and significant arrangement, it was believed that such a contract would not presage toxic production by private industry. Commercial firms have repeatedly demonstrated reluctance to contend with the hazards of toxic production. It was expected at the end of the year that higher authority would study the whole problem of the future of the Army arsenal system during FY 1961.[219]

(U) The U.S. Army Chemical Procurement District, New York, the U.S. Army Chemical Center Procurement Agency, and the U.S. Army Chemical Corps District, San Francisco, remained the three Chemical Corps procurement activities in FY 1960. The New York district obligated about $13.6 million during the year. The Army Chemical Center Procurement Agency obligated approximately $6.4 million in supply procurement and $7 million in research and development procurement. The San Francisco district handled procurement actions totaling slightly more than $848,000. In addition to the procurement in these designated materiel procurement agencies, the Biological Warfare Laboratories obligated

219 (1) Mullen interv, 31 Oct 60. (2) Interv, Hist Off with Mr William E. Montanary, Log Mgmt Bd, MATCOM, 16 Nov 60.

complementary filling facility at Newport, Indiana, proceeded on schedule during FY 1960. The Chemical Corps submitted a project request in FY 1960 to provide for a munitions assembly plant to be built in conjunction with the agent plant. Project approval was expected early in FY 1961. By the end of FY 1960, Food Machinery and Chemical Corporation, the prime contractor, and The Lummus Company, the principal subcontractor, had nearly completed the design and engineering work and had completed 49 percent of the actual construction on the agent process and filling plants. The target dates set at the end of the year were as follows:

Chemical Plant and Process Complete	23 Jun 61
Filling Plant Complete	23 Jun 61
Waste Disposal Well Complete	15 Aug 60
Step O Construction Complete	23 Jul 60
Step I Construction Complete	15 Aug 60
Step II Construction Complete	30 Aug 60
Step III Construction Complete	1 Oct 60
Machinery Installation Complete	31 Jan 61
Operating Shakedown Commence	23 Jul 60
Formal Trial Operation Commence between	1 Aug and 1 Oct 60
Trial Operation Complete between	1 Jan and 1 Mar 61[252]

(C) The contractor reported no major technical problems in plant construction or process development. Minor problems and delays were attributed to bad weather, a brief labor dispute, shortage of equipment, a lack of instrumentation, and difficulties in coordinating process plans between Chemical Corps and contractor agencies. All of these problems were resolved by the end of

252 (1) Mullen interv, 31 Oct 60. (2) Interv, Hist Off with Mr William J. Ellenberger, Log Div, OCCmlO, 1 Nov 60. (3) File, 7 Aug 59 to (not closed), sub: Progress Reports for Newport Chemical Plant, maintained by Installations Br, Log Div, OCCmlO. (Hereafter cited Progress Rpt File) Especially MRS, C, Log Div, OCCmlO for Dep CCmlO Incl Progress Report Nr. 12, 6 Jul 60. (4) Readiness Rpts, 1 Aug 59, pp. 91 - 92; 1 Nov 59, pp. 91 - 92; 1 Feb 60, pp. 27-28; 1 May 60, pp. 29 - 30; 1 Aug 60, pp. 29 - 30.

SUMMARY HISTORY OF CHEMICAL CORPS ACTIVITIES 9 SEPTEMBER 1951 TO 31 DECEMBER 1952

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viewing devices. The Chemical Corps worked on an anti-radar agent to counter radar dependent items such as VT fuzes, and search and scanning instruments.

Biological Research and Development

The field of biological warfare (BW) received more and more emphasis from every standpoint. Work on BW agents led to the standardization of an anti-personnel agent.

Plant pathogens received the most attention in the anti-crop field and one agent was standardized. Two chemical growth inhibitors were proposed for standardization.[22]

Progress in the field of animal diseases was handicapped by a complete lack of facilities, and the bulk of research on anti-animal agents had to be conducted by contracts and by other government agencies such as the Department of Agriculture. It was hoped that the activation of Ft. Terry in the spring of 1952 would meet with success in the study of certain animal diseases when the work of rehabilitation and the new facilities there were completed.[23]

22
(1) Report of Cml C Bio Labs for 1 Jul 51-30 Jun 52, Rpt Series No.6, 1 Sep 52.
(2) Interv Hist O CC Cml O with Lt Col J.G. Appel, Exec O, R & D Div, CC Cml C, 22 Jan 53.

23
(1) DA GO 45, 25 Apr 52.
(2) Hist Rpt of Ft Terry, 1 Jan 51-30 Jun 52.
(3) Public Law 496 (82nd Cong) prohibited work with the agents of certain animal diseases on the U.S. mainland.

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Work on BW munitions led to the standardization of the M114 bomb for dispersion from the M33 cluster. Development and engineering tests on other bombs were in progress. Furthermore, a number of field trials with BW agents took place during this period.

Large scale studies were made with aerosol cloud travel as well as the behavior of aerosol clouds over two U.S. inland cities. In OPERATION DEW a fluorescent chemical was released as an aerosol from a Naval minesweeper steaming along the southeast coast of the United States. The results indicated that it was possible to achieve long-range aerosol cloud travel and consequent coverage of thousands of square miles by the dissemination of relatively small amounts (250-lbs) of tracer material under low level temperature inversion.[24]

The Biological Laboratories made a very detailed study in connection with the important problems of drying, grinding, and sizing of BW agents for the BW dry agent program. As a result of this study and of guidance in this area, a large program in the field of drying has been undertaken, largely by contract.[25] That increased emphasis was given to the whole BW program can be judged by the considerable expansion of facilities and effort that took place during this period. At the close of 1952 there was a major construction program in progress at Camp Detrick, amounting to about $30,000,000 for FY 1953, which reflected the increased concentration on the development of end items.

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24 Rpt of Chl C Bio Labs for 1 Jul 51-30 Jun 52.

25 Interv Hist C CC Chl O with Col M. Moree, Spec Asst for BW, R & D Comd, 18 Feb 53.

Radiological Research and Development

The Radiological Warfare program was a new one to the Chemical Corps, having begun in 1949 with the decision to conduct an operational evaluation of RW as a weapons system.[26] Until 1951, however, the Chemical Corps was committed to the use of radioactive tantalum, thereby competing directly with atomic warfare work since both required pile neutrons.[27] Progress in RW research was so rapid as to advance the date for supplying data to the Weapons System Evaluation Group (WSEG) for the evaluation of RW as a munitions system by one year. By the end of 1952 the Chemical Corps was also in the final stages of development of aerial munitions systems. There was a highly aimable 750-lb bomb carrying 500-lbs of radioactive hydroscopic pellets with an activity of about one megacurie. This bomb was capable of contaminating between 0.07 and 1.0 square miles. Work on this project was terminated for the moment, however, because of the desire for concentration on large area targets.

The most significant development in aerial dissemination came in the investigation of spherical munitions as a means of solving the biggest problem in aerial RW, that of dispersion. Since spheres lack good ballistic characteristics they provided far better dispersion.

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26 DA SR 10-350-1, 15 Sep 49

27 Interv Hist O CC Cml O with Lt Col T.F. Cook, Ch, Special Proj. Div., R & E Comd, 9 Feb 53.

BW likewise benefited from this work since it, too, requires adequate dispersion for maximum effectiveness. The use of ribbed spheres to impart a spin to the bomb further increased the pattern size. An additional modification called the composite sphere (E96R4) enlarged the diameter of the pattern.

The problems of shielding aircraft crews, dissipating the heat due to self-absorption of radio-activity, and the mal-effect of radiation on primers and initiators were overcome. The ground handling equipment presented no problem since weight was not considered a critical factor.[28]

From the 21 August 1952 briefing on BW for the Chief of Staff, General J. Lawton Collins, the Chemical Corps acquired the task of studying an BW ground dissemination weapons system to be employed by ground troops, and work was authorized by Chemical Corps Technical Committee action on 2 December 1952.[29] Despite this direction for work no additional funds were provided. This led to the rescheduling of FY 1953 Chemical Corps funds in order to find the money for this phase of the BW program. A number of ideas resulted from this study. One envisaged a truck-trailer combination to contaminate important roads by metering the 'hot' agent into a liquid binder and spraying it onto the road. An aerosol munition or smoke generator was suggested as a means of contaminating key industrial buildings, power

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28 Ibid.

29 (1) DF, AOofS (G-3) thru AOofS (G-4) to CG Cml C, 25 Aug 52, sub: 21 August Briefing for the CofS on BW, and 1st Ind, CG, R & E Comd to C Cml C, 8 Oct 52.
(2) CCTC Item 2578, Meeting No.5, 2 Dec 52.

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facilities, mines, etc., while they are still in our possession in order to deny their use without physical destruction.[30] A big problem here was the discovery of what makes particles stick to surfaces. The greatest potential of this ground BW is from the defensive aspect, notably in withdrawal.

Defensive Aspects of Research and Development

The fields of detection, protection, and decontamination of CBR agents showed some definite advances. Adequate methods of identification existed for all CW agents except the G-agents, and detection of the latter in time to prevent casualties was a continuing problem, for an automatic device is necessary. One of these automatic alarms had already been developed for fixed installations, and three field alarms for G-agents were under development. Meanwhile the Chemical Corps had improved the M9A2 Chemical Agent Detector Kit by the addition of indole and sodium pyrophosphate peroxide solution which were used with an air-sampling pump for the detection of G-agents. This did not provide a timely-enough warning of the presence of G-agents, however.

In the field of defensive BW the ability to detect rapidly and identify BW agents was a most urgent and elusive problem. Rapid warning devices to indicate an unusual increase in the atmosphere of bacteria, high protein count, or numbers of micron-sized particles

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30 Draft, Speech by Brig Gen Wm M. Creasy, to be delivered at Ft McClellan, Ala., 13 Mar 58, sub: Research and Development in the Chemical Corps.

steam will not damage the contents of the compartment.[34]

Proving Activities

On the recommendation of the Chemical Corps Advisory Council the Environmental Surveillance Testing of Chemical Corps weapons, munitions, and equipment was moved from Dugway Proving Grounds to Edgewood Proving Grounds in February 1952, thereby permitting the planning of more extensive and comprehensive tests.[35] At the same time Dugway was freed from diversionary efforts and allowed to concentrate on the toxic effects program. Under the Environmental Surveillance Testing program the Chemical Corps was to participate in the establishment of three permanent installations at Panama, Yuma (Arizona), and Big Delta (Alaska) for army-wide use.

Flame, smoke, and non-toxic munitions continued to be tested at the Edgewood Proving Grounds. At Dugway in the spring of 1952 the Chemical Corps made an important advance in the area of anti-crop agent testing. That October an operational suitability test on E/ bombs was conducted in the most extensive test yet held. General problems confronting the Dugway Proving Grounds and the Environmental Test Teams included a lack of suitable housing and recreation facilities, thereby encouraging a high turnover of civilian personnel.[36]

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34 Rpt of Cml C Bio Labs, 1 Jul 51-30 Jun 52.

35 Interv Hist O CC Cml O with Lt Col Zim Lawhon, Ch, Proving Grounds Div, R & E Comd, 6 Feb 53.

36 Ibid.

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SUMMARY OF MAJOR EVENTS AND PROBLEMS
(Reports Control Symbol CSHIS-6)

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4 September 1953

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SUMMARY OF MAJOR EVENTS AND PROBLEMS
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In the closing days of the fiscal year an innovation in policy was introduced when the Chemical Corps was directed to let contracts on as large a part as practicable of its BW and R & D programs.[13] Heretofore contracts had been let out on part of this work, but the new policy was toward much larger contracts. (SECRET)

Nor was the new policy confined exclusively to BW and R & D contracts, but it extended also to procurement contracts. On 24 June the Chief Chemical Officer recommended to the ACofS (G-4), that nerve gas production at Rocky Mountain Arsenal be let out on contract.[14] ~~This was the [illegible] history of the Army that a proposal had been [illegible] to operate a [illegible] plant.~~ (SECRET)

Deleted per instructions [illegible] 30 Sept 53

Organizational Developments

Certain organizational changes were effected in the Corps as a consequence of the Killian Report.[15] The Research and Development Division in the Chief's Office underwent a complete reorganization.

13 Memo for Record, 26 Jun 53, sub: BW Program Contract Proposal to Matheison Chemical Company. In executive files, R & E Div, OC Cml O.

14 1st Ind C Cml O, 24 Jun 53, on ltr fr Asst CO, Mat Comd to C Cml O, 23 Jun 53, sub: Proposed Contract No. DA-11-021-Cml-469(PO-CH3-354).

15 In May the Killian Committee reconvened and invited the Chief Chemical Officer, General Bullene, to comment on developments in the Corps under the Killian concept. No report of the Committee's findings had appeared as of 30 Jun 53.

Work in the $7,200,000 construction program for the permanent Chemical Corps Training Command facilities at Fort McClellan was 31 percent complete by the end of FY 1953. With a few minor exceptions, Area 32, the 2000 man troop housing area, was completed on 29 May 1953. By 1 June 1953 the area housed the 100th Chemical Group, the Composite Troop Unit, the Chemical Corps School Detachment, and students of the Chemical Corps School. (RESTRICTED)

Table No. 3 summarizes the value of Chemical Corps' facilities and construction pending at the end of the period (under consideration). (CONFIDENTIAL)

General

Early in the second half of the fiscal year, the policies and purposes of a new secretary of defense made themselves felt. Their most immediate effect was a curtailment of activities in line with new budgetary limitations. Downward revisions of FY 54 budget were announced and instructions were issued that expenditures during last quarter of FY 53 would be scaled down to conform therewith. Influence on Chemical Corps financing is shown by the chart and table on page 7 in Appendix A. This effected particularly activities of Research and Development and Materiel Commands. (SECRET)

Other new policies of concern to Chemical Corps were (a) greater employment of civilian agencies in research and development, (b) curtailment of work at arsenals in favor of civilian producers, and (c) centralization in higher echelons of civilian control of technical corps activities. The prompt implementing of all of these new policies required the constant attention of the Chief, Chemical Corps, during the latter months of the fiscal year, as well as close staff supervision by appropriate divisions of his office. (RESTRICTED)

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RESEARCH AND DEVELOPMENT IN THE CHEMICAL CORPS

Administration

Generally, the research and development programs continued to be directed toward the completion of short-term developments, which was necessarily at the expense, to some extent, of basic research. Emphasis was placed on end item development, on weapons and munitions for the dissemination of the nerve gases (G-agents), and on the entire field of biological warfare. (CONFIDENTIAL)

As indicated above[1], several organizational changes took place during the latter six months of the fiscal year as a result of the Killian Report.[2] During the period there was a slight increase in civilian personnel, but the number of Enlisted Scientific and Professional Personnel dropped from 968 (31 December 1952) to 875 (30 June 1953).[3] (RESTRICTED)

The Fiscal Year 1953 funding program had called for the expenditure of approximately $41,500,000 for research and development activities. By 30 June 1953 the amount actually obligated was $38,411,394 (see Table 1) of which approximately 42 percent was for biological warfare, 30 percent for chemical warfare, 9 percent for atomic warfare, and the remainder for miscellaneous activities.[4]

(SECRET)

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[1] See page 10

[2] See charts 1, 2, 3

[3] Figures furnished by the Office of the Comptroller, R&E Command

[4] Ibid. For further details see "Summary of the Chemical Corps Program", Appendix A to this rpt, p.19

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Chemical Research and Development

During the period from January to June 1953, research and development proceeded in both the offensive and defensive aspects of chemical, biological, and radiological warfare. The search for new toxic agents continued, and hundreds of compounds that had possible toxic chemical structures were considered. The interest was not confined to gaseous substances, but extended on a larger scale to poisonous solids.[5] (SECRET)

Methods of disseminating Sarin (GB) by bombs, spray tank, shells, and other means continued under development. Work was begun on a 750-lb. cluster, comprising 126 3-pound vase-shaped bombs to disseminate Sarin from high speed aircraft. In the GB 1000-lb. cluster class, the E101R3, carrying 76 GB-filled bombs, was modified for external stowage, and the bombs (E54R6) were put through all tests with the exception of the USAF operational suitability tests. For the dissemination of GB vapor by means of airplane spray tanks, a tank, E28, capable of being externally mounted on jet aircraft was developed, and later modified (E29) to utilize the ram-jet principle. Studies were likewise made on the dosage of GB vapor obtainable from

5 Quart Hist Rpt, Cml C Advisory Council, Jan-Mar 53.

spray tanks. The 4.5-inch GB rocket, T164, underwent final engineering tests. Because the 4.2-inch GB mortar shells behaved erratically during ballistic tests, redesign was necessary. Standardization of 105-mm. and 155-mm. Sarin-filled artillery shells was delayed at the request of the Ordnance Department pending development of a device of detecting leaks. Research on the thermal dissemination of Sarin was continued in an effort to formulate a pyrotechnic mixture that would not destroy the agent.[6] An ingenious thermal generator having two compartments, in one of which was a thin walled collapsible tube, and in the other a fuel block, was developed. When put into use, the gases from the burning fuel exerted pressure on the tube, and forced out the agent through an atomizing nozzle.[7] (SECRET)

In the field of guided missiles, an experimental investigation was undertaken to determine the principles governing the use of chemical warheads. Development of both toxic and incendiary warheads for strategic surface-to-surface and air-to-surface missiles continued, and missiles carrying BW bombs were tested, using inert E61R4 bombs.[8] (SECRET)

6
(1) Interv Hist O, CC Cml O with Lt Preston C. Rogers, Toxic CW Div, R & E Comd, 29 Jul 53.
(2) Quart Hist Rpt, Cml C Advisory Council, Jan-Mar 53.

7
Semi-annual Progress Rpt, Cml C R & D, 1 Jan-30 June 53.

8
(1) Quart Hist Rpt, Cml C Advisory Council, Jan-Mar 53.
(2) Semi-annual Progress Rpt, Cml C R & D, 1 Jan-30 June 53.

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Biological Warfare[13]

Work on BW agents reached the point where, in addition to the antipersonnel and the anticrop agents already standardized by the end of FY 1952, a number were approaching the stage where consideration could be given to their adoption as standard types. Insofar as research and development of antianimal agents was concerned, the limiting factor was the lack of facilities. Two new laboratory buildings were under construction at Camp Detrick for work on animal diseases. (SECRET)

Two chemical type anticrop agents were standardized during the latter half of FY 1953. The special advantage of these agents is their ability to withstand weathering and the fact that field concentrations are nontoxic to men and animals. Moreover, no method exists for arresting their action.[14] (CONFIDENTIAL)

Since the size of BW particles is of critical importance, the determination of methods for the reduction of dried agents to the proper size, and the collection and classification of these sized particles are essential features of the drying program. (SECRET)

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[13] Except as otherwise noted this material on BW is based on the Seventh Annual Report, Cml C Biol Labs, 1 Jul 52 - 30 Jun 53.

[14] Quart Hist Rpt, Cml C Advisory Council, Jan-Mar 53.

In order to centralize responsibility and to achieve coordination on the important problem of drying BW agents, a research group was established at the Biological Laboratories during this period, a large part of whose work was performed by contract with other Government agencies and with private firms. Spray drying and freeze drying were both investigated. (SECRET)

Six pilot plants, including one for simulant agents, were nearing completion at the Biological Laboratories. At Pine Bluff Arsenal, the X-201 Plant was nearly completed by 30 June 1953.[15] Meanwhile, a new process for the production of the preferred BW antipersonnel agent was recommended to the X-201 facility, and piloting of this was began in June 1953. (SECRET)

The largest single portion of BW research and development funds, 45.9 percent, was devoted to the design and engineering of munitions. Two new aerial munitions were being developed, the first of which was expected to be ready for its agent filling in 1954. A problem still confronting the engineers was the development of a satisfactory needle size for filling the bomb with the preferred agent.[16] Two naval munitions for disseminating the BW agents were being developed and successful tests with a prototype were conducted with simulants

15 Ibid.

16 Cml C Advisory Council Newsletter No. 3, 21 May 53.

on land and off the Florida coast. A new means of BW dissemination was discovered in FY 1953. This was the ultrasonic generation of aerosols, which showed much promise and will be investigated in future munition development. (SECRET)

In addition to tests with BW agents and munitions conducted at Dugway Proving Ground, Eglin Air Force Base, and a number of other places, field trials with simulant agents were held at Fort McClellan, Alabama (SHORTHORN I & II) in the fall of 1952. The objective of the latter was to determine tactical potentialities of BW. The results indicated that a considerable number of casualties could have been produced in similar combat situations involving the use of pathogenic agents. (SECRET)

Radiological Research and Development

Under the Radiological Warfare program, two types of bombs had been developed by the Spring of 1953. One was an explosive, highly aimable munition, which was effective for small targets, and the other a large area munition, based on the dispersion of surface modified spheres, effective for large targets.[17] (SECRET) (RESTRICTED DATA)

By the end of the fiscal year, the RW program came almost to a stand-still as a result of a decision by the Senior Review Board, Department of the Army.[18] (SECRET) (RESTRICTED DATA)

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17 Quart Hist Rpt, Cml C Advisory Council, Jan-Mar 53.

18 See p. 9 .

Some very useful results had been attained in the three and one half years of the program's existence. These results included:[19]

(1) Discovery of a variety of agents for munitions including those utilizing waste fission products and hence not competing with the atomic program.

(2) Development of a highly aimable bomb.

(3) Development of a large-area bomb.

(4) An experimental facility placed in operation at Dugway Proving Ground for handling, processing, loading, and filling munitions of megacurie quantities.

(5) Tentative solutions to problems of transporting and transferring large quantities of radio-active agents.

(6) Some decontamination work. (SECRET) (RESTRICTED DATA)

Defensive Measures

Research and development work on detection, protection against, and decontamination of CBR agents continued to show advances.[20]

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19 Memo, Actg Dep for RW and Non-Tomic Material for Lt Col Morris Shoes, Office Assistant Secretary of Defense for Atomic Energy, 28 Jul 53, sub: Summary and Status of the RW Program.

20 See Summary History p. 20-23 for the advances in the first half of FY 1953.

Proving Activities

The Edgewood Proving Ground was deactivated on 30 June 1953.[28] This action was taken in order to reduce costs and to effect a more economical utilization of available test facilities and personnel. The functions controlling the enviromental surveillance testing installations at Yuma, Canal Zone, and Big Delta, Alaska, were transferred to Dugway Proving Ground.[29] The arctic test program at Big Delta, was authorized in November 1952, and the first detachment arrived in Alaska in May 1953. By the end of June, however, the testing program had not yet started.[30] (RESTRICTED)

At Dugway Proving Ground new grids were laid out and old ones extensively improved. Wiring and equipment for meteorological assessment was extended. An extensive series of firing tests with munitions were conducted with toxic agents, and the methods of using mustard, hydrogen cyanide and cyanogen chloride under low temperature conditions were explored. Tests were conducted on various modifications of spray tanks for dissemination of GB from aircraft, and on the capabilities of a small EW bomb under varying weather conditions.[31] (SECRET)

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28 OC Cml O, GG 9, 4 Jun 53.

29 Ltr, C Cml O to CG, R&E Comd, 15 Apr 53, sub: Discontinuance of Edgewood Proving Grounds.

30 Interv Hist O, OC Cml C with Mr. Howard E. Morton, Proving Ground Div, R&E Comd, 4 Aug 53.

31 Interv Hist O, OC Cml O with Mr. E. K. Long, Proving Ground Div, R&E Comd, 4 Aug 53.

[redacted]

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OFFICE OF THE CHIEF CHEMICAL OFFICER
ARMY CHEMICAL CENTER, MARYLAND

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IN REPLY REFER TO: 5 October 1954

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SUBJECT: Report, Summary of Major Events and Problems (Reports Control Symbol CSHIS-6)

TO: Chief, Military History
Department of the Army
Temporary Building C
2nd & R Streets, S. W.
Washington 25, D. C.

Enclosed herewith are three (3) copies of Report, Summary of Major Events and Problems (Reports Control Symbol CSHIS-6), FY 1954, as provided in Department of the Army Memorandum No. 335-80-1, 14 July 1953.

FOR THE CHIEF CHEMICAL OFFICER:

Leo P. Brophy

LEO P. BROPHY
Actg Chief, Hist. Off.

2 Incls
1. Report (in trip)
2. TS Supplement (in trip)

When the accompanying classified papers are withdrawn, this paper becomes Unclassified

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SUMMARY OF MAJOR EVENTS AND PROBLEMS
(Reports Control Symbol CSHIS-6)

Fiscal Year 1954

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SUMMARY OF MAJOR EVENTS AND PROBLEMS
(Reports Control Symbol CSHIS-6)

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process at any of the Chemical Corps Materiel Command installations at the end of the Fiscal Year.[41] (UNCLASSIFIED)

Other facilities actions included declaring excess the $29,000,000 Vigo Plant, a plant in Industrial Reserve Standby, and the declaring excess four small buildings at Pine Bluff Arsenal and a storage building at the Marshall Plant. (CONFIDENTIAL)

RESEARCH AND DEVELOPMENT IN THE CHEMICAL CORPS

Administration

The research and development program was generally directed toward the completion of short-term development, rather than toward basic research. In the field of chemical warfare the development of end items was stressed, with emphasis on the production, dissemination and detection of the G-agents. In biological warfare the production and dissemination of agent N was given top priority. Radiological warfare assumed a very minor position, with the Chemical Corps continuing research on a small scale. (SECRET)

During the fiscal year 1954 the total funds obligated for research and development was, as indicated above, $43,576,000.[42]

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41 Review and Analysis of Cml C Materiel Command Program, Hqs, MATCOM, 4th Qtr, FY 1954.

42 See above pp. 6-7.

Of this total, 53 per cent was obligated for biological warfare and the remainder for chemical and radiological warfare. The number of personnel engaged in research activities increased approximately five hundred.[43] (CONFIDENTIAL)

Chemical Research and Development

As in FY 1953, the most urgent research and development problems were associated with the large scale production of GB by the Dimethyl Hydrogen Phosphite (DMHP) process and the two alternative processes, High Temperature Methane (HTM) and Salt.[44] Continuous production of DMHP was carried on successfully in a pilot plant without the aid of internal coolant. The results of this small scale production will be of value to Site A (Muscle Shoals, Alabama) if the problem of stripping under vacuum cannot be solved. The Salt process was carried out on the pilot plant stage, steps I to III by a contractor and steps IV to V at CRL. Pilot plant development is expected to be completed in late 1954 or early 1955. The first

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43 See above pp. 19-20.

44 Unless noted otherwise, the material in chemical research is based on: C. L. Butler, F. W. Lane, G. A. Miller, E.H. Schwanke, Significant Accomplishments, Fiscal Year 1954, Chemical Corps Chemical and Radiological Laboratories. The manuscript of this report is being prepared for publication in late September or early October.

step in the HTM process, the direct union of methane and phosphorus trichloride, was successfully piloted under contract. The second step, the oxidation of the step I product to methyl phosphonyl-dichloride, is under study in the pilot plant.[45] (SECRET)

In searching for a material which will enhance the toxicity of GB, e.g., by reducing the volatility, increasing its ability to penetrate clothing, enhancing its percutaneous toxicity, it was found that methyl methacrylate polymer thickened the agent. The thickening time, however, is excessive and studies are being continued. (SECRET)

During the year the search for new agents resulted in the submission of 117 compounds for toxicity tests. Twenty-four of these were found to be sufficiently toxic to warrant further study. The most important candidate agent uncovered is cyclohexyl methyl-phosphonofluoridate (GF) which the Advisory Committee on New Agents recommended as a quick-acting persistent agent. The laboratory method of synthesizing the compound was investigated, and several hundred pounds will be prepared for field trials as soon as personnel become available for the work. The Advisory Committee on New Agents placed increased emphasis on naturally occuring toxic substances, and on synthetic compounds with structures related to natural toxics. (SECRET)

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45 See pp.106-114, for additional information.

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Radiological Research and Development

In World War II appreciable quantities of radioactive isotopes became available for use as toxicological weapons. Differences of opinion arose among those who believed that this type of warfare would be effective and those who were convinced it did not deserve consideration. In 1948 the Joint National Military Establishment-Atomic Energy Commission Panel on Radiological Warfare (Noyes Panel) met to consider the available information and to recommend a program designed to establish the feasibility of RW. The Noyes Panel continued to meet until 20 November 1950. Their published reports and recommendations formed the basis of the program effort during those years. In March 1950 the WSEG issued a memo outlining the requirements for an operational evaluation of RW. This involved munitions development (CMLC), agents (AEC and CMLC), decontamination (CMLC), biological effectiveness (AEC), and logistics (USAF and CMLC). The Chemical Corps research and development was to be completed through a service level test by the end of FY 1954. During the five fiscal years from 1949 through 1953 the Chemical Corps investment was approximately $10,000,000 of which $2,000,000 was for facilities. Of the $6,861,000 available for technical operations, $3,561,000 (or more than 50 per cent) was spent by contract. The achievements during

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this five year period include the following:

(1) A variety of agent formulations were developed.

(2) An explosive system was developed which combined the features of high aimability and large area contamination.

(3) A large area system was developed utilizing the principle of self-dispersion of surface modified spheres.

(4) A facility was designed, constructed and placed in operation to handle, precess, load and fill munitions with megacurie quantities of radioactive material.

(5) Some decontamination work was accomplished.[62] (SECRET)

Since the first of July 1953 the RW program has come to almost a complete halt. All tests were canceled, all development work was discontinued, all contract proposals canceled, personnel reduced from 360 to a few key men, facilities were closed down,[63] and support by

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62 Lt Col T. F. Cook, Summary and Status of the RW Program, file No. REC-RDS-335 (53).

63 The QMC is using the Dugway Able Area Facility to conduct a portion of its food irradiation program.

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SUMMARY HISTORY OF CHEMICAL CORPS ACTIVITIES

9 SEPTEMBER 1951 TO 31 DECEMBER 1952

Prepared By

HISTORICAL OFFICE
Office of the Chief Chemical Officer

February 1953

[redacted]

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USAF and AEC was withdrawn. The Chemical Corps asked for $850,000 to phase out the program in an orderly manner, but only $100,000, later increased to $325,000, was offered by the DA Senior Review Board.[64] (SECRET)

On 30 June 1954 word was received from Assistant Chief of Staff (G-4),[65] that the Chemical Corps would continue research and development on RW ground delivery systems (for the purpose of contaminating roads and for other retarding operations) to furnish ORO with data, and that the Corps would devote a minimum effort toward planning a tactical guided missile delivery system. (SECRET)

Defensive Measures

In the field of detection, greatest emphasis was placed on the development of field alarms for G-agents.[66] The E21 type, which utilizes

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64
(1) Lt Col T. F. Cook, Summary and Status of the RW Program.
(2) Quart Hist Rpt, R&E Comd, Jan-Mar 54.
Summary, pp. 3-4.

65
DF, ACofS (G-4) to C Cml O, 30 June 54, sub: Radiological Warfare, file G-4/F25805 (SF). File No. REC-54-S-2935.

66
Except where noted, the material in this section is based upon Significant Accomplishments, Fiscal Year 1954, Chemical Corps Chemical and Radiological Laboratories.

B. tularense prepared by the Corps as a standard type BW anti-personnel agent.[163]

Yellow Fever

(C) In 1953 the Biological Warfare Laboratories at Fort Detrick established a program to study the use of arthropods for spreading anti-personnel BW agents. The advantages of arthropods as BW carriers are these: they inject the agent directly into the body, so that a mask is no protection to a soldier, and they will remain alive for some time, keeping an area constantly dangerous.[164]

(C) One of the insects picked for the study was the Aedes aegypti mosquito, the carrier of yellow fever virus. This species is widely distributed between latitudes 40°N and 40°S. In the United States it occurs as far north as Norfolk, Virginia, but cannot survive the winters north of this latitude. The mosquito favors human habitations as breeding places. The female mosquito sucks blood from animals or humans, but seems to prefer humans. It takes its first meal two days after emerging from the larval stage and seeks blood again at intervals of about three days. While probing for blood the mosquito transmits yellow fever virus to the unknowing victim.

163

(1) Technical Study No. 6, Military Effectiveness of Bacterium tularense, Program Co-ordination Office, Fort Detrick, 6 May 58. (2) CCTC Item 3458, Classification of Bacterium tularense, 27 Aug 58.

164

Cml Corps Board Report, "Insect-Borne Antipersonnel BW," 25 Nov 58.

Airborne Spray Tank mounted on a F3D-1 jet fighter aircraft at Avon Park Air Force Base. The Spray Tank proved to be well adapted to the dissemination of the liquid chemical agents standardized by the Chemical Corps, and in several trials produced much more efficient spray patterns than has been produced by any dissemination system tested previously.[57] (SECRET)

Research at Camp Detrick has uncovered a high potential race of late blight of potatoes (Phytophthora infestans) that appears to be promising as an agent.[58] Testing of the race is being continued. The stem rust of rye (Puccinia graminis secale) has been adopted as a standard type anticrop agent. Production during the year brought the quantity of material on hand up to the USAF requirement.[59] (TOP SECRET)

On 8 April 1954, the CCTC standardized the Dispenser, Simulant Agent, BGI, 12 oz, AN-M1 (E14).[60] This dispenser, based on commercial insecticide generator, holds 2 grams of B.Globigii spores suspended in 300 grams of Freon 12. It will be used for training purposes in the sampling, detection, identification and decontamination of BW agents.[61] (CONFIDENTIAL)

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57 Technical Progress FY 1954, p.56

58 Ibid., p.58-60.

59 Ibid., p.63.

60 CCTC Item 2816.

61 Summary List for Historical Report

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SUMMARY OF MAJOR EVENTS AND PROBLEMS

[United States Chemical Corps]

Fiscal Year 1955

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SUMMARY OF MAJOR EVENTS AND PROBLEMS
(Reports Control Symbol CSHIS-6)

UNITED STATES ARMY CHEMICAL CORPS

Fiscal Year 1955

Historical Office
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December 1955

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($38,709,000), FY 1953 ($44,700,000), and FY 1954 ($45,316,000). While these figures show that the money available for R&D has remained relatively constant over the past four years, the volume of R&D which has been carried on with this money has, because of two factors, slowly decreased. First, there has been a constant increase of from 1.5 percent to 2 percent in the cost of supporting the program each year. Secondly, there has been an increase of from 25 percent to 30 percent in the cost of equipment and supplies since 1950. To overcome this continual reduction in the volume of R&D, the Corps requested more money for FY 1956. This was not granted. (SECRET)

Chemical Research and Development

The Chemical Corps laboratories constantly synthesize new compounds which theoretical studies or information submitted from outside the Corps indicate may be more effective than the present standard agents. Recently, by modification of the "electronegative" group of G-agents, there have been synthesized several phosphorus compounds which show considerable promise as quick-acting persistent agents, and which, in time, may replace the G-agents for general field use. These compounds were designated as Candidate CW Agents and upon recommendation of the Advisory Committee on New CW Agents, were given the following symbols:[64]

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64 CCTC Item 3036, Symbols for Candidate V-agents, 30 Jun 55.

Pg. 47 missing

Although in recent years the major emphasis in chemical research has been to produce compounds which are more lethal than the standard agents, there has been an increasing interest in the possibility of synthesizing compounds capable of causing temporary mental and/or motor incapacitation of enemy soldiers or civilians. In 1949 L. Wilson Greene, Technical Director of C&HL, prepared a preliminary report "Psychochemical Warfare - A New Concept of War,"[66] in which the possible applications of psychochemical agents were outlined. Psychochemical agents were defined as compounds which affect adversely the human mind, and/or produce physiological effects which in turn cause psychological disturbances. Literature studies were then made to compile a basic list of abnormal mental and physical symptoms of possible military significance, and to select the most promising fields of investigation leading to the compounds capable of affecting the mind. Three classes of compounds were chosen for investigations lysergic acid and its indole derivatives, the tetrahydrocannabinol series, and the phenethylamines and related substances. (SECRET)

In May 1955 the Corps established a new subproject, "4-08-03-016-05, Psychochemical Agents," with the short title, MM-1605, to uncover and develop promising agents. The military characteristics stated that the desired agent should act promptly, preferably in less than one hour; that it was desirable,

66 CRL Report ETF 1500 - 1

but not essential, that it have no permanent effect; that it should have a potency at least equal to the nerve gases; that it should have a low toxicity, be stable in storage, and be capable of being disseminated from airplanes under all environmental conditions.[67] Under this subproject, compounds were to be synthesized, and then screened to ascertain their value in causing symptoms of delusion, hallucination, mania, delirium, psychosis, depression, suicidal tendencies, paralysis, incoordination, convulsions, listlessness, weakness, headache, nausea, dizziness, defects in hearing, sight or judgment, and cutaneous disorders like urticaria. From leads which arise as a result of screening or from further literature study, it is hoped that compounds having the desired properties will be uncovered. (SECRET)

The chemical warfare agents which have received the greatest emphasis since World War II, the G-agents, still offer problems of large scale production. Present production facilities for Agent GB are based on the DMHP (dimethyl hydrogen phosphite) process. This process consists of five consecutive reactions, the first three of which result in the formation of the intermediate compound called dichlor (methylphosphonyl dichloride), and the last two of which result in GB. The first three steps are carried out at Muscle Shoals, the last two at Rocky Mountain Arsenal.[68] (SECRET)

---

67 CCTC Item 3060, Establishment of Subproject 4-08-03-018-05, Psychochemical Agents (C); Short Title - MM 1605 (U), 30 Jun 55.

68 The production of dichlor and GB is discussed under Accomplishments and Problems in Toxic Production, see below pp. 138 ff.

difficulty in developing an adapter which would open completely at the proper altitude, releasing the 10-lb. PTI-filled bomblets, but finally a satisfactory model, the M30(E5R3), was obtained. The new cluster contained 57 10-lb. PTI M74(E5R11) bomblets banded together by an M30(E5R3) adaptor. It was standardized as the M35 in December 1954.[84] (CONFIDENTIAL)

Biological Warfare Research and Development

The biological warfare laboratories at Camp Detrick, Md., constantly investigate agents which may be more effective than the agents that are standardized. During FY 1955 three new organisms were chosen for screening. These were the virus of Japanese type B. encephalitis, Richettsia rickettsii, the cause of Rocky Mountain Spotted Fever, and Variola virus, the cause of smallpox. The screening of Rickettsia prowazeki, the cause of epidemic typhus, was completed. The two most promising agents in the screening program were Coccidioides immitis, the cause of coccidioidomycosis, and Malleomyces pseudomallei, the cause of melidosis. In the laboratory phase of investigation was Pasteurella pestis, which will probably be the next agent transferred to the Process Development and Pilot Plant. In the pilot plant at Camp Detrick, B. tularense was under investigation. This agent was being studied for large scale production at Pine Bluff Arsenal.[85] (SECRET)

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84 (1) CCTC Item 2951, 9 Dec 54. (2) CRLR 348, Final Engineering Test No. 82, Cluster, Incendiary Bomb, PTI, 750-lb., E11R3, 7 May 54.

85 Annual Status Report (Formerly Technical Estimate) on the DOD BW and CW R&D Program, 10 Aug 55.

diseases in question, and experimental evidence from the use of BW munitions on animals. In October 1954 the Chief Chemical Officer, in order to comply with directives from G - 4 and DOD, directed Camp Detrick to initiate plans to obtain direct experimental evidence concerning the susceptibility of troops in the field to BW infection.[88] Because of the urgent nature of the work, the specific results desired, and the nature of the experiments, which required volunteers, a new project was set up and given 1-A priority.[89] (SECRET)

The experimental work was divided into four phases. In the first phase data on the infection of animals were determined in the test sphere. The second phase repeated the experiments on humans. Phase three determined the infectivity of animals in the field, and phase four was to determine the infectivity of volunteers in the field. At the end of the FY 1955 the Corps had completed the first three phases. The fourth phase was awaiting permission from the Secretary of the Army, which is necessary before volunteers may be used.[90] (SECRET)

Radiological Research and Development

One of the most important defensive measures which the Corps investigated was the protection of civilians and soldiers by means of a smoke screen,

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88 DF, CCmlO to ACCmlO/BW, 21 Oct 54, subj: Procurement of Extrapolation Data.

89 CCTC Item 2963, Establishment of Project 4-11-01-005, Vulnerability of Military Personnel to BW Attack, 9 Dec 54.

90 Fourth Quarter FY 1955 Program Review - Primary Program 15B, Chemical Corps BW Program.

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SUMMARY OF MAJOR EVENTS AND PROBLEMS

United States Army Chemical Corps

Fiscal Year 1956

November 1956

Chemical Corps Historical Office

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(Reports Control Symbol CSHIS-6)

UNITED STATES ARMY CHEMICAL CORPS

Fiscal Year 1956

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Chemical Corps Historical Office

November 1956

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Summary of Major Events and Problems
Fiscal Year 1956

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Tri-Service CBR Conferences

(U) In preparation for the "Service Aspects" portion of the 11th CBR Tripartite Conference to be held in October 1956, several preliminary meetings of Navy, Air Force, and Army (Chemical Corps) representatives were called.[123] During the first meeting, in January 1956, the participants developed a mechanism for tri-service co-ordination and for the "Service Aspects" agenda. At a second meeting, held in the following month, agreement was reached on the procedural steps necessary to prepare and co-ordinate the supporting papers which were to be presented for each of the agenda items. It was also decided at this meeting that conferences be continued, with arrangements provided by the Chemical Corps, and that the Chief Chemical Officer appoint the 1956 chairman of the "Service Aspects" agenda.

(C) For a final decision on the matter of agenda it was necessary to call a meeting of representatives of each of the participating nations, and on 11 April 1956 officers from the United Kingdom, Canada, and the United States met and adopted the following eight subjects as the basic topics for discussion at the "Service Aspects" meetings:

(1) Criteria for and Evaluation of Chemical Weapons Systems for Canalising and Impeding Enemy Movement on a Large Scale (C)

(2) Military Worth of CW Agents Against Prepared Positions (U)

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123 These tripartite conferences are held annually by the United States, Great Britain, and Canada. This conference has ten agendas or committees, nine of which are technical. The tenth, called "Service Aspects," is non-technical and United States participation falls under the direction of the Assistant Chief Chemical Officer for Planning and Doctrine.

(3) Considerations in the Employment of V-Agents (C)

(4) Operational Aspects of the Employment of Psychochemical Agents (C)

(5) Concepts of Use of the E-22 Type Generator (U)

(6) Problems Resulting from Radiological Fall-Out (U)

(7) Re-evaluation of the Requirements for Toxic Agent Detectors (U)

(8) Consideration of Collective Protection (U)

(U) On 25 April 1956 a third tri-service conference informally agreed on the agenda revision adopted by the meeting of 11 April 1956. The conference also heard and discussed the initial drafts of papers to be presented at the "Service Aspects" meetings and settled the procedures by which the final papers were to be formally co-ordinated and distributed.[124]

Test Rocket Battalion

(S) The Chemical Corps' major field test during FY 1956 consisted of exercises at Dugway Proving Ground, Utah, to determine the adequacy of the 4.5-inch rocket battalion as a conveyor of crash concentrations of chemical agents. This project had been assigned to the Chemical Corps Board on 25 October 1954 when it was asked to determine the capabilities and limitations of a rocket battalion in disseminating toxic agents, and also the logistical and training requirements for such battalions. It was required to formulate a suitable TOE organization and to develop proper tactics and techniques for employing the weapon.

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124 (1) Quart Hist Rpts, Combat Developments Div, OACCmlO P&D, Jan - Mar, Apr - Jun 56. (2) Brigden interv, 15 Aug 56.

worked out plans to telescope user test procurement, final development tests, and CONARC user tests. At this rate the Corps hopes to have the mask ready for type classification at the end of calendar year 1957.[200]

(S) During the development of the K13 type mask, the Corps continued to improve the standard M9A1 mask, so as to keep it at maximum effectiveness during the period needed to complete its successor. The Continental Rubber Works, under contract, produced M9A1 faceblanks in three sizes with smooth face-sealing surfaces. Continental also modified the mask to permit insertion of a speech unit-outlet valve and thus improve speech transmission.[201]

Radiological Warfare Agents

(S) During the year the Research and Development Command completed a study on the probable quantity of radioactive waste material that will be available for conversion into radiological warfare agents during the period 1960 - 1980. They found that radioactive waste will be available at industrial atomic energy plants in 1965. Thereafter the supply will increase rapidly. The Corps had been interested in this type of agent, but little effort had gone into this field recently because studies had shown that there was not sufficient radioactive material available to produce RW agents.[202]

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200 Quart Rsv, Classified Section, 2d Quart, FY 56.

201 (1) Cml C Annual Research and Development Report, 31 Dec 55. (2) Progress reports for Continental Rubber Works under contract DA-18-108-CML-5077.

202 (1) Cml C Research and Development Command, CW Labs, Outstanding Accomplishments FY 56. (2) Project 4-12-10-007-03, Ground Delivery of RW Agents, (RD).

Biological Warfare

(S) At Fort Detrick the screening and evaluation of bacteria, fungi, viruses, and rickettsiae produced additional information on C. immitis, M. mallei, M. pseudomallei, Myco. Tuberculosis, R. rickettsiae, Japanese B encephalitis, and variola. Genetic research led to the detection and isolation of a salt-resistant strain of Brucella suis which had much greater aerosol stability than the parent type. The virulence and stability of Pasteurella pestis was increased. Research was started to apply large scale tissue culture as a technique in the production of viruses and rickettsiae.[203]

(S) In munition development, four projects were completed during the fiscal year:

(S) (1) Project 4-04-14-020, Amphibious BW Aerosol Generator. This project was started in 1952 by request of the Navy Bureau of Ordnance. The munition was a mine from which the agent was forced out and atomized by pressure from carbon dioxide. It was developed to the point where a series of tests (Operation FOG BOUND) was conducted at Dugway. In July 1955 the Navy terminated the project.[204]

(S) (2) Project 4-04-14-022, 1/2-lb. Biological Bomb. This item was a small antipersonnel bomb (E61R4) designed for use in a 750-lb. airable cluster adapter. The agent was atomized from the bomb by a fast-burning

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203 (1) Tenth Annaul Report, Ft Detrick, 1 Jul 56. (2) Annual Chemical Corps Research and Development BW Project Report, 31 Dec 55. Hereafter cited as CmlC R&D BW Proj Rpt, 1955.

204 (1) Tenth Annual Report, Ft Detrick, pp. 187 - 88. (2) CmlC R&D BW Proj Rpt, 1955, pp. 247 - 52.

powder charge, initiated by an impact fuze.[205] The development was completed, and the bomb was ready for standardization.[206]

(C) (3) Project 4-04-14-023, Biological Bomb for Balloon Delivery. This bomb consisted of a gondola holding five containers of agent grouped around a heating device. A fuze opened the gondola at a preselected altitude, releasing the agent.[207] All engineering tests were completed, and standardization should follow.[208]

(S) (4) Project 4-04-14-025, BW Mine. This munition was designed to be laid in river mouths and harbors by means of submarine. It was designed to be fired from a torpedo tube, to sink to the bottom for a specified period up to two hours, and then rise to the surface and expell a cloud of atomized agent. Fort Detrick developed the aerosol generator, while the Naval Ordnance Laboratory produced the mine case. In July 1955, after successful trials, the Navy halted the project.[209]

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205 Tenth Annual Report, Ft Detrick, pp. 176 - 79.

206 Ft Detrick Special Report 251, Final Engineering Report, E61R4 and E133R3, Mar 56.

207 Tenth Annual Report, Ft Detrick, pp. 173 - 74.

208 Ft Detrick Special Report 255, Final Engineering Report on the E125, n.d.

209 (1) Tenth Annual Report, Ft Detrick, pp. 186 - 88. (2) Ft Detrick Special Report 237, Moby Dick: Sea-to-Land Travel of Simulated Aerosols generated by the XB - 14 B Mine, Aug 55.

(C) In addition, Project 4-04-14-026, 750-lb. Biological Bomb, was completed except for publication of the final engineering report; and Project 4-04-14-024, Biological Bomb, Continuous Generator, was cancelled because it did not offer significant advance over the 1/2-lb. Biological Bomb.[210]

(S) In the field of anticrop BW, the Biological Bomb for Balloon Delivery and the 750-lb Biological Bomb (both mentioned above), were completed. The Bomb for Balloon Delivery is one of the munitions being considered for use in the CD-30 project, an Army - Navy - Air Force test group concerned with the problem of completing a weapon system utilizing cereal rusts in munitions. Cereal rusts received the greatest emphasis among anticrop agents, particularly in regard to dissemination and spread.[211]

(C) In FY 1956 Project CD-22, the first attempt to obtain information concerning the vulnerability of military personnel to BW attack, was completed. In tests at Dugway Proving Ground thirty volunteers were exposed to an aerosol containing Coxiella burnetii, the cause of Q fever. These tests gave valuable data on the infectivity of this agent, and also corroborated earlier results obtained from the Horton Test Sphere.[212] This project was carried out with

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210 (1) Tenth Annual Report, Ft Detrick, pp. 174 - 75, 185 - 86. (2) CmlC R&D BW Proj Rpt, 1955, pp. 321 - 28, 337 - 44.

211 (1) Tenth Annual Report, Ft Detrick, pp. 196 - 97, 127 - 48. (2) Review and Analysis of Cml C BW Program, 4th Quart, FY 56.

212 Tenth Annual Report, Ft Detrick, pp. 203 - 04.

assistance from the Medical Department under an agreement between the Chief Chemical Officer and The Surgeon General.[213]

Standardized Items

(C) During the fiscal year the Corps completed the development of, and standardized the following items:

(U) (a) Incendiary, Emergency Document Destroyer, M3 (E12R1). This document destroyer was developed at the request of the Armed Forces Security Agency to insure complete destruction of classified or vital documents to prevent their capture and reconstruction by an enemy.[214]

(U) (b) War Gas Identification Set, Detonation, AN-M1A1 (E7). This set, which replaces the M1 set, broadens the range of gases which can be identified, eliminates the tests for Levinstein mustard and chloropicrin, and adds ampoules for identifying the newer agents (distilled mustard, cyanogen chloride, nitrogen mustard and agents of the G-series).[215]

(C) (c) Winterizing Kit, Protective Mask, M1 (E14R14). This kit was developed to extend the protective capabilities of the M9A1 Field Protective

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213 CWTC 3162, 17 May 56.

214 CWTC Item 3123, Classification of Incendiary, Emergency Document Destroyer, M3 (E12R1) as a Standard Type, 29 Nov 55.

215 CWTC Item 3125, Classification of War Gas Identification Set, Detonation, AN-M1A1 (E7) as a Standard Type and Reclassification of the M1 Set to Limited Standard, 29 Nov 55.

[redacted]

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UNCLASSIFIED

SUMMARY OF MAJOR EVENTS and PROBLEMS

United States Army Chemical Corps (U)

Fiscal Year 1959

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SUMMARY OF MAJOR EVENTS AND PROBLEMS
(Reports Control Symbol CSHIS-6)

UNITED STATES ARMY CHEMICAL CORPS

Fiscal Year 1959

U. S. Army Chemical Corps Historical Office

January 1960

Summary of Major Events and Problems
Fiscal Year 1959

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(U) The most noteworthy addition to recreational facilities at Chemical Corps installations during the year was a nine-hole golf course constructed at Dugway Proving Ground. Military and civilian personnel at the post contributed some 13,000 man-hours of volunteer after-hours labor to help complete the project. A grant of $62,500 in non-appropriated funds by the Army Central Welfare Fund provided materials, equipment, and necessary professional labor. New craft shop facilities were set up during the year at Dugway and Pine Bluff, and Army Chemical Center spent $52,000 in local and Central Welfare Fund grants to provide automatic pinsetters for its alleys.[64]

(U) One source of concern at the end of the fiscal year was the unexpectedly low profit margin currently recorded at the Army Chemical Center Post Exchange. For the five months preceding the end of FY 1959, the net profit, originally estimated at over 3 percent, was down to 0.11 percent. A study of this situation was scheduled for FY 1960.[65]

Facilities

Industrial Facilities

(U) The disposal of Chemical Corps plants considered excess to current needs and active mobilization requirements continued in FY 1959. The formal

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64 Hegdahl interv, 10 Nov 59.

65 Quart Hist Rpt, Admin Div, OCCml0, Apr - Jun 59.

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completion of the Vigo Plant sale took place at the outset of the year.[66] As of 31 March 1959 the Owl 4X Plant at Azusa, California, was transferred to General Services Administration for sale; it was formally discontinued as an Army installation in April.[67] The St Louis Plant was declared excess in December 1958, and was transferred to the Corps of Engineers for disposal action on 1 June 1959. The lessee, Monsanto Chemical Company, holds an option on the land. The greater part of the Marshall Plant reservation (seventy acres, more than 80 percent of the total) was also declared excess on 29 June 1959. The land, which fronts on the Ohio River in a region favored for industrial development, will eventually be sold to the highest bidder. Fourteen acres, containing facilities for the production of hexachlorethane and supertropical bleach, remain in the Chemical Corps reserve.[68] The southwestern corner of Rocky Mountain Arsenal, adjoining the airport of the city of Denver, was the subject of extensive negotiations, still in progress at the end of the year, aimed at making the land available for extension of the airport's runway system.[69]

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66 Summary of Major Events and Problems, FY 58, p. 34.

67 (1) Interv, Hist Off with Mr William J. Ellenberger, Log Pl Div, OCCmlO, 10 Nov 59. (2) DA GO 13, 22 Apr 59.

68 Interv, Hist Off with Mr Robert H. O'Donnell and Mr Clifford Isom, Log Pl Div, OCCmlO, 16 Nov 59.

69 Interv, Hist Off with Mr Charles L. Alberding, Dir Fac, Hq, US ACC and MATCOM, 14 Dec 59.

(U) One Chemical Corps installation substantially increased the land area available to it during FY 1959. By arrangement with the Air Force, some 407,720 acres of public land formerly assigned to Wendover Air Force Base in Utah were transferred by the Interior Department to the jurisdiction of the Army for use by Dugway Proving Ground. This act extends Dugway's range and test areas several miles into the desert west of their present limits.[70]

(U) During the first quarter of the year Congressional committees completed approval of a project to offer selected mobilization reserve facilities for outleasing under terms which would safeguard the Government's recapture rights in case of emergency. The Chemical Corps advertised as available for lease a total of ten facilities at the arsenals, three additional facilities at the Marshall Plant, and the Phosphate Development Works. Three buildings at Rocky Mountain Arsenal were leased to the Mesa Chemical Company as of 16 January 1959. At about the same time negotiations were undertaken with Monsanto Chemical Company for a lease of the Phosphate Development Works. The company's desire to have the Government assume responsibility for the cost of its unamortized capital improvements in the event of Government recapture conflicted with Army policy, however, and negotiations for a lease were finally abandoned.[71]

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70 (1) Public Land Order 1777, 13 Jan 59, in Federal Register, 17 Jan 59. (2) Alberding interv, 14 Dec 59.

71 (1) Quart Rev, Jan - Mar 59, p. 34. (2) Quart Hist Rpt, Log Pl Div, OCCml0, Jul - Sep 59.

(U) Fy 1959 saw the conclusion of a contract for the construction and trial operation of a VX production facility, a project which had been earnestly pursued by the Chemical Corps for some time past. After a succession of delays had made it impossible to receive bids in FY 1958, the task was resumed in the following year. But a question having arisen at higher echelons as to whether the invitations to bidders prepared by the Chemical Corps provided for fullest possible utilization of existing Government facilities, DCSLOG directed the Chief Chemical Officer in August 1958, to issue an amended invitation specifying consideration of all available government sites.[72] The Chemical Corps, with the aid of the Corps of Engineers, assembled the necessary information and amended the invitation accordingly. The most likely prospect among government sites turned out to be the inactivated Dana Heavy Water Plant of the AEC, at Newport, Indiana, within the Wabash River Ordnance Works. Attempts to enable prospective bidders to examine this plant produced further delays; a patent dispute had led to a restraining order by the Chief Justice of the United States which had to be modified before free access could be afforded Army reprsentatives.[73]

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72 Memo, DCSLOG for CCmlO, 12 Aug 58, sub: Invitation for Fixed-Price Proposal for Design and Construction of Classified Agent Production Facility....

73 Draft memo, [CCmlO] for Asst Sec Army (Logistics), 26 Jan 59, sub: Progress Report - VX Agent Production Facility....

The date for opening bids was finally fixed at 20 March 1959. Of the ten chemical companies invited to bid, three responded; the low bidder was Food Machinery and Chemical Company, which based its estimate on use of the Newport plant. The AEC agreed to the transfer of the plant to the Army to meet Chemical Corps needs, so a contract was negotiated with the low bidder during May 1959.[74] Final DOD approval was gained on 19 June 1959, and four days later the contract was formally awarded. Transfer of the Newport plant to the Army and the beginning of construction were scheduled for FY 1960.[75]

FMC →

Military Construction, Army (MCA)

(U) Aside from the new laboratory facility at Fort Detrick completed just after the start of the fiscal year,[76] only five minor MCA projects, costing about $731,000 in all, were completed in FY 1959. As of 30 June 1959, four projects were under construction, with final costs estimated at $1,500,000. These included two new facilities: a service club for enlisted men at Army Chemical Center and a CW Field Analysis Building at Dugway Proving Ground.[77]

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74 OCE (Asst CofE for Mil Const), Fact Sheet, 29 May 59, sub: Facilities Contract....

75 (1) Memo, Dep Sec Def for Sec Army, 19 Jun 59, sub: Facility Expansion.... (2) Installations Br, Log Pl Div, OCCmlO, Briefing for Gen Sullivan, 14 Jul 59. (3) Contract #DA-11-032-ENG-7295, 23 Jun 59.

76 Summary of Major Events and Problems, FY 58, p. 35.

77 Quart Rev, Apr - Jun 59, p. 67.

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with sufficient cobalt^{60} to give an intensity of 100 roentgens per hour. Dugway planned two other fields of the same size, contaminated with cesium^{137} chloride, for technical experiments, and one large area of from one to ten miles square suitable for operational units to solve doctrinal and tactical problems. The Navy, Air Force, AFSWP, AEC, and Civil Defense were all interested in the possibility of using the facility.[154]

(C) In June the Army awarded an 8 million dollar contract to Food Machinery and Chemical Corporation for the construction of a VX agent plant at the inactive Dana heavy water plant of the Atomic Energy Commission at Newport, Indiana. Shortly thereafter the Corps supplemented the contract to provide for a filling line for shells and missiles. The Corps has set a target date of July 1961 to go on stream with the plant. The Engineering Command had technical supervision for the design of the VX Plant.[155]

(U) During FY 1959 the Corps received permission to engage in the Army's polar research program. At Dugway a Polar Environmental Test and Research Team, consisting of an officer and two enlisted men, was established in March 1959. The Team was based at Camp Tuto, Greenland, and scheduled to start operations in July. The team's first task was to learn

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154 (1) Quart Hist Rpt, Dugway Proving Ground, Apr - Jun 59. (2) CmlC Info Memo, 16 Feb 59.

155 Interv, Hist Off with Mr Charles J. Helmer, Prog Mgmt, ENCOM, 16 Nov 59.

if a number of Chemical Corps items could be stored and operated in a polar environment.[156]

Thirteenth Tripartite Conference

(S) During the period 15 - 26 September 1958 the Thirteenth Tripartite Conference on Toxicological warfare, between the United Kingdom, Canada, and the United States, was held in Canada. Col. Graydon Essman headed the U.S. delegation. The three nations agreed on several major points, including the following: (a) research should be continued on organophosphorus compounds, specifically in areas where there is a possibility of marked enhancement in speed of action and resistance to treatment; (b) all three countries should concentrate on the search for incapacitating and new type lethal agents; (c) high priority should be given to improved prophylaxis and therapy of anticholinesterase poisoning; (d) work should be continued on BW warning devices; (e) studies should be continued on aerosols. The conferees planned to hold the Fourteenth Conference at Army Chemical Center, Maryland, 14 - 26 September 1959.[157]

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156 (1) Quart Hist Rpts, Dugway Proving Ground, Jan - Mar 59, Apr - Jun 59. (2) CCTC Item 3597, The Chemical Corps' Polar Research Program for CY 1959, 30 Jun 59.

157 CmlC Info Memo, 5 Mar 59.

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the Corps designated the compound as a standard agent. Following the United Kingdom, the Corps adopted the symbol CS to designate the agent. The letters C and S stand for the initials of two American chemists, Carson and Staughton, who first synthesized the compound in 1928.[160]

Tularemia

(S) Ten years ago in its search for biological warfare agents the Chemical Corps established a project to determine the military usefulness of Bacterium tularense. This micro-organism causes tularemia, also known as rabbit fever and deer-fly fever. The disease occurs naturally in many kinds of animals, and is passed along to man by ticks, flies, contaminated water, infected animal meat, or inhalation of infected material. Man comes down with the sickness one to ten days (most commonly three days) after being infected. The victim is prostrated with chills and fever. There are two forms of tularemia, the cutaneous and the typhoidal. The latter is much more dangerous, with the mortality rate in untreated cases about 30 percent. If pneumonia develops the mortality rate jumps to 40 percent. It is this typhoidal form which is of paramount importance as an agent. The new

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160
(1) CCTC Item 3549, Code letters for compound EA 1779, 12 Mar 59.
(2) CCTC Item 3581, Classification of Irritant Agents, CS and CS1 as Standard Types, and authorization for use in M7A1 and M25A2 Hand Grenades, the M2 Irritant Gas Disperser, and CS Capsule, 30 Jun 59.

antibiotics are quite effective in arresting the progress of tularemia infections, but they do not modify the debilitating effects of the disease. This is important because convalescence from the disease is usually slow and may extend for a period of from six months to a year. Troops, therefore, infected with Bacterium tularense could turn into long-term hospital cases, putting a strain on enemy hospital facilities as well as effectively putting soldiers out of action.[161]

(S) The micro-organism Bacterium tularense is approximately .3 micron in diameter and .7 micron long. It grows best around 37°C, the temperature of most warm-blooded animals. It is resistant for months at temperatures around freezing, but is easily killed by heat at 45°C for a few minutes. It can be grown on artificial culture media if care is exercised in controlling the conditions. There are a number of strains of the micro-organism, and the one chosen by the Corps as an agent was a streptomycin-resistant strain.

(S) Fort Detrick's BW laboratories developed and maintain the stock culture of B. tularense from which the organism was grown in large quantity

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161

(1) Project 4-11-02-19, Bacterium tularense as an Agent for BW, established by CCTC Item 1882, 14 May 48. (2) TM 3-216, Military Biology and Biological Warfare Agents, 11 Jan 56. (3) Project 4-92-02-031, Wet Suspension of Pasteurella tularense, established by CCTC Item 2876, 29 July 54.

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by the Directorate of Biological Operations at Pine Bluff Arsenal. At Pine Bluff production of the micro-organism was carried out at a temperature of approximately 37°C. The subsequent processing, storage, and handling was done at 4°C. Four degrees was picked because at this temperature the micro-organisms have a fairly long life (in a batch of the micro-organisms one-half will be alive after 40 days) and it is a temperature that can be readily maintained by standard equipment.

(S) The Corps' CP-120 program, designed to evaluate the effectiveness of E120 bomblets loaded with liquid B. tularense, had indicated that a single aircraft sortie would produce more than 50 percent casualties over an area of 16 square miles. But while the munitions are capable of causing widespread outbreaks of tularemia, they can be transported, stored, and handled logistically with no more hazard than with regular explosive munitions.[162]

(S) Satisfied that the development of B. tularense had reached the point of uniform mass production in a form specified to produce optimum military effects, the Army in August 1958 accepted the suspension of

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162 Summary Report, Development of Liquid Bacterium tularense as a Biological Warfare Agent, Pilot Plants Division, Fort Detrick.

(U) Yellow fever is a highly dangerous disease. A person begins to show symptoms of the fever from two to ten days (the average is three days) after he has been bitten by the mosquito. The fever appears suddenly causing headache, high temperatures, rigor, vomiting, and even prostration. If the disease is fatal, death usually comes on the sixth or seventh day. If the patient recovers, he is weak for a period of from two weeks to two months. There is no known therapy for yellow fever, other than symptomatic, and in severe cases the patient has a poor chance of recovering. Of the clinical cases since 1900, one-third of the patients have died.

(U) Every few years an epidemic occurs somewhere in the world, primarily in Africa and the Americas, occasionally in Europe. Yellow fever has never occurred in some areas, including Asia, and therefore it is quite probable that the population of the U.S.S.R. would be quite susceptible to the disease.

(S) If military attack were made with Aedes aegypti mosquitos it would be quite difficult to detect the fact, particularly if this type of mosquito ordinarily lived in the area. While there is a possibility that a trained entomologist might realize that an attack had taken place, it would be unlikely. And even if an attack were suspected, it could not be confirmed until symptoms of the disease broke out, which would take two or more days. There is a yellow fever vaccine that has proven to be an effective prophylactic, but it would be impossible for a nation such as the U.S.S.R. to quickly undertake a mass-immunization program to protect millions of people. The difficulties that an enemy would face in detecting

infected mosquitoes and protecting their population would make the Aedes aegypti - yellow fever combination an extremely effective BW agent.

(C) The Chemical Corps tested the practicality of employing Aedes aegypti mosquitoes to carry a BW agent in several ways. In April - November 1956 the Corps ran trials in Savannah, Georgia, by releasing uninfected female mosquitoes in a residential area, and then, with co-operation of people in the neighborhood, estimating how many mosquitoes entered houses and bit people. Also in 1956 the Corps released 600,000 uninfected mosquitoes from a plane at Avon Park Bombing Range, Florida. Within a day the mosquitoes had spread a distance of between one and two miles and had bitten many people. In 1958 further tests at Avon Park AFB, Florida, showed that mosquitoes could easily be disseminated from helicopters, would spread more than a mile in each direction, and would enter all types of buildings. These tests showed that mosquitoes could be spread over areas of several square miles by means of devices dropped from planes or set up on the ground. And while these tests were made with uninfected mosquitoes, it is a fairly safe assumption that infected mosquitoes could be spread equally well.[165]

(C) Aedes aegypti mosquitoes were produced in the laboratory by the following method. A colony of 6,000 to 10,000 adult mosquitoes were confined in a cage where they fed on sugar syrup and blood. The colony was

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165
(1) BWL Technical Study 7B, Short title XYA - 8121, July 1958.
(2) Fort Detrick Special Report 280, "Operation Drop Kick," 1956.

maintained for two weeks, then destroyed. During their life the mosquitoes laid hundreds of thousands of eggs on moist paper towels. Mosquito eggs, which could be kept for several months under proper temperature and humidity, were hatched in water and the larvae reared in trays. The larvae turned into adult mosquitoes one to two weeks later. Fort Detrick's laboratories were capable of producing a half million mosquitoes a month, and the Engineering Command designed a plant capable of producing 130 million mosquitoes a month.[166]

(C) The yellow fever virus employed by Fort Detrick came in human serum obtained from a person in Trinidad who had been infected with the disease in the epidemic of 1954. Scientists inoculated Rhesus monkeys with the serum, and thus propogated the virus. Approximately 100 ml of plasma containing virus were obtained from a monkey. Fort Detrick found that infected monkey serum would maintain its virulence for at least two years.[167]

(S) Aedes aegypti mosquitoes were infected with yellow fever virus by taking larvae, 3 or 4 days old, and immersing them in infectious Rhesus monkey plasma. The infected larvae were reared in the same manner as uninfected larvae. The virulence of infected mosquitoes was tested by allowing them to bite and infect Swiss mice.

(S) By action of the Chemical Corps Technical Committee the yellow fever virus - Aedes aegypti mosquito was classified as a standard type in June 1959.

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166 ENCR No. 24, Engineering Concept Report, Project X-701, Feb 1959.

167 EWL Report, Short Title XYA - 9286, 1 Apr 59.

The Corps proposed to construct a large-scale facility for production of the agent-vector combination as part of the Industrial Mobilization Program. If employed, it could be disseminated in 2½-lb containers of the 750-lb cluster; 4.5-inch spherical bombs for aircraft dispensers; and 3.4-inch spherical bombs of the BW SERGEANT warhead.[168]

Anticrop BW

(S) During World War II the Chemical Corps started research on anticrop agents as a part of its mission in biological warfare. Scientists at Fort Detrick made a search for chemical compounds that could injure or kill plant life, and began study of micro-organisms that were deadly to plants. In 1957 the Army decided that it had to stop research on anticrop warfare because of a shortage of funds. Maj. Gen. William M. Creasy, Chief Chemical Officer, protested, pointing out that the action would be practically irreversible once it had commenced. The Chief of Staff reviewed the Army's proposal to cut funds, and decided that no other alternative was available. The Corps thereupon phased out the research program, maintaining only limited facilities for agents already developed and standardized.[169]

(S) In October 1958, the Chief of Research and Development, DOD, requested the Corps to resume anticrop warfare research. This had been made

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168 CCTC Item 3582, Classification of Yellow Fever...as a Standard-A Type (S).

169 (1) Summary of Major Events and Problems, FY 58, pp. 104 - 06.
(2) CCTC Item 3363, Anticrop Warfare Program, 12 Dec 57.

possible because sufficient unobligated balances of prior year R&D funds existed on 30 September 1958 to support anticrop BW research for a six month period, 1 January 1959 to 30 June 1959.[170]

(S) The Corps reactivated its anticrop warfare research project and began work at Fort Detrick. The funds available for the six month period in 1959 amounted to $200,000. The funds needed for the next three fiscal years were estimated at $500,000 each year.

(S) The objects of the revived anticrop program were: (1) research on biological and chemical anticrop agents effective against cereal and broad-leaf crops of economic importance; (2) conduct of epidemological studies in suitable climatic analogues of potential target areas; (3) screening of new biological anticrop agents, including viral types; (4) search for new chemical anticrop agents by screening and synthesis of new compounds and by liaison with the chemical industries; (5) research on promising chemical and biological agents in the laboratory and greenhouse, and on field-grown crops to establish agent potential prior to large-scale testing; (6) research to determine practical anticrop dissemination techniques and equipment suitable for field testing and possible operational applications; (7) to maintain close contact with the United States Department of Agriculture, universities and other agricultural institutions in order that information of military value may be properly correlated; and (8) to conduct target analysis

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170 D/F, CRD/A, CofR&D, to CCmlC, sub: Anticrop BW Research, 29 Oct 58.

studies to include estimation of the economic and military impact of anticrop operations on selected target countries.[171]

BW Spray Tests

(C) On 16 December 1957 the Biological Warfare Laboratories awarded a contract to North American Aviation, Inc., to determine the feasibility of conducting large-area biological warfare attacks by means of spray tanks carried on low flying aircraft. North American modified a 275-gallon fuel tank to act as the spray dispenser. In the bow of the tank was a pressure source to force the liquid BW agent, contained in the middle section, through a nozzle in the tail of the tank. A critical point in the work was the development of a nozzle that would spray out liquid particles 5 microns or less in size, so that minute drops of the liquid agent would float in the air over a wide area. North American and Battele Memorial Institute assessed various nozzles in wind tunnels to find the effect of air velocity, ejection pressure, fluid composition, and nozzle design.

(C) After completing and testing the spray system, North American shipped it to Dugway Proving Ground. There, in August and September, 1958, Dugway ran six trials at night, flying the spray tanks on wings of an F-100A airplane. The pilot flew the craft over a triangularly shaped area, approximately 15 miles long and 12 miles wide. In the area were 72 sampling

171
(1) Project Data Sheet, Project 4-11-01-004. (2) CCTC Item 3521, Reactivation of Project 4-11-01-004, Anticrop Warfare Research, in the FY 59 R&D Program, 12 ~~Feb~~ 59.

devices, while at one end was a tower 300 foot high with sampling devices every five feet. The Corps contracted with Stanford University's Aerosol Laboratory to analyze the aerosol cloud behavior during the tests. The flight trials proved the feasibility of spray attacks, and showed that an area 10 miles or better could be covered downwind. While five trials were made with simulants, one flight was made carrying the agent that causes Q fever. Guinea pigs were placed at the sampling stations. Results indicated that if human beings had been in the area, 99 percent of them would have been infected. Other important results from the tests were these: that a spray device would disseminate BW aerosol more effectively than bombs, shells, or special ~~BW~~ munitions; and that the tank held a much larger quantity of liquid agent, in regard to the weight of the spray system, than other BW dissemination devices.

(C) The contract proved that airborne BW attacks could be carried out at low levels, and that a properly designed spray system could contaminate 50,000 square miles with BW aerosol in a single sortie. The significance of this lies in the remarkable efficiency of this means of attack. For example, on a night when the wind was blowing ten miles per hour, three large aircraft, each carrying 4,000 gallons of liquid BW agent, and flying at a speed of 500 knots, could spray an area of 150,000 square miles, causing more than half the people in the area to become ill.[172]

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172 (1) North American Aviation, Inc, Airborne Biological Warfare at Low Altitudes, 2 volumes, contract No. DA-18-064-404-CML-338, 16 Jun 59. (3) Interv William L. Jacobs, Program Co-ordination Office, Fort Detrick, 30 Nov 59.

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United States Army Chemical Corps (U)

FISCAL YEARS 1961 - 1962

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(Reports Control Symbol CSHIS-6)

UNITED STATES ARMY CHEMICAL CORPS

Fiscal Years 1961 - 1962

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technical work within Chemical Corps installations, support costs took almost $16,000,000, and $22,000,000 was used for work placed on contract, an illustration of the increasing importance of contracts in the Corps' R&D structure. The level of funding for FY 1962 represents an increase of the order of 100 percent over the level available for planning at the outset of FY 1960.[6]

(C) Operating under instructions from the Chief of Research and Development, DA, to place 90 percent of the funding above basic FY 1960 levels into contracts, the Chemical Corps throughout the FY 1961 - 62 period continued its efforts to expand its contract activities. Largely as a result of its Study Requirements Program, through which industry was apprised of specific areas in which work was needed, some $12,000,000 worth of individual contracts were let. In addition to these, a program for making prime contracts covering major areas of mission responsibility rather than specific projects was successfully carried through during FY 1961 following its initiation late in FY 1960. The areas covered and the contractors chosen were:

1. Dissemination research: Aerojet - General Corporation
2. CW Warning: Melpar, Inc.
3. BW Warning: Douglas Aircraft Company
4. Dissemination of dry agents (BW): General Mills, Inc.
5. Physical protection: Mine Safety Appliances Company
6. BW agents screening: Hazleton Laboratories, Inc.
7. New CW agents: E.I. DuPont de Nemours and Company

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6 (1) R&E, CmlC Operating Program, FY 61, p. 36. (2) Interv, Hist Off with Mr Richard Read, D/CER, DCSOPS, 14 Aug 62.

8. Vaccines: National Drug Company (This contract is administered by The Surgeon General)

Except for the prime contract for research in the field of new chemical agents, all of the above were in effect by the end of FY 1961. The new agents contract was finally concluded in the first half of FY 1962, though the contractor, in an action illustrating the equivocal position of CBR in the public mind, first demanded and received assurances that the firm name would not be made public in this connection. Taken together, the contracted portion of the research and development effort rose from 8 percent to 37 percent of the total R&D program between FY 1959 and FY 1961, the increase representing a satisfactory 91 percent of the rise in funding.[7]

(U) The use of joint R&D-user seminars as an advanced planning technique to assist in the development of user requirements was again resorted to in FY 1961, after its inception with Project SCORPION the previous year.[8] Project WASP, a seminar carried out in cooperation with United States Continental Army Command, took place at the Army Command and General Staff School, Fort Leavenworth, Kansas, during the week of 6 February 1961. With the technical assistance of Air Force representatives, the seminar dealt with the use of eleven selected chemical and biological agents and four delivery

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7 (1) Interv, Hist Off with Dr William H. Summerson, Hq, RDCCM, 27 Dec 61. (2) Quart Presentation, RDCCM, to C/R&D, DA, 1st Qtr, FY 62. (3) Minutes, CmlC Adv C mtg, 19 - 20 Jun 61, pp 2 - 16, in Quart Hist Rpt, CmlC Adv C, Oct - Dec 61. (4) Minutes, Agents Committee, CmlC Adv C, 20 - 21 Nov 61, pp 38 - 39, in Quart Hist Rpt, CmlC Adv C, Jan - Mar 62.

8 Summary of Major Events and Problems, FY 60, pp 54 - 56, 107.

systems in a range of hypothetical infantry and armor combat situations.[9]

Fifteenth Tripartite Conference

(U) The British CW and BW research installations at Porton were the scene of the fifteenth annual Tripartite Conference on toxicological warfare, 12 - 23 September 1960. Brigadier General Delmore led the American delegation, which joined its British and Canadian counterparts to form eight discussion groups to deal with the eight aspects of CBR on the agenda: BW basic research, BW applications, CW basic research, CW applications, medical aspects, protection, radiological defense, and user aspects. The Conference initiated a major change in its procedure by proposing to the three governments represented that in future the formal tripartite meetings be biennial rather than annual. It further proposed that in the two year interval between full conferences tripartite discussion groups should meet from time to time, as arranged by a standing committee, to correlate work on points of particular or current importance. By making the proceedings of these discussion groups available to the succeeding Conference, it was anticipated that the latter would be able to limit its work to a single week. In accordance with this plan, the next Tripartite Conference was tentatively scheduled for the fall of 1962, in Canada.[10]

(S) A fair characterization of the work under review by the Fifteenth Conference could be drawn from the remark of the leader of the United Kingdom

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9 RDCCM, Preliminary Report of the Project WASP Seminar, Mar 61. For a fuller discussion of Project WASP, see pp 70 - 71above.

10 Rpt, 15th Tripartite Conference on Toxicological Warfare, pp 60 - 62.

delegation that the year past had been one of steady progress rather than spectacular advances.[11] Among the recommendations produced by the discussion groups were:

a. increased effort on research in virology, as being probably the most important research area in BW,

b. a decision by the United States to conduct tests to evaluate long range travel of biological aerosols and the performance of BW munitions (a recommendation pointing toward the subsequent extra-continental test program of FY 1963).

c. continued research in the field of organophosphorus agents, to meet the need for more volatile percutaneous agents and more versatile defensive measures.

d. consideration as a matter of urgency of the problems of dissemination of solids, in view of the increasing number of new solid-state agents.

e. the effectiveness of oximes, such as P2S or PAM, as effective prophylaxis and therapy against GB and VX has been established and one of them should be adopted for use.

f. the granting of highest priority in agent-munition programs to research and development of incapacitating agent systems, together with development of user concepts.

g. the development by all three countries on an urgent basis of an over-garment offering temporary protection against liquid agents.

h. granting highest priority to the development of CW/BW alarm systems, with consideration of their integration with radiological fall-out warning systems.[12]

Dissemination

(C) The establishment of a Qualitative Military Requirement for aerial line source dissemination of chemical and biological agents by surveillance

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11 Ibid, p 3.

12 Ibid., pp 16 - 48.

210-70

the M44 generator cluster respectively.[22] The Standard B classification represents the interim character of the new agent which in some respects - its prolonged time of onset of symptoms (at least two to three hours), and its dissemination in a visible cloud of smoke - falls short of optimum performance.

(C) Research was resumed during the FY 1961 - 62 period on botulinum toxin, the substance responsible for botulism. The research project on the crystalline toxin was the responsbility of CRDL, but some of the work was done by the Biological Laboratories acting as a sub-contractor. Problems in bio-assays and dissemination methods were a major concern during the period.[23]

(S) Progress toward standardizing new BW agents was slowed in 1961 - 62 by the lack of adequate extra-continental test facilities in which agent-munition combinations could be fully assayed without the limitations necessary in less remote test areas. Lack of the data such a test program could provide was responsible for the inability of the Chemical Corps to gain approval at the outset of the period for the standardization of a strain of Venezuelan equine encephalomyelitis. The requirement, new in FY 1961, that agents be type classified only in conjunction with munitions, was itself a limiting factor in consequence of the small range of formulated Army requirements for BW anti-personnel munitions.[24]

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22 CCTC Item 3960, 26 Feb 62.

23 Quart Hist Rpt, CRDL, Jan - Mar 62 .

24 (1) Interv, Hist Off with Dr C.G. Ash, Hq RDCOM, 27 Dec 61. (2) Interv, Hist Off with Dr R.D. Housewright, Bio Labs, 16 Feb 62. (3) Interv, Hist Off with Dr R.J. Goodlow, Bio Labs. 16 Feb 62. For creation of Deseret Test Facility to expedite extra-continental test programs, see Chap I, above.

(S) Research on new agents has tended to concentrate on viral and rickettsial diseases. A whole range of exotic virus diseases prevalent in tropical areas came within the screening program in FY 1961 - 62, with major effort directed at increased first-hand knowledge of these so-called arbor (i.e., arthropod-borne) viruses. The importance of epidemiological studies in connection with this area of endeavor was being emphasized. A major step forward was achieved in the development of a better known agent, the virus of psittacosis, when stabilization of the dry agent through addition of a small amount of monosodium glutamate was successfully demonstrated. This accomplishment eliminated one of the principal difficulties in the path of future development of this agent.[25]

(S) In the realm of bacterial and fungal agents, the causative organisms of histoplasmosis, leptospirosis, and cryptococcosis reached the laboratory screening stage. Work on Bacillus anthracis, an agent which has been the subject of more or less concern to the Corps for many years, went forward in the area of process research, particularly in the evaluation of drying methods. But the crucial problem of providing adequate assessment of human susceptibility to this agent remains to be solved.[26]

(U) One of the most striking lines of inquiry in the Corps program was the basic research being done by the Biological Laboratories on the genetic factors underlying the infectivity of micro-organisms. Nucleic acids carrying infectivity factors were isolated from viruses. First attempts at inducing new

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25 Goodlow interv, 16 Feb 62.

26 (1) Ibid. (2) Technical Program Review & Analysis, Bio Labs, Jan - Mar 62, p 24.