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Control No. 254156-A
Declas Bus Mgl 4/13/9

Recommend Review Prog DA Decl

CMLWA
Declassify PMNBCDSJM

25 October 1956

SUBJECT: Quarterly Historical Report of Major Events and Problems, Dugway Proving Ground, Dugway, Utah (RCS CMLHO-194) (U)

DECLAS - RET

TO: Chief, Historical Office
Army Chemical Center, Maryland

2306

The attached report is forwarded as a matter pertaining to your Office.

FOR THE CHIEF CHEMICAL OFFICER:

1 Incl
SUBJECT ltr
dtd 19 Oct 56
w/5 incl
(1 cy ltr &
6a incl w/d)

MELVIN W. REED
Colonel, CmlC
Chief, Administration Div

Regraded Unclassified when separated from classified paper.

Maj Schade/ext/52081

MEMO FOR RECORD:

REFERENCE: CCR 40-1.

DISCUSSION: Reference regulation requires that quarterly historical reports be submitted to the Historical Officer (Dr Brophy) by 20 Apr, 20 Jul ~~XXX~~, 20 Oct and 20 Jan of each year. The classification of the report may be Restricted through Top Secret.

The Historical Office, ACC is under the administrative jurisdiction of the Chief, Admin Div for program (Military History).

CONCLUSION: This report should be forwarded to the Historical Officer, ACC.

POLICY: Within established. ACTION: This completes action.

declassified by CBDCOM Security Classification Review Board 24 Aug 95

Asst Chief, Admin
HOWARD G. SCHADE, Major, CmlC,
Ext. 52081, 25 October 1956

~~SECRET~~

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CmlC
Control No. 25456-S

Declas Bus Mgt 4/13/95

DECLAS TD 4/13/95

CMLWA

Declassify PM NBCDS AM

25 October 1956

SUBJECT: Quarterly Historical Report of Major Events and Problems, Dugway Proving Ground, Dugway, Utah (RCS CMLHO-194) (U)

DECLAS - RET

TO: Chief, Historical Office
Army Chemical Center, Maryland

The attached report is forwarded as a matter pertaining to your Office.

FOR THE CHIEF CHEMICAL OFFICER:

1 Incl
SUBJECT ltr
dtd 19 Oct 56
w/5 incl
(1 cy ltr &
ea incl w/d)

MELVIN W. REED
Colonel, CmlC
Chief, Administration Div

Regraded unclassified when separated from classified papers.

Mary Schade 5-4-5-1-41

MEMO FOR RECORD:

REFERENCE: CCR 40-1.

DISCUSSION: Reference regulation requires that quarterly historical reports be submitted to the Historical Officer (Dr Brophy) by 20 Apr, 20 Jul ~~XXX~~, 20 Oct and 20 Jan of each year. The classification of the report may be Restricted through Top Secret.

The Historical Office, ACC is under the administrative jurisdiction of the Chief, Admin Div for program (Military History).

CONCLUSION: This report should be forwarded to the Historical Officer, ACC.

POLICY: Within established. ACTION: This completes action.

declassified by CBDCOM Security Classification Review Board 24 Aug 95

Asst Chief, Admin D.
HOWARD G. SCHADE, Major, CmlC,
Ext. 52081, 25 October 1956

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CmlC
Control No. 2541-56

CMLRD-DU-AED 19 October 1956

SUBJECT: Quarterly Historical Report of Major Events and Problems, Dugway Proving Ground, Dugway, Utah (RCS CMLHO-194)(U)

TO: Chief Chemical Officer
Department of the Army
Washington 25, D. C.

1. UNCLASSIFIED The Quarterly Historical Report for the quarter July through September, 1956, consists of the activities of the Directorates of Materiel Testing, Research, and Doctrinal Testing and is presented in inclosures 1, 2, and 3, Report of Operating Personnel Utilization and Requirements - Dugway Proving Ground, Dugway, Utah - for the quarter, inclosure 4 and Quarterly Historical Report of Major Events and Problems in the Office of the Commanding Officer, Dugway Proving Ground, Dugway, Utah, inclosure 5.

(U) 2. ~~CONFIDENTIAL~~ These inclosures do not actually cover the period 1 July to 12 July in regard to Materiel Testing. The information is included below:

a. CW 173 (Capability of 4.5" Rocket Battalion)

CW 173-D2	Battalion Scale Agent Trials	3 July 1956
CW 173-01	Single Rocket on Tower	11 July 1956

b. CW 218 (Trials of 155 mm Shell)

CW 218-E-4	Dynamic Single Shot against Fortification	5 July 1956
E-5	" " " "	10 July 1956
E-6	" " " "	11 July 1956

c. BW 4-56 Transit III

BW 4A-6-56	Field Testing the E-2	2 July 1956
BW 4A-7-56	" " " "	9 July 1956
BW 4A-8-56	" " " "	11 July 1956

3. UNCLASSIFIED Activities of the directorates of Research and Doctrinal Testing during the period 1 July to 12 July 1956 have been

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Page 1 of 2 pages

RCB6-2155

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CMLRD-DU-AED 19 October 1956
SUBJECT: Quarterly Historical Report of Major Events and Problems, Dugway Proving Ground, Dugway, Utah (RCS CMLHO-194) (U)

adequately reported in the information contained in inclosures 1, 2, and 3.

FOR THE COMMANDER:

WILLIAM C. WELLS
Captain, CmlC
Executive Officer

5 Incl 3 cys each
1. DPG 6-1652 CONF
   cys 24,25, & 26
2. DPG 6-1842 CONF
   cys 24,25, & 26
3. DPG 6-2064, SECRET
   cys 24,25, & 26
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Chemical Corps Research and Development Command

DUGWAY PROVING GROUND
Dugway, Utah

CMLRD-DU-GDO

10 August 1956

SUBJECT: Significant Accomplishments during period 13 July - 9 August 1956 (CSGLD 696)

TO: Commanding General
Cml C Research & Development Command
Gravelly Point
Washington 25, D. C.

1. Submitted herewith is information regarding the field test status and significant developmental and research accomplishments for the period 13 July - 9 August 1956.

2. Events, problems, and accomplishments on current projects being conducted by Research Directorate are as follows:

A. BW Research

a. Sinden Sampler. A new sieve, for time sequential sampling has been designed and will be fabricated in the near future. A new type drive is presently being designed which will eliminate the magnetic transmission.

b. Persistence of BW Agents. The Salt Flats Grid and the regular plots contaminated with [redacted] are presently being monitored for the agent.

c. Bacterial Recovery Rates in the 6 L/min All-Class Impinger - After Aspiration. Completed except for statistical evaluation which will be accomplished after which a final report will be written.

d. Impinger Efficiency Studies. Complete study on the effect of raising the orifice from the bottom of the impinger bowl. Best results were obtained with the orifice 15 mm from the bottom of the bowl. Presently studying the effect of volume of impinger fluid on the efficiency of the AG1 with the orifice raised 15 mm from the floor of the AG2.

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DPG-6-1632

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e. Counting Methods for Anderson Sampler Plates. Data has been secured which may be adequate for confiming the positive hole method and the table which has been calculated from the formula

$$P = N \left(\frac{1}{N} \frac{1}{N-1} \frac{1}{N-2} \cdots \frac{1}{N-r1}\right)$$

where P is the number of particles, N is the number of holes per stage (340) and r is the number of positive holes. The data have not been analyzed by the statistician.

f. Relationship of Size of Particles to AS Stage Distribution. A considerable amount of data has been accumulated on relationship of size of particles to stage distributio[redacted] AS. These data are being turned over to the statistician for analysis.

g. Cold Weather Sampling (AS) This cold weather sampling unit, designed, constructed and tested more than a year ago, has now been made more compact. Final tests will be made as soon as a heat exchange tube is fabricated.

B. CW Research

a. Enzyme Purification. With Tween 20 a yield of 47% of soluble enzyme is obtained from red cell stroma. It is anticipated that improvements in this yield as well as subsequent purification by organic solvent precipitation will be achieved.

b. Bio-Assay. Rabbits - A BW nebulizer was tested and was found to be capable of delivering [redacted] 30 rabbits were exposed and dosages /bubbler data/ [redacted] The animal data are not available at this time.

c. Adsorbent Synthesis. Synthesis of monomers and polymers in the phosphonate series for use as adsorbents in enzyme purification has continued. Allyl phenyl phosphonyl fluoride has been prepared and a more practical systhesis has been worked out. This compound and analagous derivatives should polymerize readily to give solids that will be useful in chromatographic separations. Work on the synthesis of thio acetyl derivatives is continuing.

d. Field Colorimeter. A redesigned field colorimeter is being constructed. This device will be capable of obtaining total dosage or differential dosage sampling of agent in a cloud.

e. Modification of Agent Solutions. Munitions filled with agent (Ucon solution Sept 1955) was found to be stable when tested last month with respect to viscosity (7% decrease). Viscosities were calculated at 3 different temperatures for the modified agent solutions as requested by Edo Corp. For the 5 month period of study it was found that only a slight decrease in agent stability occurred.

f. Liquid assessment. Rotary drum samplers fabricated here have proved to be effective and are being used. On trials with the Mars generator, stains produced on filter paper and M-6 detector paper (undyed agent) indicated liquid droplet travel as far as 420 yards downwind.

g. V Agents. Major effort is being expended in the development of satisfactory chemical methods for laboratory analysis [redacted] To date a sensitivity of about 8 Klett units /gamma/ml [redacted] has been attained. A variety of chemical reactions are being investigated in the hope of finding one that will provide greater sensitivity. In addition, a suitable technique for purity analysis is also being investigated. Physical as well as chemical methods are being considered and investigated.

Polyethylene gloves have been found to afford good protection from [redacted] However, efforts to decontaminate contaminated gloves have not been successful. Further study is to be continued in this area.

C. Cloud Physics

a. Cloud Diffusion in Relation to Cloud Transport.

1. Computations are being made to determine theoretical downwind dosages for the CW 219 tests by considering the space-time variation of the transporting wind vector. A wind vector was forecast via numerical methods, and the results applied to Roberts' diffusion equation. Theoretical results will be compared with field observations via dosage isopleth diagrams.

2. An addendum to Cloud Physics Scientific Report No. 4 has been finalized. The addendum considers the case of non-isotropic turbulence. Results show that the assumption of isotropic turbulence is valid for small scale tests, but on large scale tests (i.e., CW 219) the assumption of their being non-isotropic turbulence is imperative. Theoretical and observed dosage isopleth comparisons show that assuming the lateral component of the eddy diffusivity to be twice the longitudinal or vertical component affords the closest agreement.

[redacted]

b. Diffusion Study. A study has been initiated to derive a diffusion equation for an instantaneous ellipsoidal volume source. Such an equation will allow the approximation of any source cloud resulting from any explosive release of agent by any munition expenditure.

c. Nomography of Diffusion Equations. The project dealing with construction of a nomogram for Roberts' equation is continuing. This work has been delayed by the absence of the working person for three weeks.

e. X-ray of Fire-Bomb Fuses. A satisfactory method of orienting and photographing the fuses has been developed. The materials necessary in the operation have been requisitioned and further work awaits their arrival.

E. Ecology and Epidemiology

a. Infectious Disease Survey. The annual report of the Rocky Mountain Laboratory, U. S. Public Health Service, was received in July. The report covered activities supported under Inter Agency Agreement CD4-4345, for the period May 1955 to 1 July 1956.

In the 14-month period additional findings indicate that [redacted] occurred in jackrabbits, white-footed mice and their ectoparasites. Serological tests for [redacted] antibodies in Utah human sera were negative and very few sheep and cattle sera were positive.

Dugway wildlife specimens frequently yielded [redacted]

Serological reactions against the [redacted] group of antibodies were as follows:

426 human sera tested,	7 percent positive;
191 cattle sera tested,	14 percent positive;
1614 sheep sera tested,	23 percent positive.

[redacted] were isolated from 3 pools of jackrabbit tissue and 1 pool of ticks from jackrabbits.

No fungi infections for man were isolated from rodents, but rodent specimens continued to yield [redacted]

b. Laboratory Study of Infectious Diseases in Wildlife. A study of experimental [redacted] in coyotes was concluded. The results form the basis of a special report. A study of [redacted] in deer mice was also concluded. A special report on the subject is in preparation. A detailed special report on experimental [redacted] in rodents was completed.

F. Development Engineering

a. Mobile Recording Van 547. A data reduction system to record meteorological parameters on magnetic tape or in the form of punched cards is to be used in lieu of the chart roll type recording method now in use. Several proposals from commercial companies have been received. It has been determined that the system is feasible.

The preliminary specifications have been written and are being reviewed by the interested organizations.

b. Transmitter Programmer. The programmer has been field tested at Tower Grid, the drawings are complete, the fork controlled power supply has been redesigned and rebuilt and a draft report has been submitted.

c. Sampler Transmitters. Work has progressed as follows on the radio transmitter for sampler operation:

1. One 250 watt 40.2 mc transmitter has been completed and is ready for field use.

2. The 60 watt 217.55 mc transmitter has been completed and installed in mobile van for field use.

3. The 250 watt 217.55 mc transmitter is in the design and construction stage. All of the ordered parts have been received. The driver stage has been redesigned, built and mounted in the proper position with respect to the final R. F. stage. The coupling between the driver stage and final stage is the final problem.

d. Radio Field Strength Survey. Field strength surveys have been made on various grids at 217.55 mc. Optimum transmitter locations and broadcasting antennas have been selected. The survey at 217.55 mc has been completed, and the work on the survey at 40.2 mc has been started. The problems of mechanical and electronic design have been checked and two types of antenna are being built.

3. Events, problems, and accomplishments on current projects being conducted by Doctrinal Testing Directorate are as follows:

A. Chemical Corps Board Projects.

a. Cml C Board Project 6-55 "Effects of Masking in Conduct of Military Operation" (Doctrinal Order 806). Available literature is being evaluated at the present time. Special information has been requested from Human Resources Research Office on the training of a qualified cadre of observers. Methods and techniques of using and handling of the training agent are under consideration to insure that an adequate means to enforce masking will be available. An alternate method for the enforcement of masking is being considered, that of locally applied CN, in the event DM is found unsuitable. Sample tactical situations are being prepared and will be completed in the near future.

b. Cml C Board Project 5-55 "Aerial Delivery of Gas Masks" (Doctrinal Order 804). Further progress reports have been received from the project officer at Ft Lee, Virginia. Arrangements have been made for the transportation of the M9A1 masks to Army Chemical Center for inspection upon completion of the test. Air drop demonstrations at Ft Lee have caused some delay in the air drops for this project. The estimated date of completion of the test is now 17 August 1956.

c. Cml C Board Project 892 "Quartermaster Laundry Test" (Doctrinal Order 805). The test plan for this project is currently being rewritten in order to reduce the number of trials to be performed and quantity of clothing to be used. A statistical design is being applied to the test to facilitate this reduction. 2nd Chemical Weapons Battalion has been contacted and equipment and clothing available at Dugway Proving Ground for the conduct of the test are being checked.

d. Cml C Board Project 889 "Field Test of Thickner, Gasoline, E4R1" (Doctrinal Order 800). Correspondence was initiated with CCB citing problems that now exist and requesting additional information, pertaining to the project. A test plan is being prepared on the project.

e. Cml C Board Project 4-55 "Tactical Capabilities and Techniques for the employment of the 4.5 inch Chemical Rocket Battalion" (Testing Order 400.05). Doctrinal Testing Directorate has assumed responsibility for preparing the reports on phases G-N on project 4-55. Data on these phases have been received and reviewed by this Directorate. Comments on phases K, I, and H have been returned to 2nd Cml Wpns Bn. Approximate date of submission of phases K, I, and H is 15 August 1956.

B. Projects Planning Actions.

a. Variation in Munitions Effect. A study on the variation in munition effect was completed for the 105mm Howitzer Shell, 155mm Howitzer Shell, T-164 4.5 inch rocket, [redacted] The final draft of the report is being edited by the Editorial Staff of Material Testing Directorate for possible inclusion in the FT&M progress report for the 11th Tripartite.

b. Staff Study on Persistency. (Doctrinal Order 803). All reviews and comments by members of the Doctrinal Testing and Materiel Testing Directorates have been completed. The study is presently being prepared on duplimats and will be published in the near future.

c. Munitions Expenditure data for the 105 and 155mm Howitzer Shell. (Doctrinal Orders 801 and 802). Publication of the final report has been temporarily delayed pending some minor revisions in the text.

d. Value of Massive Bombs. The evaluation of available data to assess the usefulness of GB bombs for a total dose effect is in progress. Methods for calculation of total dose are being carried out concurrently. Information and results are being prepared for presentation at the Eleventh Tripartite Conference.

e. Regimental Artillery Effects (Doctrinal Order 807.01). This study has been undertaken to assess the effects of a Regimental Artillery shoot using GB filled munitions. A literature survey was conducted to obtain data on the distribution of impact points for 105 and 155mm Howitzer Battalion shoots. Ideas generated by the literature survey are being discussed and analyzed within the directorate.

f. Procedures for Protective Systems Evaluation. Progress on this project has been temporarily delayed because of higher priority operations.

g. M114 [redacted] Combination Data Study (Doctrinal Order 808.01). This project was undertaken to determine if existing data are sufficient and suitable for the calculation of munition expenditure tables for the M33 bomb filled with [redacted] An extensive literature survey was conducted of all available field and laboratory reports on the [redacted] An evaluation report of these data is being prepared at the present time.

h. Test of Smoke Generator Engine Tubes, Black Iron and Inconel. (Testing Order 408). Doctrinal Testing Directorate assisted in obtaining necessary supplies and equipment for the test. Work on the test between Materiel Testing Directorate and 2nd Chemical Weapons Battalion will be coordinated through Doctrinal Testing Directorate.

i. Preparation for the Eleventh Tripartite.

1. Coordination of statements of progress in the fields of CBR field testing, CBR test technology and meteorological research has been completed and all material is in the publication stage. Expected date of distribution to the Tripartite Secretariat is 10 August, as estimated for compliance with the overall schedule.

2. Two of the required eight discussion papers for the FT&M agenda items have been submitted to the Editorial staff. The remaining six are in a satisfactory state, considering the schedule of action required. Distribution to the Secretariat is scheduled for 27 August 1956.

4. From 1 July to the present time the following items have been accomplished in Materiel Testing Directorate in support of the testing program:

A. Completion of 1½ miles of a 3 mile foot trench on West Vertical Grid.

B. Removal of the wooden tower at Horizontal Grid.

C. Completion of a decontamination point at Down Wind Grid.

D. Extension of the roads (east) on Down Wind Grid.

E. Survey of new positions at Tower Grids, the lanes as extended on Down Wind Grid, new positions and munitions points at North Wig and 3/4 and 1 mile arcs at Horizontal Grid.

F. A radio link operating on the Security frequency has been established between Callao and Dugway Proving Ground for transmittal of meteorological data from Callao.

G. Representatives from Office of the Chief Chemical Corps, Research and Development Command consulted this activity as to a proposed Photo Ballistic Grid for Dugway. Acting upon their recommendations this office is preparing a detailed staff-study of problems relevant to the establishment of such a grid and means as how it may be implemented and phased into current activities in this field.

H. Equipment for the application of magnetic sound to Dugway produced motion pictures was received during the referenced period. Contracts for the application of magnetic striping to existing films are being investigated. As soon as definite information is received as to means of application, work will proceed on the addition of sound tracks to major Dugway films.

I. Vapor sampling has been accomplished vertically through 150 feet by use of Sea Fang balloons to determine vertical profile and density of agent cloud with satisfactory results.

J. To ensure the proper functioning of electronic sampling devices and communication equipment essential for the successful conduct of field trials, the Electronics Branch was established in Test Support Division, Materiel Testing Directorate. This branch consists of the Sampler Repair and Communications Sections formerly in Test Facilities Branch, Test Support Division. Since the two sections were allied and dependent on each other, it was felt that combination of these activities under one qualified engineer would eliminate many

of the difficulties encountered when split responsibilities existed.

K. The Bendix Aviation Corporation, contractors for micro meteorological telemetering network has made considerable progress in the field installation of telemetering network. Uncalibrated data from 5 stations are now being telemetered to the receiving station. It is planned to have all 8 stations so transmitting by 15 August 56. Calibration of the micro barameters is also in progress.

L. On 6 July 1956, Mr. Harold Thompson resigned from Civil Service and was replaced by Mr. William Shreve as chief of the Meteorological Division, Materiel Testing Directorate.

M. A total of seventeen (17) field trials were conducted during the period 13 July - 9 August 1956 and are as follows:

1. CW 173 (Capability of 4.5" Rocket Battalion)

Test No.		Date Completed
CW 173-03	Single Rocket on Tower	16 July 1956
CW 173-04		17 July 1956

2. CW 218 (Trials of 155mm Shell)

CW 218-At-6	Thickened Agent on Tower	19 July 1956

3. CW 225 (Transit III)

CW 225-B1	Continuous Source	24 July 1956
CW 225-B2		26 July 1956

4. CW 305 (Fortification Penetration)

CW 305-1		30 July 1956
CW 305-2	M10 Jettison	3 Aug 1956
CW 305-3		8 Aug 1956

5. CW 405 (Black Iron Engine Tubes)

CW 405-1		7 Aug 1956

6. CW 414 (Field Study of Toxic CW materiel)

CW 414-1	Temperature Effect Trials	1 Aug 1956
CW 414-2		6 Aug 1956
CW 414-3		8 Aug 1956
CW 414-4		9 Aug 1956

7. BW 421 (Area Dosage BW)

Test No.		Date Completed
BW 421-A1		8 Aug 1956
BW 421-C1	Temperature vs. Area	26 July 1956
BW 421-C2	Dosage Relationships	31 July 1956
BW 421-C3		6 Aug 1956

N. Following is a list of technical documents published by Dugway Proving Ground during the report period and a brief indication of their contents:

1. DPGRR 101: "Bacterial Aerosols in a Rendering Plant Process": During the recent outbreak of ornithosis in the Portland, Oregon, area, approximately sixty people were infected with the virus and two related deaths occurred. The source of the disease was determined to be an epizootic of ornithosis in the turkeys of two ranches north of Portland. Since 25 of the infections occurred in the personnel of the rendering plant that handled the dead turkeys, the Oregon State Health Service hypothesised that infective ornithosis-virus aerosols may have been produced by the animal rendering process. Biological Warfare Assessment Directorate, Dugway Proving Ground, Dugway, Utah, was requested to test this hypothesis. Four trials were conducted at the plant using Andersen samplers. Two chromogenic tracer organisms, [redacted] were used to determine the origin and extent of aerosols arising from the rendering process. Although the final plant-products were probably sterile, both [redacted] were recovered from every sampler position. It was concluded that the rendering process did create aerosols of the microbial organisms present in the animal tissue handled. It is pointed out that, in view of the fact that many of the animals handled by a plant of this nature have died from diseases that are transmissible to man, such plants may represent a hazard to almost every community of any size in America.

2. DPGRR 102: "The Large-Scale Enzymatic Assay of Sarin": Procedures for large-scale enzymatic assay of Sarin with purified bovine red blood cell cholinesterase are described in this report.

3. DPGRR 103: (CW Scientific #19): Experimental evidence indicates that isopropanol is satisfactory as a field solvent for the collection of GB at temperatures from -10 to -65°F. Its characteristics at these temperatures compare favorably with the absorptive qualities of Dowanol 50B and hexylene glycol at temperatures from 60 to 130°F.

Solutions of GB in isopropanol can be colorimetrically analyzed for GB by routine analysis, with stable color development and relatively high sensitivity [redacted] There is only one foreseeable difficulty in the use of isopropanol. If the filled bubblers are stored for several days at room temperature, there may be excessive evaporation. However, suitable storage facilities should eliminate this difficulty.

4. DPGRR 104; (MIB No. 8): The clinical and serological findings in 5 cases of [redacted] in immunized laboratory personnel are presented. [redacted] No evidence of subclinical infections was found.

5. "An Investigation of Ultraviolet and Solar Intensity and Energy at Dugway Proving Ground": The purpose of this study is to determine the amount of effect cloud cover has on the instantaneous recorded intensity, and to relate the mean percentage of the sky obscured daily by clouds to the total amount of solar energy that is received.

FOR THE COMMANDER:

Donald A. Restool

for IAN W. TERVET
Deputy Commander for
Scientific Activities

[redacted] UNCLASSIFIED

Chemical Corps Research and Development Command

DUGWAY PROVING GROUND
Dugway, Utah

CMLRD-DU-ASD 6 September 1956

SUBJECT: Significant Accomplishments during period 10 August - 4 September 1956 (CSGLD 696) (U)

TO: Commanding General
Cml C Research and Development Command
Gravelly Point
Washington 25, D. C.

1. Submitted herewith is information regarding the field test status and significant developmental and research accomplishments for the period of 10 August - 4 September 1956.

2. Events, problems, and accomplishments on current projects being conducted by Research Directorate are as follows:

A. BW Research

a. Counting Methods

Work on positive hole and microscopic counting methods has been completed. The theory and data have been evaluated by the statistician and considered sound and adequate. A paper on this will be prepared for the BW Research files.

b. Relationship of Particle Size to Stage Distribution of the AS.

Duplication of results has not been satisfactory. Work is continuing.

c. Diluter for the Andersen Sampler (AS)

Experimental data collected have been given to the statistician. Consistency of results is under question. Project is being redesigned to evaluate the AS against the AGI for comparison of consistency of results.

d. Persistency

Survey has been made of the [redacted] using animals. Level of persistency is still high. Animals can still be killed by injection. A map of the present persistency level is being prepared.

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B. CW Research

a. Enzymatic Assay [redacted]

The procedure for GB /DPGRR No. 102/ is satisfactory for [redacted] sensitivity, reproducibility, and reaction rate for [redacted] were of the same order of magnitude as for GB. [redacted] The KI's for the reaction of GB and V with the bovine RBC ChE are being determined.

b. Data Reduction System

A prototype assembly of a data reduction system which will permit direct recording of the output of colorimetric equipment on punch cards has been completed and is in the process of final testing.

c. Chemical Analysis of [redacted]

[redacted]

dele

d. Field Colorimeter

The completed drawings for the new field colorimeter have been submitted to Engineering Personnel for review and modification prior to fabrication. This instrument may prove to be useful for the collection of concentration vs time data as soon as a number of minor problems have been solved.

e. Liquid Assessment

Counting and sizing of the droplets sampled on two Tower trials gave an average spot size on M-6 detector paper of about 200 microns in diameter. Eight drum-type rotary samplers are being fabricated which will be used in future field tests for drop size assessment.

C. Cloud Physics

a. BW Cloud Travel Study

An attempt is being made to predict the downwind travel of BW Agents. Roberts' diffusion equation is utilized, with an additional factor to anticipate the "settling out" of aerosol particles. The theoretical approach has been finalized, and numberical computations are now in progress.

b. Stability Criterion

A stability criterion has been derived to predict the height a burst cloud attains before leveling off and traveling downwind. This height is a function of the frictional effect and the hydrostatic stability. It is hoped that this criterion will help to explain the lack of surface contamination from the last two CW 173 tests.

D. Ecology and Epidemiology

a. Infectious Disease Survey

[redacted] was isolated from a tissue pool from two jackrabbits. The isolation provides the first indication of wildlife infected with this organism in the Dugway area.

b. Laboratory Study of Infectious Diseases in Wildlife

A study of [redacted] indicates that immunity to infection with homologous strains of organisms can be stimulated in deer mice. No difference in the degree of immunity stimulated by four kinds of antigen (heat-killed, formalized, phenolized, antigen in adjuvant) was detected in the deer mice.

c. Studies on Diseases-transmitting Abilities and Incidence of Parasitic Anthropods

After feeding on a mouse infected with [redacted] both fleas and mites harbored the infection. [redacted]

3. Events, problems, and accomplishments on current projects being conducted by Doctrinal Testing Directorate are as follows:

A. Chemical Corps Board Projects

a. Cml C Board Project 6-55 "Effects of Masking in Conduct of Military Operation" (Doctrinal Order 806)

An extensive literature survey is still in progress. Information has been received from outside sources and is being evaluated at the present time. The formal preparation of a Staff Study has been delayed until further information is received from the Cml C Board on the possible increased scope of the project.

b. Cml C Board Project 5-55 "Aerial Delivery of Gas Masks" (Doctrinal Order 804)

Progress reports received on this project indicate that free fall deliveries from light aircraft have been halted because of the extensive damage to masks. The scheduled completion date for the test was set at 10 August 1956. The following week (13-17 August) was devoted to testing of masks in the CN chamber and their shipment to the Army Chemical Center.

c. Cml C Board Project 892 "Quartermaster Laundry Test" (Doctrinal Order 805)

The revision of the test plan for project 892 was completed during the report period. At present it is being placed on duplimats so that copies can be furnished to cooperating agencies for comments and criticisms.

d. Cml C Board Project 889 "Field Test of Thickener, Gasoline E4R1" (Doctrinal Order 800)

A test plan on this project has been initiated and is in rough draft form at the present time. Progress has been temporarily delayed because of higher priority operations.

e. Cml C Board Project 4-55 "Tactical Capabilities and Techniques for the Employment of the 4.5 inch Chemical Rocket Bn" (Testing Order 400.05)

Comments by this office on Phases G, L, and M have been forwarded to 2nd Chemical Weapons Battalion. Phase J has been cancelled and no report or comments are necessary. Agreements were reached on comments of Phases K, G, and L and these are being prepared for forwarding to Materiel Testing.

B. Project Planning Action

a. Variation in Munition Effect

The study has been finalized and copies for 11th Tripartite were published 31 August 1956. Copies for general distribution have a publication date of 5 September 1956.

b. Staff Study on Persistency (Doctrinal Order 803)

The study has been completed and is ready for publication. A method of analysis suggested by Suffield Experimental Station is now being applied to available long term sampling data. The results of this analysis will not be published with the persistency study, but will be published as an addendum to the study when completed.

c. Munition Expenditure Data for the 105 and 155mm Howitzer Shell (Doctrinal Orders 801 and 802)

An extensive review of this study is being initiated to correct some discrepancies that have been found in methodology.

d. Value of Massive Bombs

Work is continuing on the calculation of munition expenditure for total dosage effects. Higher priority operations have prevented final preparation of this report for presentation at the 11th Tripartite Conference.

e. Regimental Artillery Effects (Doctrinal Order 807.01)

A distribution of impact points from 3 groups of 6 Howitzers each has been determined from existing data. At the present, the effective dosage areas are being determined from these impact patters.

f. Procedures for Protective Systems Evaluation

Progress delayed because of higher priority operations.

g. [redacted] Combination Data Study (Doctrinal Order 808.01)

Evaluation of data from field test and technical bulletins is being continued. Information is being gathered on specific subjects listed below:

(1) Methods of estimating the infective dosage for man.

(2) Comparison of Guinea Pig ID_{50}'s under laboratory conditions, Fort Detrick conditions, and DPG field test conditions.

(3) Variations in source strengths.

(4) Comparison of data from single munitions, fractional clusters, and whole clusters.

h. Preparation for the Eleventh Tripartite Conference

(1) All discussion papers available for agenda items on Field Trials and Meteorology were transmitted to the Secretariat on 31 August 1956. The major preparatory activity required is now completed. From this date to the commencement of the conference, some correspondence will be generated between the chairman and co chairman on topics introduced by the progress reports and discussion papers. The final agenda for the FT & M session will be submitted during the next report period.

(2) Specific papers prepared:

(a) Ventilation Rates for Various Structures

This paper consisted of information and mathematical analyses of air infiltration rates and dosage build-ups with respect to strategic and tactical structures. A discussion of the applicability of CW and BW against these structures and recommendations for field testing is also presented.

[redacted]

(c) Use of Simulants in the evaluation of CBR Systems.

4. Events, problems, and accomplishments on current projects being conducted by Materiel Testing Directorate are as follows:

A. Modification of the horizontal grid has been completed to allow conducting of tests when wind direction is north.

B. The M-45 tracking camera mounts were used for the first time by Photo Instrumentation Branch, Test Support Division, on field trials. Results from these trials are highly satisfactory. These tests show that with the addition of longer focal length telephoto lenses, these mounts will serve an important function in future trials at Dugway.

C. Permanent photo positions have been surveyed and emplaced on new Target "S." Mitchell cine-phototheodolites will be installed at these positions and used in future trials.

D. A control system has been devised to reduce the malfunction rate of the E-34 sampler in dense arrays. This system has been used on three (3) tests at Target "S" Grid with encouraging results. A brief description of how the system operates follows: One (1) E-34 sampler and one (1) E-32 receiver (called controls) are located twenty feet apart and wired in parallel to a booster box. When these "controls" are indexed by the transmitter, each feeds 6 volts DC into the booster box, which in turn feeds 22½ volts DC to a group of 4 to 8 wire controlled samplers. If either control fails, the other will index them through the sampling period.

E. A repair van has been fully equipped with the necessary instruments, tools, and spare parts to repair E-32's and E-34's at the grid site. This repair van accomplishes the following:

a. Eliminates the long haul of sampling equipment from the test site to the Dog Area repair shop and back on day of test.

b. Makes possible the repair and replacement of sampling equipment on the grid almost to firing time if necessary.

c. Increases the reliability of the sampling equipment.

F. A vertical sampling mast was constructed as a proto type and set up in the field for evaluation. The mast (know as "The Holihan Vertical Sampling Mast") is hinged approximately 27" above ground so it can be raised and lowered. Eight vacuum lines ¼" ID are attached with provision for eleven sampling stations spaced a distance of 18," 36" above ground for the first two and the other nine spaced 3 feet apart.

G. A total of thirteen (13) field trials were conducted at Dugway Proving Ground during the period 10 August - 4 September 1956 and are as follows:

1. CW 173 (Capibility of 4.5" Rocket Battalion)

Test No.		Date Completed
CW 173-B3-2	Single Round, Downwind Travel	16 August 1956
CW 173-B3-3		22 August 1956
CW 173-B3-4	aborted because of weather	28 August 1956
CW 173-B3-5		30 August 1956

2. CW 307 — 6"/47 Navy Trials — 21 August 1956

3. CW 311 — Munition Shape Test — 23 August 1956

4. CW 414 — (Field Study of Toxic CW Materiel)

CW 414-5		13 August 1956

5. BW 413 — (Fortification Penetration)

BW 413-B1		16 August 1956
BW 413-A1		22 August 1956
BW 413-A2		30 August 1956
BW 413-A3		4 September 1956

6. BW 421 — (Area Dosage BW)

BW 421-C4		13 August 1956
BW 421-A2		20 August 1956

H. During the reporting period the following tests were completed by the Temperate Test Team and the Desert Test Team:

1. Temperate Test Site — Completed Week of 9 - 16 August 1956

   Pot, Smoke, HC, M1
   Pot, Smoke, 30 lb, M5
   Squib, Electric, Flash Vented, M1

2. Desert Team Site — 2 - 8 August 1956

   Pot, Smoke, HC, M1
   Pot, Smoke, 30 lb, M5
   Pot, Smoke, Floating, HC, M4A2

I. Following is a list of technical documents published by Dugway Proving Ground during the report period and a brief indication of their contents:

1. DPGRR 105: "Comparison of Computed Dosages for Point and Cubical Volume Sources." By the application of Green's function, a generalized form of the instantaneous point source can be developed into a cubical volume source in order to arrive at cumulative normal distribution functions. The computed dosages for both types of sources were compared at different times after burst and at different points on the coordinate axes representing distances from the burst point. The value represented by the center point of the volume source distribution curve is smaller than the same value on the point source distribution curve, while at a longer time interval, the volume and point source results approach each other in value. These observations support the relationships between computed and corresponding observed dosage isopleths noted in previous Cloud Physics reports, and partially explain the discrepancies found when an instantaneous point source is used.

2. Eleventh Tripartite Conference on Toxicological Warfare: "U. S. Progress Report on Field Trials and Meteorology:" This report briefly summarizes the progress from July 1955 through June 1956, in the fields of CBR field testing, CBR test technology and meteorological research, as assigned to Dugway Proving Ground by Chemical Corps command echelons. It includes brief statements in the cited technical areas from the other field commands of the Chemical Corps Research and Development Command, as well as a summary of action taken by Dugway Proving Ground on various recommendations of the Tenth Tripartite Conference.

3. Eleventh Tripartite Conference Discussion Papers on:

a. U. S. Discussion Paper, Field Trials and Meteorology Agenda - Use of Simulants with CBR Systems.

b. Data Collection for Casualty Production Estimation

c. V-agent Munition Testing

d. Ventilation Rates of Various Structures

e. Survey of Munition Expenditure Calculation Techniques

f. Variability in Munition Performance

g. Survey and Evaluation of BW Aerosol Samplers

FOR THE COMMANDER:

for Donald A. Restool

IAN W. TERVET
Deputy Commander for
Scientific Activities

Chemical Corps Research and Development Command

DUGWAY PROVING GROUND
Dugway, Utah

CMLRD-DU-ASD 8 October 1956

SUBJECT: Significant Accomplishments during period 5 September - 3 October, 1956 (CSGLD 696) (U)

TO: Commanding General
Cml C Research and Development Command
Gravelly Point
Washington 25, D. C.

1. (UNCLASSIFIED) Submitted herewith is information regarding the field test status and significant developmental and research assomplishments for the period 5 September - 3 October, 1956.

2. (UNCLASSIFIED) Events, problems, and accomplishments on current projects being conducted by Research Directorate are as follows:

A. (UNCLASSIFIED) BW Research

a. Relationship of particle size to stage distribution of the Andersen Sampler(AS).

Duplication of results by various methods has not been satisfactory. Work has been stopped pending redesign of experiment to relate actual size collection to the theoretical percentage of each size particle collected on the stages.

b. Diluter for the Andersen Sampler (AS)

More consistent results are now being obtained. Two experiments of five runs each showed average variations of less than 70 per cent.

c. Cold Weather Sampler

All Glass Impinger - Two units have been prepared and are acceptable to BW Testing Division.

Andersen Sampler - A satisfactory unit has been completed. Report is being written.

d. Field Tests

Seventy Andersen Samplers were used by BW Test Division. Results are not yet available.

REGRADING DATA CANNOT BE PREDETERMINED

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Copy 26 of 28 Copies
Page 1 of 10 Pages
DPG 6-2064

B. [redacted]L) CW Research

a. Enzymatic Assays

A study of the kinetics of inhibition of bovine red blood cell cholinesterase by GB and [redacted] showed that the latter reacted 50 per cent more rapidly than GB.

A large scale method for enzymatic assay of GB has been adapted for use on rabbit blood.

b. Data Reduction System

The system is being checked out for day-to-day operation and reliability.

c. Colorimeter

Temporarily inactive pending construction of two field instruments. Work is being continued on extended range colorimeter. Sensitivity and range have been extended.

(U) d. Chemical Analysis [redacted]

[redacted]

e. Sand Tube Withdrawal

Stability of GB and precision of sand tubes in aliquot samples has been reinvestigated to ascertain the limitations of sand tubes withdrawal technique in the quantitative estimation of GB. Approximately 500 sand tubes were used and the stability checked periodically for nine (9) days. Results are being analysed.

C. (UNCLASSIFIED) Cloud Physics

a. BW Cloud Travel Survey

A method has been finalized for predicting downwind particle counts resulting from the instantaneous release of particulate matter in the atmosphere. Roberts diffusion equation is modified to include a term that takes into account the finite terminal velocities of the released particles. Theoretical estimates of particle counts 40 miles downwind differ from measured counts by a factor of 1.5.

b. Stability Criteria

The report on a stability criteria for determining the effectiveness of agent releases in establishing surface contamination has been finalized and sent to Editorial. Theoretical interpretations have been applied to various CW tests with excellent results. In all tests where theory predicted either good or bad results, field test data verified the forecast results.

c. Temperature Gradient Study

This project has been completed. A periodic convective heat flow solution is presented in which the boundary temperature varies sinusoidally with time while the eddy diffusibility is postulated to vary sinusoidally with time as a power law of height. The report remains to be published.

d. Gas Slide Rule Project

All theoretical forms have been developed up to the point of calculating the desired circular nomograms for the rule. Equations and necessary geometric relationships have been realized for converting a parallel line nomogram to the circular form for a three variable problem. The instantaneous point source diffusion formula desired for this project has been manipulated into a desired master form. Work has started on a subsidiary chart needed for source computations.

D. ~~(UNCLASSIFIED)~~ Ecology and Epidemiology

~~(S)~~ (U) a. Infectious Disease Survey

Field Crews secured 315 wildlife specimens during the month in the following areas: Calao, Fish Springs, and Gold Hill. [redacted] were isolated from jackrabbit tissue and ticks from jackrabbits which had been collected earlier in the year from southern Skull Valley. Significant antibody titers from Rocky Mountain [redacted] were found in sera of jackrabbits collected in May, June, and July. One pool of sera from deermice also reacted positively to [redacted] antigen.

b. Laboratory Study of Infectious Diseases in Wildlife

A satisfactory technique for the culturing of [redacted] in a liquid medium (MCPH) was developed and standardized. The coyote [redacted] infection experiments continue. The relative susceptibility of three species of native rodents to [redacted] infection was investigated.

c. Studies on Disease-Transmitting Abilities and Incidence of Parasitic Arthropods.

A study of extoparasites in relation to their host-

(U)

community association was initiated. A tick of jackrabbits, [redacted] was successfully reared on domestic rabbits. [redacted]

E. (UNCLASSIFIED) Development Engineering Division

a. CW Radio-Controlled Sampler

Development work at the prototype level awaits the receipt of components.

b. BW Radio-Controlled Sampler

Prototype samplers are about to be completed and have undergone initial test phases. Testing under field conditions will be started upon completion of the transmitter installation at Target X.

c. Mobile Recording Van 547

Work toward increasing reliability and accuracy of raw meteorological data as collected in the field is continuing. Proposals from several companies are being studied to determine the type of system that would best fulfil our requirements.

d. Radio Field Strength Survey

Field strength surveys have been made on various grids. Optimum transmitter locations and broadcasting antennas have been selected. The compiled information will be used for planning sampler operations on test grids.

3. (UNCLASSIFIED) Events, problems, and accomplishments on current projects being conducted by Doctrinal Testing Directorate are as follows:

A. (UNCLASSIFIED) Chemical Corps Board Projects:

a. Cml C Board Project 6-55 - "Effects of Masking in Conduct of Military Operation" (Doctrinal Order 806).

Correspondence has been received from the Cml C Board detailing the increased scope of this project. This new information is being reviewed by members of the Directorate to generate comments and ideas to be discussed at a meeting of personnel interested in the project. The meeting will take place at Dugway Proving Ground in the near future.

b. Cml C Board Project 5-55-"Aerial Delivers of Gas Masks" (Doctrinal Order 804).

All air drop tests at Fort Benning and Fort Lee have been completed. Results are being evaluated and the preparation of a final report has been undertaken by the Project Officer.

c. Cml C Board Project 892 - "Quartermaster Laundry Test" (Doctrinal Order 805).

The revised test plan for this project is being duplimated and will be forwarded to the Cml C Board for approval. Field tests will begin as soon as approval has been received from the Cml C Board.

d. Cml C Board Project 889 - "Field Test of Thickener, Gasoline E4R1" (Doctrinal Order 800).

A test proposal is being written on this project and the estimated date of completion is 5 October 1956.

e. Cml C Board Project 4-55 - "Tactical Capabilities and Techniques for the Employment of the 4.5-Inch Chemical Rocket Battalion" (Testing Order 400.05).

Comments on all phases of the project for which this Directorate was responsible have been completed and forwarded to Materiel Testing Directorate.

B. (UNCLASSIFIED) Project Planning Action

a. Variation of Munition Effect

Final report DPGR 106 "Variation in Munition Performance," published 18 September 1956.

b. Staff Study on Persistency (Doctrinal Order 803).

The Staff Study has been approved and a duplimat copy is being forwarded to Technical Publishing Branch of Test Design and Analysis for publication.

c. Munition Expenditure data for the 105 and 155 mm Howitzer Shell (Doctrinal Orders 801 and 802).

Responsibility for a complete re-evaluation of the data contained in the report has been transferred to Materiel Testing Directorate.

d. Value of Massive Bombs.

Work is continuing on Munition Expenditure calculations for total dosage effects and results are being organized into report form.

e. Regimental Artillery Effects (Doctrinal Order 807.01)

Progress delayed because of higher priority operations.

f. Procedures for Protective Systems Evaluation.

Progress delayed because of higher priority operations.

g. [redacted] Combination Data Study (Doctrinal Order 808.01).

The Background Research Study is continuing on the subject outlined in the previous report.

h. Operation Pinetree (Testing Order 413.03)

During the report period this operation was undertaken and tests were conducted in the Uinta Mountains. Tests were run using agent simulant to assess the effects of forest and underbrush on the behavior of the agent cloud. Reports are being received from agencies connected with the operation and from these a final report on the project will be published.

i. BW-CW Capabilities of Army Aviation (S)

([redacted] A cost estimate of $150,000 has been made and the justification for the estimate has been written and forwarded to the Assistant Chief Chemical Officer, Plans and Doctrine, to initiate a program to assess the BW-CW Capabilities of Army Aircraft. Information pertinent to the subject is being gathered at the present time by members of the Directorate.

j. Staff Study on Munition Disposal (Doctrinal Order 810.01).

This study was initiated to determine the best means of disposing of a CW/BW Agent while rendering safe any toxic-filled munitions. A background research study of all available information is in progress.

k. Preparation for the Eleventh Tripartite Conference.

Six discussion papers on agenda items were completed, published and distributed. The responsibility for future efforts, both administrative and technical, was transferred to the Special Assistant to the Deputy Commander for Scientific Activities.

C. (UNCLASSIFIED) Major Personnel Changes

Mr. Eugene P. Visco, Scientific Director for the Directorate of Doctrinal Testing terminated 28 September 1956.

4. (UNCLASSIFIED) Events, problems, and accomplishments on current projects being conducted by Materiel Testing Directorate are as follows:

A. (UNCLASSIFIED) Final editing was completed on the motion picture file of the surveillance testing of the M-360 shell by the Photo Instrumentation Branch, Test Support Division. Preliminary editing of the three films relating to GA disposal was accomplished. Trails were conducted during the report period on Target S, utilizing the newly established photo-theodolite positions. This coverage was unique inasmuch as it was the first time that photo-theodolites have been operated here, connected to a time network, wherein a common base time signal was supplied to all positions.

B. (UNCLASSIFIED) Two Pulser transmitters have been installed in Van 504, Electronics Branch, Test Support Division. This does away with the need for having two vans at one index position during test. During the period covered by this report Shops Branch, Test Support Division, has fabricated the following items:

a. Power Supply: This unit is to be shipped to the Gerstle River Test Site for use in conjunction with the cold weather tests. This power supply is designed to provide 6-volt and 90-volt power for operation of the wind speed and wind direction units installed in the Meteorological Van currently in operation at the Gerstle River Test Site. It is estimated that this power supply will save approximately four hundred dollars in battery costs plus the large shipping charges of approximately four dollars per pound. In addition this unit will provide greater reliability during cold weather testing operations. This system previously used battery voltage supply.

b. Rocket Controllers: These rocket controllers are divided into two systems, each system consisting of thirteen units interconnected by two wire cables and thirteen each six-volt batteries,

one for each unit. The thirteen units are comprised of one Central Control Unit and twelve sequentializer units. The sequentializer units directly operate the rocket launcher tubes. This system is designed to fire automatically the contents of up to twelve rocket launchers simultaneously. The launchers may be controlled whether individually or en masse, and each launcher fires at the rate of six rounds per second.

3d-party Review

[redacted]

D. (UNCLASSIFIED) The number system on the Horizontal Grid was converted to a permanent system which will take care of the numbering on any test conducted on that grid in the future, thus eliminating some of the confusion that has arisen when several tests were being conducted on the grid during the same period.

E. (UNCLASSIFIED) A total of nineteen (19) field trials were conducted at Dugway Proving Ground during the period 5 September - 3 October 1956 and are as follows:

Test No.	Date Completed
a. CW 173 (Capability of 4.5" Rocket Battalion)	
CW 173-B3-6	6 September 1956
CW 173-B3-7	12 September 1956
b. CW 305 (Jettison Trials)	
CW 305-C1	13 September 1956
CW 305-B1	19 September 1956
CW 305-B2	25 September 1956
CW 305-B3	27 September 1956
c. CW 311 (Munition Shape Tests)	
CW 311	2 October 1956
d. CW 317 (Mars Generator)	
CW 317A-1	18 September 1956
CW 317A-2	21 September 1956
CW 317A-3	24 September 1956
CW 317A-4	1 October 1956
CW 317A-5	3 October 1956
e. Preliminary Trials Operation "Pinetree"	6 September 1956

f. BW 5C-55 (Operation COFF)

BW 5C1-55	24 September 1956
BW 5C2-55	26 September 1956

g. BW 313 (BW Area Dosage)

BW 313-B1	19 September 1956

h. BW 314 (Mars Generator)

BW 314-A5	10 September 1956

i. BW 413 (Fortification Penetration)

BW 413A-4	6 September 1956

j. BW 421 (BW Area Dosage)

BW 421B-1	5 September 1956

F. (UNCLASSIFIED) During the reporting period the following tests were completed by the Temporate Test Team and the Desert Test Team:

a. Temporate Test Team — Week Completed

Grenade, Hand, Irritant, CN-DM, M6 (B12)
30 Aug - 5 Sep
Grenade, Smoke, HC, AN-M8 (B14)
30 Aug - 5 Sep
Grenade, Hand, Riot, CN, Metal (B21)
30 Aug - 5 Sep

b. Desert Test Team

Grenade, Hand, Irritant, CN-DM, M6 (B12)
23 Aug - 29 Aug
Grenade, Hand, Riot, CN, M25A1 (B21)
23 Aug - 29 Aug
Grenade, Hand, Tear, CN, M7A1 (B20)
30 Aug - 5 Sep
Grenade, Smoke, Green, M18 (A12)
23 Aug - 29 Aug
Grenade, Smoke, Yellow, M18 (A11)
23 Aug - 29 Aug
Grenade, Smoke, Red, M18 (A10)
23 Aug - 29 Aug
Grenade, Smoke, White, HC, AN-M8 (B14)
30 Aug - 5 Sep

Grenade, Hand, Smoke, WP, M15 (A9)
30 Aug - 5 Sep
Curtain, Gas Proof, M1 (B1) 13 Sep - 19 Sep

G. (UNCLASSIFIED) DPG RR107 - "Theoretical Derivations and Nomographic Methods for Sutton's Diffusion Equations" was published. Following is a brief summary of the contents:

A survey is made of diffusion equations, including hypotheses underlying derivations and limits to applicability. Nomograms are derived and their use is demonstrated for Sutton's diffusion equations. The use of nomograms is shown to simplify and expedite diffusion calculations. Six computed nomograms are included with derivations and demonstrations of their use.

FOR THE COMMANDER:

for Donald F. Restool
IAN W. TERVET
Deputy Commander for
Scientific Activities

REPORT OF OPERATING PERSONNEL UTILIZATION AND REQUIREMENTS - CONTINENTAL UNITED STATES

(SR 600-620-10)

REPORTS CONTROL SYMBOL CSGPA-382

PART A - AUTHORIZATION AND STRENGTH BY SUBORDINATE ECHELON RECEIVING A SUB-AUTHORIZATION

COMMAND OR AGENCY: Dugway Proving Ground, Dugway, Utah

REPORT FOR MONTH ENDING: 30 September 1956

SHEET 1 OF 1 SHEETS

LINE NO.	SUBORDINATE ECHELON RECEIVING A SUB-AUTHORIZATION	TOTAL PERSONNEL USED (Cols 5 + 20)	COVERED BY PERSONNEL AUTHORIZATION VOUCHER: TOTAL AUTHORIZATION (Cols 6 + 14)	TOTAL STRENGTH (Cols 10 + 17)	MILITARY PERSONNEL: AUTHORIZATION: TOTAL (Cols 7 + 8 + 9)	OFFICER	WO	ENL	STRENGTH: TOTAL (Cols 11+12+13)	OFFICER	WO	ENL	CIVILIAN PERSONNEL: AUTHORIZATION: TOTAL (Cols 15 + 16)	GRADED	UNGRADED	STRENGTH: TOTAL (Cols 18 + 19)	GRADED	UNGRADED	OTHER PERSONNEL USED NOT SUBJECT TO AUTHORIZATION VOUCHER (Convert to Man-Month Equivalents)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1.	Aggregate	1638	1511	1441	552	69	0	483	499	88	1	410 (114)	959	458	501	942	471(a)	471(b)	197
2.	TD	1638	1506	1441	552	69	0	483	499	88	1	410 (114)	954	453	501	942	471(a)	471(b)	197
3.	Yuma Test Station		5										5(c)	5(c)					

(a) Includes (25) WAE, (1) part-time and (2) temporary employed during September 1956.
(b) Includes 2 temporary employed during September 1956.
(c) (5) spaces for Yuma Test Station excluded per AR 705-28 from strength accounting.

	2nd Cml Wpns Bn								218	16	2	200			University of Utah				20
	9470th Sig Mat Team No. 3								43	1		42			Gen Serv Admin				
	Cml Warfare Lab Clinical Research								3	3					Office				3
	U S Naval Unit								6	1		5			Custodial				32
	94th MP C I Det								2		1	1			Security				62
	19th Air Wea Det								15	2		13			9470th Sig Mat Team No. 3				43
	U S Public Health Service								1	1					Cml Warfare Lab Clinical Research				3
	6th Army								2	1		1			U S Naval Unit				6
	Cml C Bd								1	1					Det #1, 6570th Test Gp (Cml and Ord)				13
	General Services Administration														19th Air Wea Det				15
	Corps of Engineers															3			
	U of U															1	1		
	U S Post Office															1	1		
	Public Schools															84	52	32	
	Concessionaire, N A Fund, Contractors															1	1		
	Dependents															20			
	Transients															4			
	TOTALS								291	26	3	262				21			
																87			
																1103			
																8			
																1333	55	32	

WM M. HILLEY
Comptroller

DA FORM 1 DEC 53 1043

REPLACES DA FORM 379, 1 DEC 52 AND DA FORM 379-A, 1 FEB 53, WHICH ARE OBSOLETE.

U. S. GOVERNMENT PRINTING OFFICE

4-1

REPORTS CONTROL SYMBOL CSGPA-372

REPORT OF OPERATING PERSONNEL UTILIZATION AND REQUIREMENTS - CONTINENTAL UNITED STATES

(SR 600-620-10)

PART A - AUTHORIZATION AND STRENGTH BY SUBORDINATE ECHELON RECEIVING A SUB-AUTHORIZATION

COMMAND OR AGENCY: Dugway Proving Ground, Dugway, Utah

REPORT FOR MONTH ENDING: 31 August 56

SHEET 1 OF 1 SHEET

LINE NO.	SUBORDINATE ECHELON RECEIVING A SUB-AUTHORIZATION	TOTAL PERSONNEL USED (Cols 5 + 20)	COVERED BY PERSONNEL AUTHORIZATION VOUCHER: TOTAL AUTHORIZATION (Cols 6 + 14)	TOTAL STRENGTH (Cols 10 + 17)	MILITARY PERSONNEL: AUTHORIZATION: TOTAL (Cols 7 + 8 + 9)	OFFICER	WO	ENL	STRENGTH: TOTAL (Cols 11+12+13)	OFFICER	WO	ENL	CIVILIAN PERSONNEL: AUTHORIZATION: TOTAL (Cols 15 + 16)	GRADED	UNGRADED	STRENGTH: TOTAL (Cols 18 + 19)	GRADED	UNGRADED	OTHER PERSONNEL USED NOT SUBJECT TO AUTHORIZATION VOUCHER (Convert to Man-Month Equivalents)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1.	Aggregate	1684	1511	1472	552	69	0	483	500	88	1	411 (122)	959	458	501	972	481(a)	491(b)	212
2.	TD	1648	1508	1472	552	69	0	483	500	88	1	411 (122)	956	455	501	972	481(a)	491(b)	212
3.	Tuma Test Station		3										3(c)	3(c)					

(a) Includes (23) WAE, (1) part-time and (8) temporary employed during Aug 1956.
(b) Includes 21 temporary employed during Aug 1956.
(c) (3) spaces for Tuma Test Station excluded per AR 705-28 from strength accounting

	2nd Cml Wpns Bn								255	16	2	237			University of Utah				20
	9470th Sig Mot Team No. 3								42	3		39			Gen Serv Admin				
	Cml Warfare Lab Clinical Research								2	2					Office				3
	U S Naval Unit								21	5		16			Custodial				34
	94th MP C I Det								2		1	1			Security				61
	19th Air Wea Det								16	2		14			9470th Sig Mot Team No. 3				42
	U S Public Health Service								1	1					Cml Warfare Lab Clinical Research				2
	6th Army								2	1		1			U S Naval Unit				21
	Cml C Bd								1	1					Det #1, 6570th Test Gp (Cml & Ord)				13
	General Services Administration														19th Air Wea Det				16
	Corps of Engineers															2			
	U of U															1	1		
	U S Post Office															1	1		
	Public Schools															84	50	34	
	Concessionaire, N A Fund, Contractors															2	2		
	Dependents															20			
	Transients															4			
	Totals								342	31	3	308				0			
																63			
																1266			
																9			
																1452	54	34	

WM M. RILEY
Comptroller

DA FORM 1 DEC 53 1043

REPLACES DA FORM 319, 1 DEC 52 AND DA FORM 319-A, 1 FEB 53, WHICH ARE OBSOLETE.

U S GOVERNMENT PRINTING OFFICE

4-2

REPORT OF OPERATING PERSONNEL UTILIZATION AND REQUIREMENTS - CONTINENTAL UNITED STATES
(SR 600-620-10)

REPORTS CONTROL SYMBOL CSGPA-372

PART A - AUTHORIZATION AND STRENGTH BY SUBORDINATE ECHELON RECEIVING A SUB-AUTHORIZATION

COMMAND OR AGENCY: Dugway Proving Ground, Dugway, Utah

REPORT FOR MONTH ENDING: 31 July 56

SHEET 1 OF 1 SHEET

LINE NO.	SUBORDINATE ECHELON RECEIVING A SUB-AUTHORIZATION	TOTAL PERSONNEL USED (Cols 5 + 20)	COVERED BY PERSONNEL AUTHORIZATION VOUCHER: TOTAL AUTHORIZATION (Cols 6 + 14)	TOTAL STRENGTH (Cols 10 + 17)	MILITARY PERSONNEL: AUTHORIZATION: TOTAL (Cols 7 + 8 + 9)	OFFICER	WO	ENL	STRENGTH: TOTAL (Cols 11+12+13)	OFFICER	WO	ENL	CIVILIAN PERSONNEL: AUTHORIZATION: TOTAL (Cols 15 + 16)	GRADED	UNGRADED	STRENGTH: TOTAL (Cols 18 + 19)	GRADED	UNGRADED	OTHER PERSONNEL USED NOT SUBJECT TO AUTHORIZATION VOUCHER (Convert to Man-Month Equivalents)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1.	Aggregate	1680	1511	1492	552	69	0	483	513	90	1	422 (129)	959	458	501	979	472(a)	507(b)	188
2.	TD	1680	1506	1492	552	69	0	483	513	90	1	422 (129)	954	453	501	979	472(a)	507(b)	188
5.	Yuma Test Station		5										5(c)	5 (c)					
															University of Utah				18
															Gen Serv Admin				
															Office				3
															Custodial				34
															Security				61
		2nd Cml Wpns Bn							286	20	2	264			9470th Sig Mat Team No. 3				39
		9470th Sig Mat Team No. 3							39	3		36			Cml Warfare Lab Clinical Research				2
		Cml Warfare Lab Clinical Research							2	2					U S Naval Unit				7
		U S Naval Unit							7	1		6			Det #1, 6570th Test Op (Cml & Ord)				12
		94th MP C I Det							2		1	1			19th Air Wea Det				12
		19th Air Wea Det							12	1		11							
		U S Public Health Service							1	1						2			
		6th Army							2	1		1				1	1		
		Cml C Bd							1	1						1	1		
		General Services Administration														85	51	34	
		Corps of Engineers														2	2		
		U of U														18			
		U S Post Office														4			
		Public Schools														0			
		Concessionaire, N A Fund, Contractors														93			
		Dependents														1133			
		Transients														40			
		Totals							352	30	3	319				1379	55	34	

W. J. MC CAHUL, Capt
Deputy Comptroller

DA FORM 1 DEC 55 1043 Inc of 43

Sec 6-2155

REPLACES DA FORM 379, DEC 52 AND DA FORM 379-A, 1 FEB 53, WHICH ARE OBSOLETE.

U S GOVERNMENT PRINTING OFFICE

4-3

CMLRD-DU-RED

QUARTERLY HISTORICAL REPORT OF MAJOR EVENTS AND PROBLEMS IN THE OFFICE OF THE COMMANDING OFFICER, DUGWAY PROVING GROUND DUGWAY, UTAH

(Reports Control Symbol CMLHO-194)

QUARTER ENDING 30 September 1956

DATE OF SUBMISSION 19 October 1956

I. Administration

A. There has been no significant change in the mission or responsibility of this headquarters during the reporting period.

B. The new organization chart has been approved by the Commanding General, Chemical Corps Research and Development Command.

II. Personnel

A. Captain Michael J. McGague was assigned primary duty as Deputy Comptroller and Captain William C. Wells was assigned as Executive Officer, effective 1 July 1956.

III. Plans

A. There has been no significant changes.

IV. Operation

A. Operations have been conducted in accordance with test schedules established with Chemical Corps Research and Development Command.

V. General

A. The most significant inspection of the Command during the period was made by representative of the Inspector General and Chemical Corps Inspector.

B. The Commanding Officer visited the Arctic Test Team at Fort Greely, Alaska during this quarter. The principal result of the visit was a draft agreement with the Commanding General, USARAL, with reference to the Test Team as a Class II activity.

FOR THE COMMANDER:

WILLIAM C WELLS
Captain, CmlC
Executive Officer

NGB 6-9155

REFERENCE REQUEST—FEDERAL RECORDS CENTERS

NOTE: Use a separate form for each request.

SECTION I—TO BE COMPLETED BY REQUESTING AGENCY

ACCESSION NO.	AGENCY BOX NUMBER	RECORDS CENTER LOCATION NUMBER
[illegible] A-1405	10 OF	[illegible]

DESCRIPTION OF RECORD(S) OR INFORMATION REQUESTED

☐ BOX

☒ FOLDER (include file number and title) [illegible]

REMARKS

NATURE OF SERVICE

☐ FURNISH COPY OF RECORD(S) ONLY ☐ PERMANENT WITHDRAWAL ☒ TEMPORARY LOAN OF RECORD(S) ☐ REVIEW ☐ OTHER (Specify)

SECTION II—FOR USE BY RECORDS CENTER

☐ RECORDS NOT IN CENTER CUSTODY ☐ RECORDS DESTROYED

☐ WRONG ACCESSION NUMBER—PLEASE RECHECK

☐ WRONG BOX NUMBER—PLEASE RECHECK

☐ WRONG CENTER LOCATION—PLEASE RECHECK

☐ ADDITIONAL INFORMATION REQUIRED TO IDENTIFY RECORDS REQUESTED

☐ MISSING (Neither record(s), information nor charge card found in container(s) specified)

☐ RECORDS PREVIOUSLY CHARGED OUT TO (Name, agency and date):

REMARKS

[illegible]

DATE	SERVICE	TIME REQUIRED	SEARCHER'S INITIALS
[illegible]			[illegible]

SECTION III—TO BE COMPLETED BY REQUESTING AGENCY

NAME OF REQUESTER	TELEPHONE NO. ☐ FTS	DATE
Jeffery K. Smart	410-671-4430	8/14/95

NAME AND ADDRESS OF AGENCY (Include street address, building, room no. and ZIP Code)

Commander
US Army Chemical and Biological Defense Command
ATTN: AMSCB-CII/Ed Gier
Bldg E3330, Technical Library
Aberdeen Proving Ground, MD 21010-5423

RECEIPT OF RECORDS

Requester please sign, date and return this form, for file item(s) listed above, *ONLY* if the block to right has been checked by the Records Center. ☐

SIGNATURE | DATE

NSN 7540-00 5011-108

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36 CFR 1228.162