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SUMMARY OF MAJOR EVENTS  
and  
PROBLEMS

United States Army Chemical Corps (U)

Fiscal Year 1958

March 1959

*Downgraded Unclassified  
Authority: DAMO - SWC LETR of  
8 JAN 90, SIGNED by COL A. D. Robb for  
MG L. J. Del Ross.*

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

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(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. <sup>159</sup>

Technical Operations

V-Agents <sup>160</sup>

(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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(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.

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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.

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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 toxicity, 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

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treatment consists of artificial respiration and injection of atropine.

(S) Chemists devised several possible ways of preparing the agent. The method adopted by the Corps starts with a reaction between phosphorus trichloride and methane to form methyldichlorophosphine. The latter is reacted with ethyl alcohol to produce diethylmethylphosphonite. The reaction between the latter and diisopropylaminoethanol produces a compound commonly called the transester. In the final step the transester and sulfur are heated to form VX.

(S) In the first stage of production the Chemical Warfare Laboratories constructed a pilot plant capable of turning out 20 pounds of VX on an eight hour shift. This operation provided data for a larger pilot plant, funded in part by Industrial Preparedness Measure, having a capacity of 250 pounds a day. On the basis of data from the pilot plants plans were drawn up for the full-scale plant to be constructed and operated by an industrial firm and having a capacity of ten tons per day. The Corps hopes to have the V-plant in operation in 1960.

(S) Looking forward to the date when VX would be available in quantity, the Corps decided on the disseminating devices that would be employed with the agent. Plans called for the use of VX in the following munitions: the 155-mm. shell containing about 6 pounds of VX and covering 3,500 square meters from an airburst at an altitude of 50 feet; the 8-inch howitzer shell carrying 12 pounds of VX and covering 9,000 - 13,000 square meters from an airburst 50 feet in the air; the E5 land mine holding 12 pounds of VX; the T238 rocket; the HONEST JOHN and LITTLEJOHN rockets; the

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SERGEANT missile; and aircraft spray tanks.

(C) Chemical Corps scientists believe that when sufficient stocks of VX are on hand the Corps will be capable of employing a new, quick-acting, persistent agent. The reign of mustard gas, which has been called the King of Battle gases since it was first used in July 1917, will probably come to an end.

K-Agents <sup>161</sup>

(C) In contrast to the lethal V-agents are the harmless, incapacitating K-agents. These are compounds that affect a person's mind temporarily, causing him to have hallucinations, to be depressed or stimulated, to lose partial control of his senses or muscles, or to behave abnormally in other ways.

(S) For seven years the Corps has been studying K-agents. Attention has centered on three classes of compounds: lysergic acid and its derivatives, tetrahydrocannabinol derivatives (marijuana-type compounds), and mescaline and its derivatives. In 1956 the Department of the Army approved a Corps plan to ascertain the effects of K-agents on human volunteers. Several experiments have been conducted using a derivative of lysergic acid. One of the most interesting investigations was carried out to see if the drug

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This section is based on the following: (1) CmlC Consolidated R&D Annual Report, 31 Dec 57, Project 4-08-03-016-07. (2) Presentation by Dr Van M. Sims, Meeting of the Agents Committee, USA CmlC Advisory Council, 12 - 13 May 58, pp. 80 - 87.

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to the other since past experience has proved that contractors usually find it difficult to adapt equipment, particularly faceblank molds, previously used by another contractor, to their own production processes. <sup>223</sup>

Agent Planning and Production

(C) Production of "dichloro," the intermediate product for the manufacture of GB nerve gas, at the Muscle Shoals U.S. Army Chemical Corps Phosphate Development Works was terminated in July 1957 since stockpile requirements for the agent had been met. Effective 1 September 1957 the installation was officially placed on inactive status, and a project was approved for lay-away at an estimated cost of \$3,759,493. A new lay-away concept, developed at the installation and approved by the Materiel Command, was expected to result in a net savings of approximately \$1,250,000 in lay-away costs. Under the new lay-away concept, the amount of preservation and rehabilitation within the plant was considerably reduced, partly on the assumption that rehabilitation work would have to be repeated on reactivation even when done at lay-away, and partly on the assumption that preservation measures had previously been more extensive than required. For example, instead of following the previous pattern of checking resistance, rewinding and varnishing all electric motors, the lay-away crew surveyed all

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(1) Bartlett-Abbruscato interv, 28 Jan 59. (2) Quart Hist Rpts, MATCOM, Jan - Mar 58, Apr - Jun 58. (3) Interv, Hist Off with Mr Michael Kienznski, Chief Inspector, USA CmlC Dist, Chicago, 9 Dec 58. (4) Summary of Major Events and Problems, FY 57, pp. 137 - 38.

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motors and followed the complete procedure only in the case of some large, exposed motors. The crew dried and left in place other motors in good condition and in relatively protected locations, and they moved some small motors to dry storage. Since humidity is the greatest enemy of equipment in reserve, workmen fabricated electric strip heaters to provide a few degrees of drying warmth in specific locations, and they left a slight trickle charge on transformers. Facilities maintenance personnel made and were scheduled to continue frequent checks of the facility in lay-away to insure that the reduced standards of maintenance did not lead to the deterioration of any equipment.<sup>224</sup>

(C) The production capacity of the Phosphate Development Works at a rate more than twice the accepted roundout figure of 45 tons per day had been proved in fiscal year 1957. While it had also been proved that the facility for the reduction of by-product phosphorus oxychloride could support the operation of the product plant at the mobilization rate of 30,000 tons per year, the reduction facility operation remained costly, difficult and relatively unsafe. Lt. Col. Serge Tonetti, commanding officer of the Phosphate Development Works at the time of its inactivation, studied

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(1) Interv, Hist Off with Lt Col Dale L. Vincent and Mr William J. Hewitt, Dir IMP, MATCOM, 28 Jan 59. (2) Interv, Hist Off with Maj William J. Cribb, Jr., and Mr Samuel M. Lipnick, Dir Fac, MATCOM, 29 Jan 59. (3) Annual Hist Rpt, USA CmlC PDW, CY 57. (4) DA GO 48, 11 Sep 57. (5) Quart Hist Rpt, Log Pl Div, OCCmlO, Apr - Jun 57. (6) Quart Hist Rpts, MATCOM, Jul - Sep 57, Apr - Jun 58. (7) Summary of Major Events and Problems, FY 57, pp. 139 - 42.

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the problem and recommended that step I (production of dimethyl hydrogen phosphite which gives the whole process its designation, DMHP) of the product process be converted to high temperature methanation (HTM) with a product of methyl dichloro phosphine. The new step I product could then be processed through the existing steps II and III to the same end product. Colonel Tonetti dubbed this proposed combination of the existing and HTM processes HTM-LY; in the new designation the LY represents the existing step II pyro mixture product. The apparent advantages of the proposed process were virtual elimination of by-products, lower production costs and greater plant flexibility. Funding and planning limitations did not permit the further examination of the new process recommendations during fiscal year 1958.<sup>225</sup>

(C) The two step agent production facility at the U.S. Army Chemical Arsenal, Rocky Mountain, was likewise closed down on 16 August 1957. No major production difficulties were encountered in the terminal production while rates were increased from 150 percent to 200 percent and, finally, 250 percent of design capacity. Overall agent yield during these final runs was 93.65 percent and all material produced met specification. The production plant was placed in standby, and lay-away under the concepts developed at the Phosphate Development Works was begun. Munitions filling

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(1) Annual Hist Rpt, USA CmlC PDW, CY 57, and Annex B, Staff Study prepared by Lt Col Serge Tonetti, 30 Jan 58, sub: Comparison of DMHP and HTM-LY Processes. (2) See below, pp. 163-68 for discussion of planning limitations.

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on a one-crew basis was continued until April 1958 when the filling lines were also closed down. Lay-away for the Rocky Mountain facility was estimated at \$1,229,852 at the beginning of the fiscal year; a later estimate was \$832,000 for an estimated total lay-away savings of \$1,519,000 on both GB facilities.<sup>226</sup>

(S) During fiscal year 1958 the Chemical Corps proceeded with plans to acquire a production facility for the new agent, VX, which is to replace mustard as the standard persistent agent.<sup>227</sup> Major General William M. Creasy, Chief Chemical Officer, had decided in fiscal year 1957 that the interests of the Government could best be served by contracting with industry for the design, construction and operation of a 10 ton per day production plant. General Creasy, in making this offer to industry, wished to provide incentive to develop a continuous manufacturing process in place of the batch process, which has previously been the source of quality control problems, to improve agent stability and to develop and construct a munitions filling line as an adjunct of the production facility. General Creasy also desired to stipulate that the process and facility be designed for a potential four-fold expansion of which the initial capacity increment

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(1) Quart Hist Rpts, USA Cml Ars, RM Class App, FY 58. (2) Annual Hist Rpt, USA CmlC PDW, CY 57. (3) Quart Hist Rpt, Log Pl Div, OCCm10, Apr - Jun 57. (4) Quart Rev, Oct - Dec 57, p. 58.

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See above, pp. 97 - 99 for information on standardization of VX.

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(10 ton per day) should be ready by 1 January 1960. A subsidiary consideration was to determine the extent of industrial support for the Chemical Corps agents production program. Since a majority of the fifteen industrial firms consulted indicated an interest in the Chief Chemical Officer's plan, the Chemical Corps, on 16 September 1957, transmitted to the Deputy Chief of Staff for Logistics a project request for \$24,763,000 to be obligated in FY 1958. On 10 December 1957, DCSLOG advised the Chief Chemical Officer that the Assistant Secretary of the Army (Logistics) had approved the project inclusion in the FY 1958 program. Subsequently, in response to a DCSLOG objection that the plant would be ready before munitions were available for filling, the Chemical Corps instituted an accelerated program to effect standardization and procurement of a selected group of munitions. Then, at various times during the first three months of CY 1958, General Creasy briefed Mr. Wilber M. Brucker, Secretary of the Army, Mr. F. H. Higgins, Assistant Secretary of the Army (Logistics), and Dr. William H. Martin, Army Director of Research and Development; in each briefing General Creasy stressed the urgency of obtaining an early project approval from the Deputy Secretary of Defense in order to achieve VX capability with the least possible delay. Mr. Donald A. Quarles, Deputy Secretary of Defense, did not, however, approve the Secretary of the Army's request for construction approval when it was presented to him in March. General Creasy then again discussed his proposals with Mr. Higgins, and, at Mr. Higgins' invitation, briefed Mr. Floyd S. Bryant, Assistant Secretary of Defense (Properties and Installations), and Mr. Paul D. Foote, Assistant Secretary of Defense (Research and Engineering), with the result that the matter was again brought to Mr. Quarles'

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attention. Mr. Quarles approved the Chemical Corps project request on 27 April 1958 with the provision that full consideration should be given to the utilization of any available and appropriate Government-owned facilities as location for the plant.<sup>228</sup>

(S) Approval of the VX plant project was received too late in fiscal year 1958 to allow a contract to be let, and, consequently, funds could not be obligated in the fiscal year. On 9 May 1958 the Chemical Corps asked the Corps of Engineers to issue invitation for proposals to the interested industrial firms; the invitation was issued to ten firms on 23 May with a date of 26 August 1958 set for receipt of proposals. Meanwhile, agreement was reached among the Chemical Corps major commands and with the Corps of Engineers on the delineation of responsibilities in establishing a VX agent production facility. These agreements were approved by General Creasy on 2 June 1958. A few days before the end of the fiscal year a conference was held in the Office, Chief of Engineers, at which representatives of the Chemical Corps and the Corps of Engineers answered questions put by the industrial firms receiving invitations for proposals. As of the end of the fiscal year some delays in site selection and approval were expected to delay the receipt of proposals, but it was expected that funds could be obligated and design work started during fiscal year 1959.<sup>229</sup>

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(1) Mullen-Van Sant interv, 21 Jan 59. (2) Summary Sheet, CCm10 to DCSLOG, 13 May 57, sub: V-Agent Program. (3) Summary of VX Agent Production Facility, prepared by Installations Br, Log Pl Div, OCCm10, no date.

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Ibid.

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(S) A factor limiting the extent of planning both with respect to GB and VX was the lack of a firm, approved day-of-supply calculation for toxics. The plans for agent production, which were presented as indicated above, included calculations for toxic supply which were derived from Chemical Corps interpretation of wartime supply experience since no expenditure data for toxics post World War I is available. Higher authority indicated that requirements so estimated appeared to be reasonable and modest, but the Chemical Corps intended these estimations as interim statements pending an official determination. The Office of the Assistant Chief Chemical Officer for Planning and Doctrine continued to work on a basis for a firm calculation. It was expected that a Command and General Staff School study on toxic requirements would be of material assistance in this area, and it was hoped that a day-of supply calculation would be approved by higher authority in fiscal year 1959.<sup>230</sup>

(S) Production capability for the biological antipersonnel agent AB-1 has been maintained in the Directorate for Biological Operations (DBO) at the U.S. Army Chemical Arsenal, Pine Bluff, and facilities are maintained at the same location for filling of bomblets and clustering operations. The Directorate for Biological Operations was, in 1958, the only facility for the production of antipersonnel biological munitions in the Free World. When the question arose, during fiscal year 1958, whether to continue this

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Mullen-Van Sant interv, 21 Jan 59.

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facility or to seek some other means of maintaining capability, Brig. Gen. Clifford L. Sayre, on temporary active duty, made a study of BW productive capability. General Sayre reported to the Chief Chemical Officer that "...an operating [DBO] production facility is necessary to the readiness capability of the country in CBR;...there is no acceptable "cheap" substitute...." The Chief Chemical Officer, on 21 November 1957, accepted General Sayre's report as the Chemical Corps position, and the ready standby status of the Directorate for Biological Operations was maintained. Actual production, filling and clustering were not accomplished during fiscal year 1958 because agent viability and infectivity potential decreases with storage. From the original establishment of capability in 1954 until October 1957, the production facility was maintained in ready standby with an initial delivery time of 72 hours. Since the cost of such readiness was considered excessive, Air Force Logistical Plan AMC 13-57 which provides the readiness base for this plant was amended on 7 October 1957 with the result that initial delivery was set back to 90 days plus 72 hours and funding for the operation was reduced from an approximate annual sum of \$5.5 million to \$3.3 million.<sup>231</sup>

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(1) Interv, Hist Off with Mr Joseph J. Marcus and Mr Eli R. Vuicich, Dir Indl Opns, MATCOM, 28 Jan 59. (2) Vincent-Hewitt interv, 28 Jan 59. (3) Mullen-Van Sant interv, 21 Jan 59. (4) OCCm1O, Estimate of the CBR Situation, 1959, p. 7 and Annex 4. (5) Quart Hist Rpt, Log Pl Div, OCCm1O, Oct - Dec 57. (6) Memo, Brig Gen Clifford L. Sayre, CmlC - USAR, for CCm1O, 1 Nov 57, sub: Active Duty, 20 October - 2 November; Consideration of Continuity of Readiness at PDL [DBO], Pine Bluff Arsenal.

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(U) An administrative problem in connection with operating the biological facility at Pine Bluff arsenal was in the statement of funds. Each year program and project approval was secured for the fiscal year, and each fiscal year it was necessary to secure approval on an incremental basis because of the delays experienced in fiscal year funding. In fiscal year 1958 the funding program was received in September 1957, and sub-allocations were not available until November. Approval of the project in the amount of \$3,683,000 was received in December 1957. These delays resulted in deferral of required operation, inability to plan on an orderly basis, and numerous accounting adjustments. In the interest of establishing an orderly lead time for the operation of the facility, the Chief Chemical Officer on 29 April 1958 proposed financing on a calendar year basis to the Deputy Chief of Staff for Logistics. DCSLOG recommended approval of the Chief Chemical Officer's proposal to the Assistant Secretary of the Army (Logistics), and on 12 June 1958, the Assistant Secretary of the Army approved an increase in fiscal year 1958 funds to \$5,283,000 to support operation through 31 December 1958, thus placing funding on a calendar year basis. Calendar year funding precluded the hiatus in operations occasioned by delay in Congressional appropriation of funds. The Pine Bluff facility was believed to be the first in the Army so funded.<sup>232</sup>

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Supp. Statement, Log Pl Div, OCCmlO.

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