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

FISCAL YEAR 1960

April 1961

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

[redacted] [redacted]

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

UNITED STATES ARMY CHEMICAL CORPS

Fiscal Year 1960

U. S. Army Chemical Corps Historical Office

[redacted] April 1961

[redacted]

Summary of Major Events and Problems
Fiscal Year 1960

Charts

Tables

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U. S. ARMY
CHEMICAL CORPS

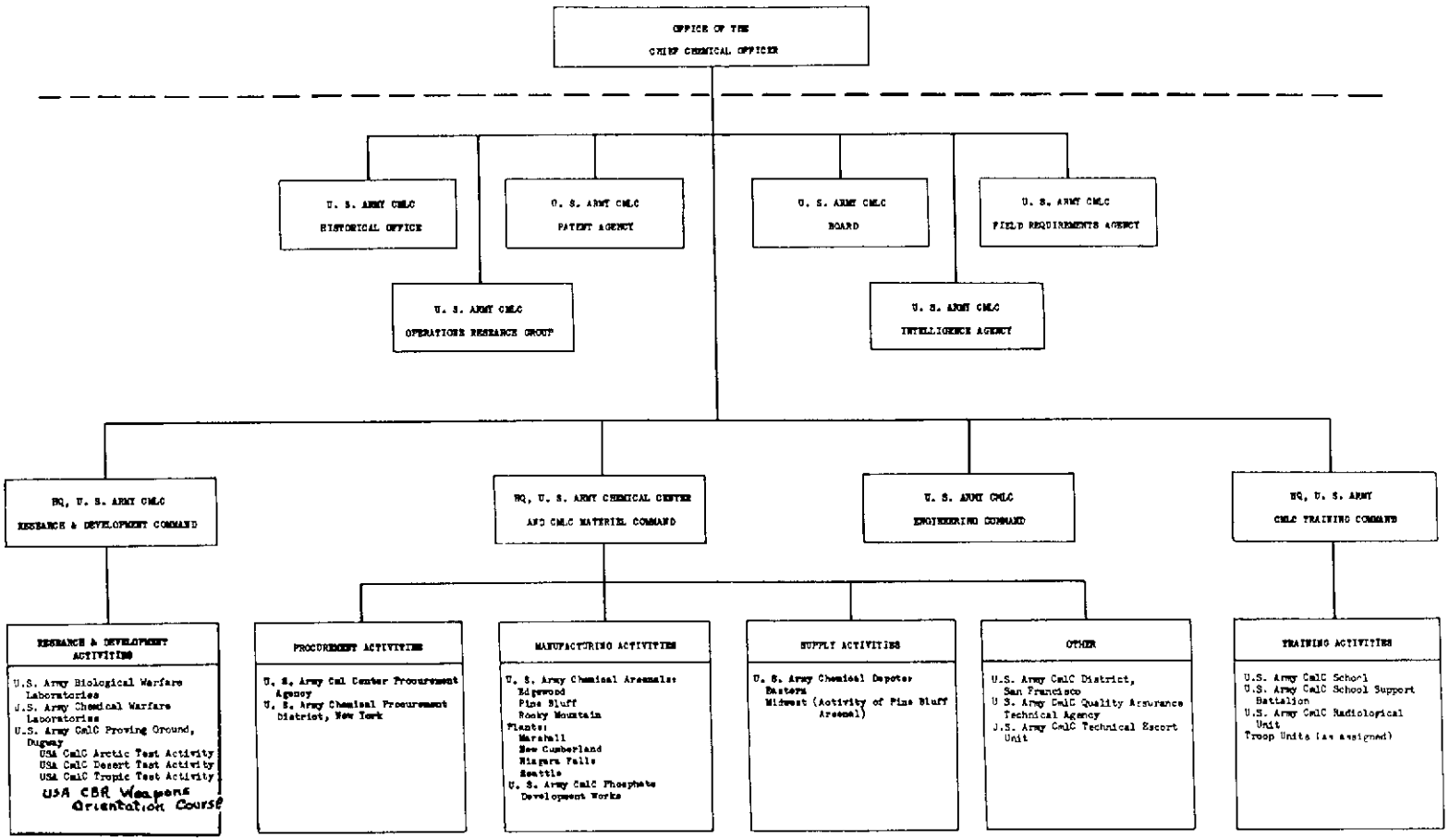

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Chart #1

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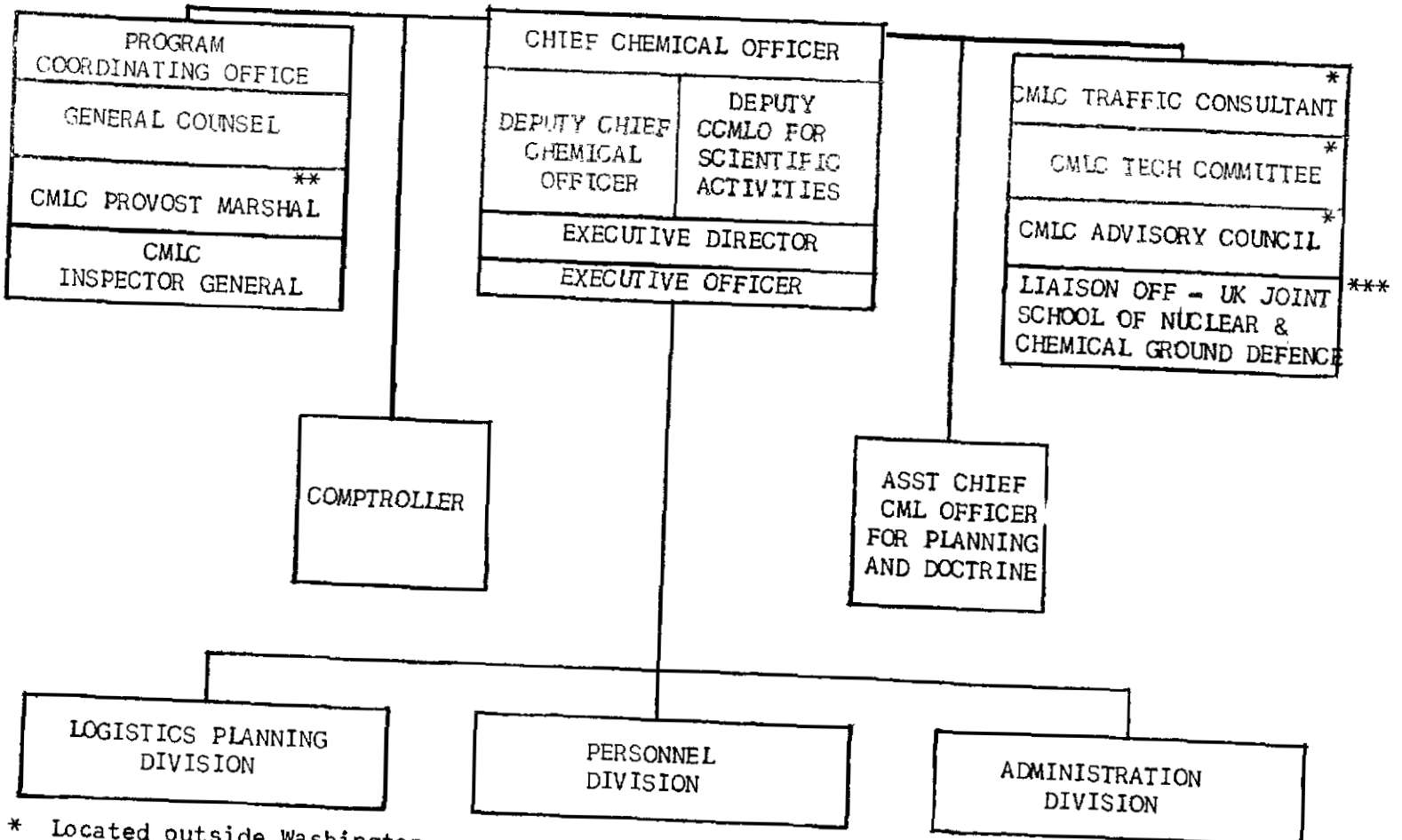
30 June 1960

HEADQUARTERS, DEPARTMENT OF THE ARMY

OFFICE OF THE CHIEF CHEMICAL OFFICER



* Located outside Washington
** Located in part outside Washington
*** Eff 23 Jun 60 - "Liaison Officer - UK Joint School of Nuclear & Chemical Ground Defence" GO is now being processed.

Chart No. 2

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OFFICE OF THE ASSISTANT CHIEF CHEMICAL OFFICER FOR PLANNING AND DOCTRINE

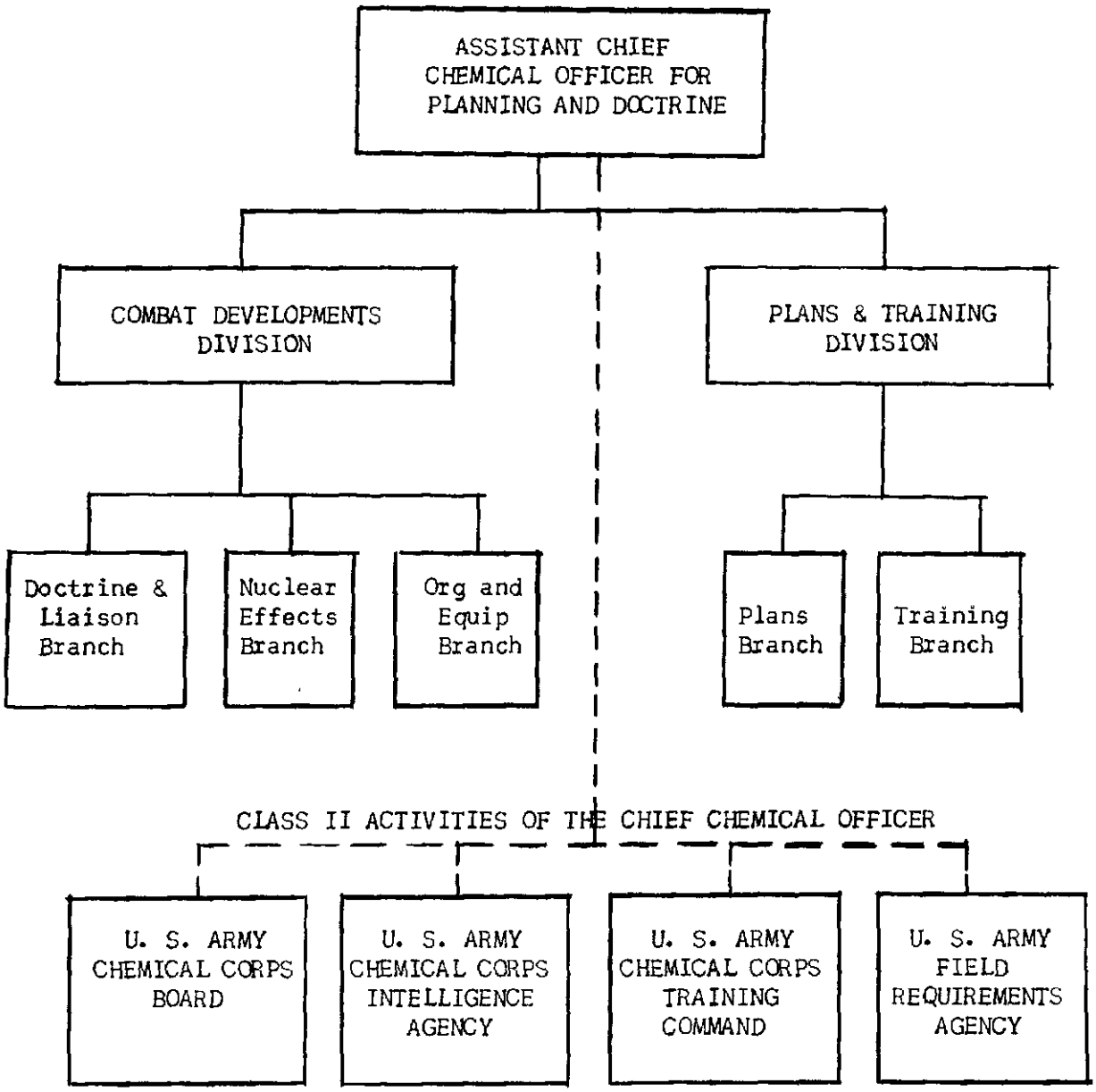

Chart No. 3

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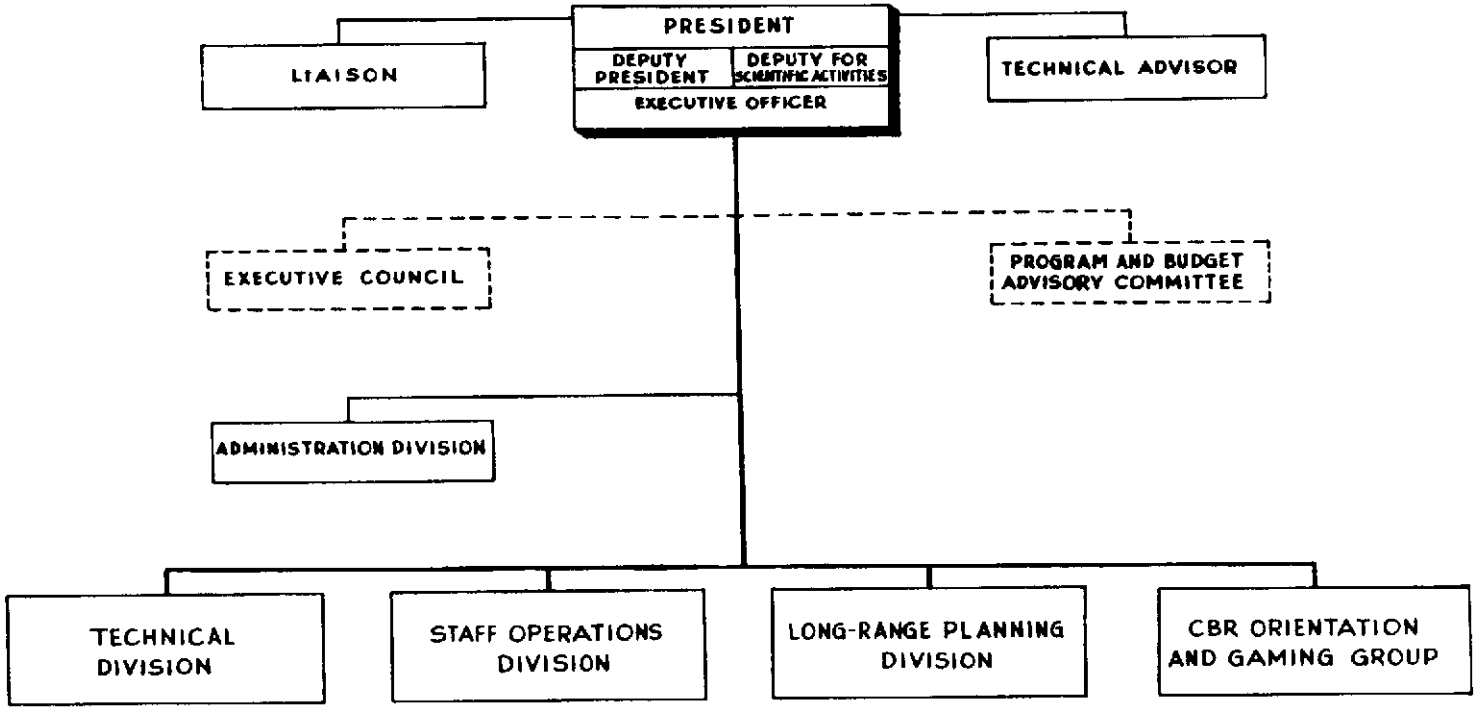
CHEMICAL CORPS

U. S. ARMY CHEMICAL CORPS BOARD



LEGEND
——— COMMAND
——— SUPPORT AND STAFF
- - - - - COORDINATION

SUBMITTED:
FRED J. DELMORE
COLONEL, CMLC
PRESIDENT

APPROVED:
MARSHALL STUBBS
MAJOR GENERAL, USA
CHIEF CHEMICAL OFFICER

DATE: 13 November 1958
PREPARED BY: MANAGEMENT BRANCH
ADMINISTRATION DIV.

Organization Chart #5

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RESEARCH, DEVELOPMENT AND ENGINEERING

Administration

(U) The Chemical Corps Research and Development Command (RDCOM) experienced a change at the top midway in FY 1960, when Brigadier General Graydon C. Essman, commanding, was reassigned as Commanding General, US ACC and MATCOM, and Colonel Fred J. Delmore became Commanding Officer, effective 12 January 1960.[167] On 21 April 1960 Colonel Delmore was promoted to Brigadier General. Dr. John Schwab, Deputy Commander for Scientific Activities was detailed (and subsequently transferred) to the Chief of Research and Development, DA, in October 1959; he was succeeded by Dr. William H. Summerson, whose appointment became effective as of 1 March 1960. Col. Ronald L. Martin, Deputy Commander, retired effective 30 June 1960.[168]

(U) FY 1960 was noteworthy as the first year of an expanded Chemical Corps research and development effort. The recommendations of the Defense Science Board and the Director, Defense Research and Engineering, DOD, in the preceding year, calling for an increase in the level of CBR activity[169] produced a substantial gain in Corps funding for R&D, a gain which represented the first phase of a long-range program. In addition to the $38,480,000 originally in the DA approved program for Corps R&D use in FY 1960, the

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167 OCCm10, GO 1, 7 Jan 60.

168 Quart Hist Rpts, RDCOM, Jan - Mar and Apr - Jun 60.

169 See above, pp. 10 - 12.

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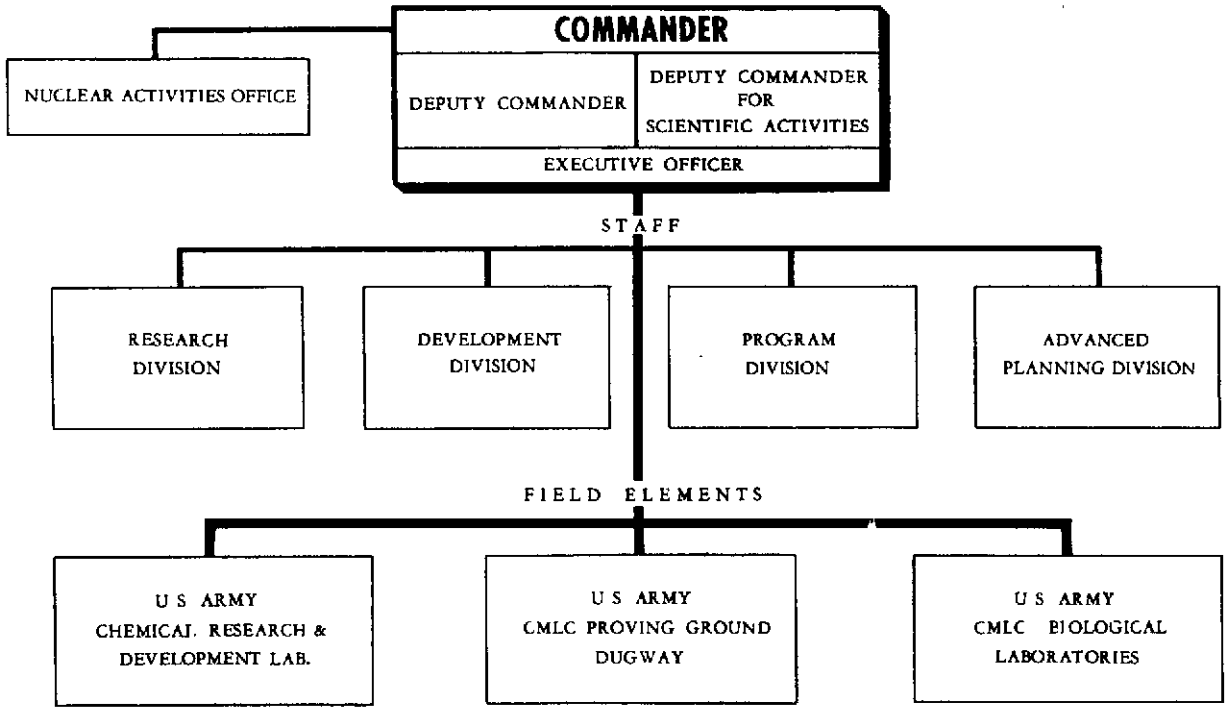
U. S. ARMY
CHEMICAL CORPS RESEARCH AND DEVELOPMENT COMMAND



SUBMITTED: [signature]
FRED J. DELMORE
BRIGADIER GENERAL USA
COMMANDING

APPROVED [signature]
MARSHALL STUBBS
MAJOR GENERAL USA
CHIEF CHEMICAL OFFICER

DATE 1 JULY 1960

PREPARED BY MGT ENGR BR, O/COMPTROLLER, CML C

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Chart #10

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U. S. ARMY CHEMICAL CORPS ENGINEERING COMMAND

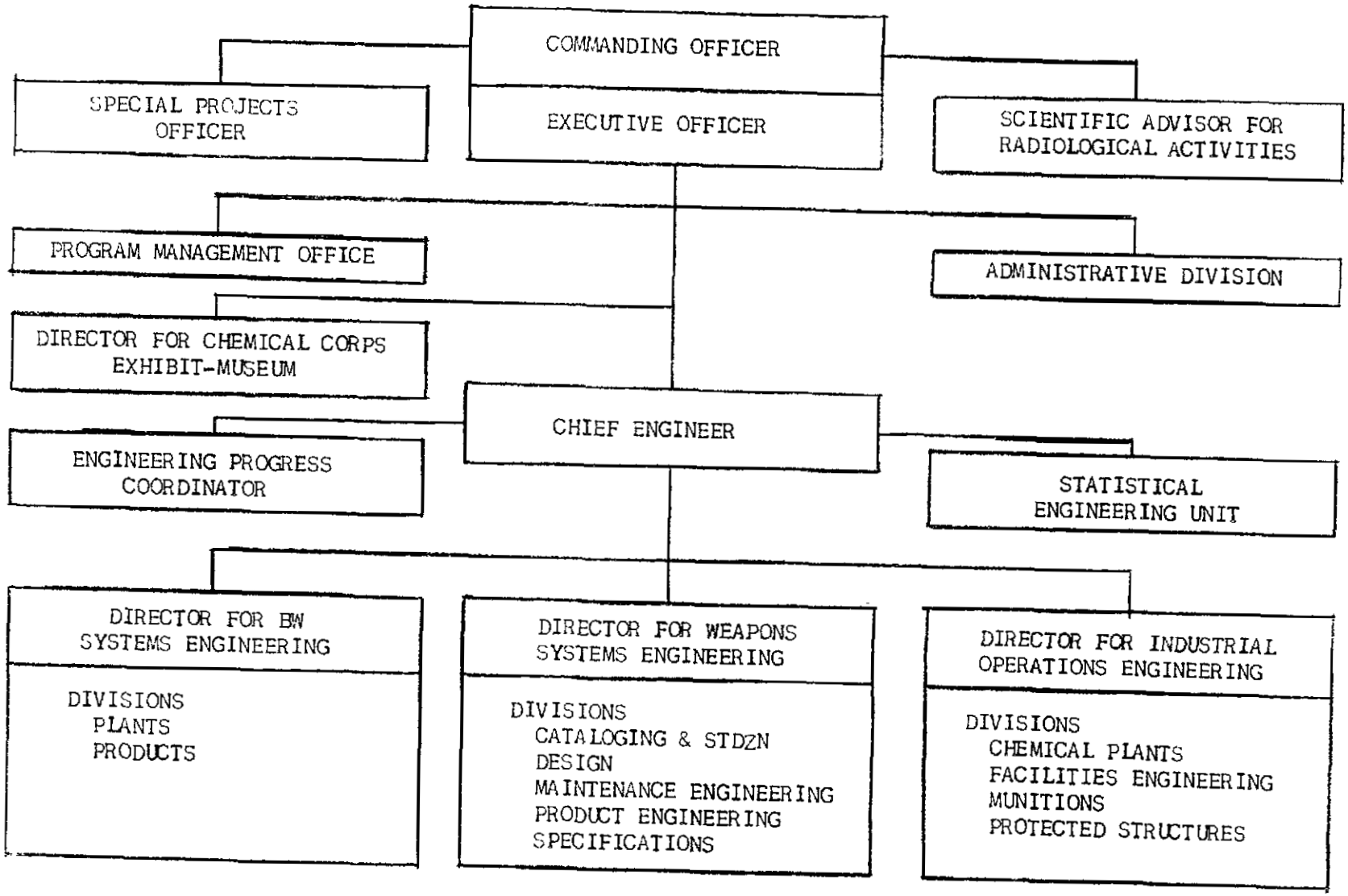

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Chart No. 11

U. S. ARMY CHEMICAL CORPS RESEARCH AND DEVELOPMENT COMMAND

U. S. ARMY CHEMICAL CORPS PROVING GROUND, DUGWAY

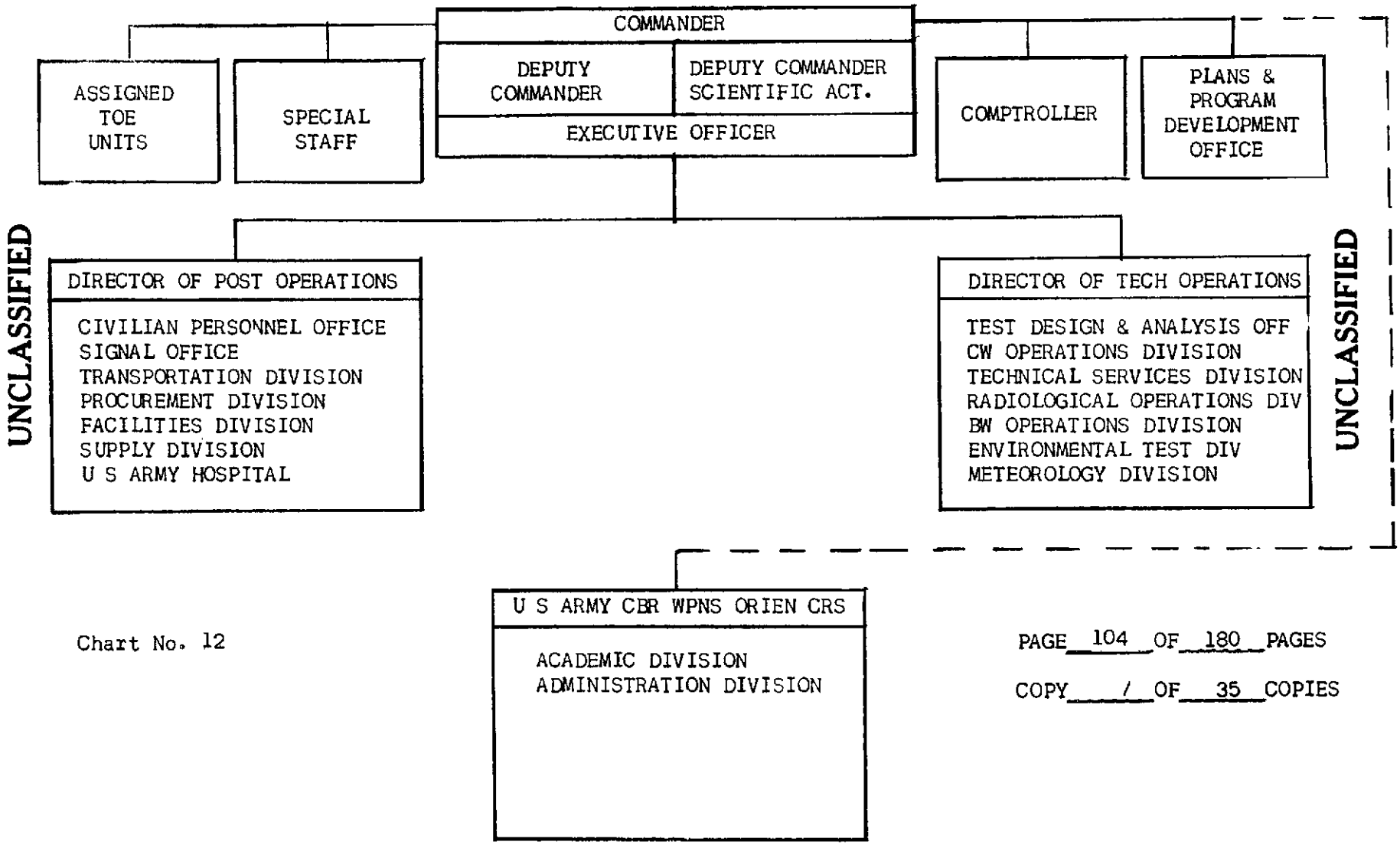

Chart No. 12

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U.S. ARMY CHEMICAL CORPS RESEARCH AND DEVELOPMENT COMMAND

U.S. ARMY CHEMICAL CORPS BIOLOGICAL LABORATORIES

FORT DETRICK

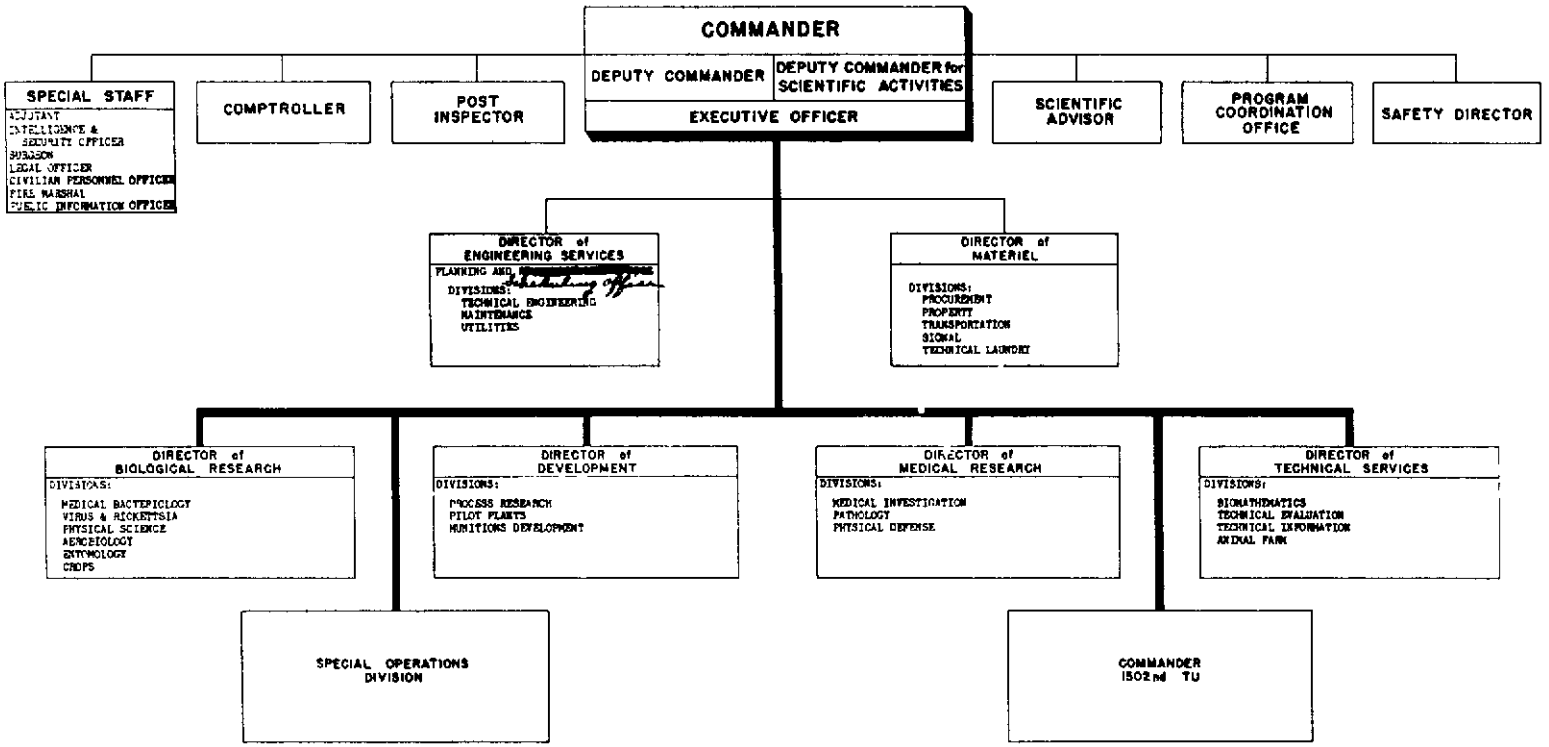

Chart # 13

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SUBMITTED

APPROVED:

FRED K. OHLMACHER
BRIGADIER GENERAL, USA
COMMANDING, CMLRDECOM

DATE: 30 September 1960

Chemical Corps obtained from the Army supplementary funding equivalent to a net increase of $8,119,320. Approximately $3,000,000 of this increase was provided for programs in the area of incapacitating agents. Another $1,084,000 went for basic research. The remainder, about $4,275,000, made available later in the year from emergency funds following a Corps request, was provided as transitional funding to accelerate item development programs.[170]

(U) It was the policy of higher authority to require that the expansion of Corps research and development begun in FY 1960 be accomplished primarily through contracting. Accordingly, the institution of a more vigorous contracting effort was a major characteristic of R&D administration, especially in the latter part of the year. Late in the fall of 1959 preparations were begun for calling a conference of potential research and development contractors. The conference was held in April, 1960, and served to bring to the attention of industry those areas which were of primary interest to the Corps. Some 300 contract proposals were received by R&D Command in the period following the conference. Departmental requirements for the commitment of emergency funds by contract as of 1 June 1960 were met on schedule, a feat which brought commendation from the DA Director of Research and Development.[171]

170
(1) Interv, CmlC Hist Off with Mr John Haje, Prog Div, RDCOM, 28 Oct 60. (2) Quart Rev, Jul - Sep 59, p. 50; Apr - Jun 60, p. 60A. (3) Quart Presentations, RDCOM to Ch, R&D, DA, FY 60.

171
(1) Interv, Hist Off with Dr William H. Summerson, RDCOM, 8 Nov 60. (2) Ltr, Dir R&D, DA, to CCmlO, 17 Aug 60, no sub. (3) Quart R&A Presentation, RDCOM, to CCmlO, 3d Qtr FY 60.

(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

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172 Interv, Hist Off with Mr Howard M. Trussell, Adv Pl Div, Hq, RDCOM, 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 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.

capability.[175]

(C) A second VX munition was accepted for standardization by the Chemical Corps Technical Committee in April, 1960: the E5 chemical land mine. This item, conforming in general design to the standard anti-tank mine, was designed to replace the mustard mine originally developed before World War II. It is a thin steel container with fuze wells, bursters, and a capacity for 11½ pounds of VX. In tests conducted earlier in the year the mine functioned satisfactorily in terms of the prescribed military characteristics, but the Armor Board, which carried out the user testing, indicated concern over possible shortcomings if the weapon were used as an anti-personnel munition, and recommended re-evaluation of employment. The Chemical Corps view was that since the mine admittedly met the characteristics originally prescribed by CONARC, it ought to be accepted as a standard item. This policy was adopted by the Army when type classification of the item as Mine, Gas, Persistent VX, 2-gallon, M23 (E5) was approved on 25 May 1960. However, the Corps of Engineers entered a demurrer based on the fact that it was currently reconsidering the entire field of mine warfare doctrine. In consequence, it was impossible to say, as of the close of the fiscal year, what role the newly standardized M23 would play in the arsenal of chemical weapons.[176]

175
(1) Ibid. (2) Quart R&A Presentation, RDCOM, to CCmlO, 1st Qtr, FY 60.

176
(1) CCTC Item 3705,Classification of Mine, Gas, Persistent VX, 2-gallon, M23 (E5) as a Standard-A Type, 8 Apr 60. (2) CCTC Item 3710, same sub, 5 May 60 w/1st Ind, 25 May 60. (3) Interv, Hist Off with Mr Nicholas S. Capasso, Dev Div, RDCOM, 4 Nov 60.

(C) A third major type classification action in the area of dispersal systems was that which brought a toxic warhead for the Honest John missile into the Army supply system. The warhead was the E19R1, the outgrowth of over seven years of work on the problem of utilizing large-caliber mid-range rockets to carry toxic agents. The method adopted was the inclusion of a large number of small self-dispersing spherical bomblets within a warhead shell compatible with the basic rocket design. The E19R1 utilizes as its bomblet the E130R1, a ribbed steel 4.5-inch sphere containing about 1.1 pounds of GB as its fill and equipped to arm itself for bursting by its own rotation as it falls. When loaded, the E19R1 contains 356 of these spheres.

(C) Engineering and user test reports, available near the beginning of the fiscal year, indicated that the warhead was able to contaminate effectively a target area 500 meters in radius, not including downwind areas, when fired under standard circumstances. Use of the E130-type bomblet in the warhead for VX disseminations, though originally projected for development, was ultimately regarded by the Chemical Corps as unsatisfactory from the point of view of fully exploiting VX capabilities. Type classification action, completed on 14 April 1960, designated the munition as a standard-B type Warhead, 762-mm. Rocket, Gas, Non-persistent, GB, M79 (E19R1). An E19R2 warhead, utilizing the E130R2 aluminum bomblet, was not ready for type classification as the year ended.[177]

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177 CCTC Item 3694, Classification of Warhead, 762-mm. Rocket, Gas, Non-persistent GB, M79 (E19R1) as a Standard-B Type, 10 Feb 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.

(C) After preliminary feasibility studies, carried out in coordination with the Army Combat Surveillance Agency by the prime contractors in the drone development program in the first half of the fiscal year, the Chemical Corps urged the project upon CONARC. With the support of the Army Chief of Research and Development, the Corps succeeded in gaining from CONARC the issuance of a Qualitative Military Requirement for drone disseminators as early as March, 1960, making possible a rapid start on contracting as the fiscal year closed.[180]

(U) Meanwhile, a more efficient and economical method of collecting test data on BW spray munitions was already in use. An obsolescent Navy missile, designated HVAR (high velocity aircraft rocket), was found to be a suitable vehicle for short-range testing of line source dissemination devices. It was capable of being fired in a relatively flat trajectory at speeds up to Mach 1.2, providing a good approximation of a high-speed drone, though necessarily with scaled-down payload capacity. The use of this rocket in lieu of Air Force planes reduced test costs to $200 per trial, as against $1,000 an hour and up for Air Force support, and made possible much more frequent testing on shorter notice.[181]

180
(1) Pimlott interv, 4 Nov 60. (2) Information Memorandum, OCCmlO, 28 Mar 60.

181
(1) Quart Presentation, RDCOM, to Ch, R&D, DA, 4th Qtr, FY 60. (2) Interv, Hist Off with Mr William W. Dorrell, Dir Tech Serv, U.S. Army CmlC Biological Laboratories, (Bio Labs), 9 Nov 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, CWL, 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.

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

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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, RDCOM, 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 4 C08-03-016-07.

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

made. The new version, designated E14R1, was undergoing comparative testing with the E41R1 at the close of the fiscal year.[193]

(C) The principal effort in the development of automatic BW field alarms was directed toward two devices now in the prototype stage: the ratio alarm and the partichrome alarm. The first of these is based on observation of fluctuation of particle size distribution in the atmosphere; it is handicapped by a high false alarm rate resulting from random background fluctuation. Improved sensitivity was achieved during the year, with a corresponding reduction of this deficiency. Statistical studies in progress were expected to improve the ability of the instrument to distinguish significant data. The partichrome alarm is based on the detection of airborne bacteria through visual staining; the procedure employed requires automatic scanning of samples collected and stained on oil-coated optical tape. The basic design for this device was completed during the year, and development of an improved model capable of practical field use was begun. A third alarm principle, detection of airborne protein through reduction to ammonia by pyrolysis, with subsequent determination of the ammonia, was the object of study. An ion chamber measuring the decrease in current when finely divided ammonium chloride is passed through constituted the detection device employed in the laboratory. Toward the end of the year the first phase of a prime contract for the development of a BW rapid warning system was negotiated with Douglas Aircraft Company.[194]

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193 Briefing Notes, Dir Ind Opns Eng, ENCOM, Jul - Sep 60, pp. 11 - 12.

194 (1) Technical Program Review & Analysis, Bio Labs, FY 60, pp. 26 - 29.
(2) Consolidated R&D Annual Project Report, 31 Dec 58, Subproject 4-11-05-014-01.

Protection

(U) Considerable emphasis was given during FY 1960 to research and development work on vaccines. A major accomplishment in this area was the successful testing of a live tularemia vaccine. Vaccines containing non-viable antigens for tularemia had been used at the Biological Laboratories for fifteen years, with overall results considered unsatisfactory. Neither the level of protection conferred nor the character of reactions met desired standards. After several hundred vaccinations with a live attenuated vaccine of Russian origin, it was possible to state that reactions were negligible and the protection conferred, in terms of blood tests and skin sensitivity, decidedly superior to that previously attained. Significantly, the Biological Laboratories experienced no cases of laboratory - acquired tularemia in the second half of the fiscal year, after the new program was instituted.[195] A corresponding attempt to replace killed vaccines known to be inadequate with a viable attenuated vaccine for Venezuelan equine encephalomyelitis had not reached the same degree of development by the close of the fiscal year.[196]

(C) A recent commercial development, an emulsion copolymer of polyethylacrylate named Hycar, is being utilized in the protective clothing program. Hycar-treated fabrics possess a permanent absorbent which is capable of taking

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195 (1) Minutes, Med & Prot Committees, CmlC Adv C, 3 - 4 Dec 59, pp. 33 - 37, in Quart Hist Rpt, CmlC Adv C, Apr - Jun 60. (2) Technical Program Review and Analysis, Bio Labs, FY 60, p. 30.

196 Ibid, p. 31.

up toxic vapor. Underwear made of such fabrics offers a substantial degree of protection against the amount of toxic vapor which might be expected to penetrate impregnated outer clothing. The treated fabric is more stable and less irritating than that treated with CC2, the standard chloramide impregnite.[197]

(U) Several special purpose protective masks were type classified during the fiscal year. The first of these was a new headwound mask. The replacement of the obsolete World War II headwound protective mask had been a Corps objective since 1951. The E5R3 model, developed in the years following, consists of a semi-rigid hood of filter material equipped with plastic eyepieces and a fabric skirt providing a gas-tight closure at the neck. The hood permits diffusion of oxygen, carbon dioxide, and water vapor, but excludes gas-aerosol matter, including standard CW/BW agents and radioactive particulates. It was approved by The Surgeon General after user tests in FY 1959, and was standardized on 29 September 1959 as the M18.[198] A second type of special purpose mask to enter the supply system was the E15 rocket propellant gas mask, a replacement for the M15 compressed air breathing device previously standard for use by personnel handling liquid rocket propellants. Current Army requirements for protective equipment for this purpose indicated that the more limited protection of an appropriate gas mask would meet ordinary

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197
(1) Minutes, Med & Prot Committees, CmlC Adv C, 3 - 4 Dec 59, pp. 60 - 61. (2) Quart Presentation, RDCOM, to Ch, R&D, DA, 4th Qtr, FY 60. (3) Interv, Hist Off with Mr Irving Cort, RDCOM, 4 Nov 60.

198
CCTC Item 3625, Classification of the Mask, Protective, Headwound, M18 (E5R3) as a Standard-A Type, 13 Aug 59.

needs, leaving air supply devices for emergency situations. The E15 mask developed in FY 1959 consists of a standard M9 combat facepiece equipped with a modified industrial-type acid-vapor canister and a 27" corrugated hose. It was standardized as the M21 on 14 April 1960.[199] The third such action was the standardization of an improved version of the M14 mask, a component of the M8 three-man tank collective protector, as the M14A1. The new model featured a slightly redesigned black rubber facepiece, a simplified lens assembly, and provision for future incorporation of a new nosecup still under development. Type classification was approved on 6 May 1960, at which time the M14 became a standard-B item.[200]

Anticrop Research

(C) The uncertain status of anticrop programs in recent years has tended to keep work in this area to a minimum. In FY 1960, after $300,000 had been earmarked to keep the program alive, a deferral action by the Bureau of the Budget, followed by a withdrawal by DA of certain R&D sub-allotments had the effect of leaving anticrop research unfunded. The Chemical Corps was able to restore the $300,000, however, by reprogramming the funds from other resources. This hand-to-mouth financing, though it kept research from being phased out altogether, had a deleterious effect on systematic planning of projects and

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199 CCTC Item 3684, Classification of Mask, Gas, Rocket Propellant, M21 (E15) as a Standard-A Type, 11 Jan 60.

200 CCTC Item 3691, Classification of Mask, Protective, Tank, M14A1 as a Standard-A Type & Reclassification of the M14 Mask to Standard-B, 5 Feb 60.

made long-range contracts impossible.[201]

(S) Within these severe limitations, work was continued on the epidemiology of rice blast. A new project was initiated to test wheat stem rust on wheat crops at four sites selected as climatically analogous to wheat-growing regions in potential target areas. Crop failures at two of these sites frustrated experimentation there; successful operations were completed at a third site and in progress at the fourth as the year ended. Preliminary study of stripe rust, an Oriental disease of wheat, was carried on in greenhouses and by contract. The screening program for herbicidal compounds continued, with emphasis on cacodylic acid.[202]

Radiological Warfare

(U) A major new tool for work in radiological defense will be available to the Chemical Corps as the result of work begun early in FY 1960 on a radiological test field at Dugway Proving Ground. The design calls for a circular paved field 616 feet in diameter, and virtually flat, save for a drainage slope. Controlled radioactive contamination will be provided within the test area by pellets of a radioactive alloy containing Cobalt 60. Items to be tested will be handled in the contaminated area by means of remotely controlled electric vehicles and observed by television. As a source of radiation for determining residual effects, efficacy of protection, and the like, the new

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201 (1) Quart Presentations, RDCOM, to CCmlO, 2d Qtr, FY 60. (2) Haje interv, 28 Oct 60.

202 Technical Program Review and Analysis, Bio Labs, FY 60, pp. 12 - 13.

facility will fill the gap left by the loss of residual radiation sources inherent in the suspension of nuclear weapons tests.[203]

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203 (1) Minutes, Dissem & Field Testing Comm, CmlC Adv C, 28 - 29 Apr 60, pp. 28 - 29, in Quart Hist Rpt, CmlC Adv C, Oct - Dec 60. (2) Interv, Hist Off with Capt W. Wohlford, Nucl Act Div, RDCOM, 28 Oct 60.