

~~SECRET~~ Security Information

RDB PROJECT CARD		TYPE OF REPORT	REPORTS CONTROL SYMBOL
1. PROJECT TITLE G-Agents - (G-AGENTS)		2. SECURITY ██████████	3. PROJECT NUMBER 4-08-03-005
		4. INDEX NUMBER	5. REPORT DATE 31 Dec 53
6. BASIC FIELD OR SUBJECT Chemical Warfare	7. SUB FIELD OR SUBJECT Agents		7A. TECHNICAL OBJECTIVE CW-1a
8. COGNIZANT AGENCY Cm1C	12. CONTRACTOR AND/OR LABORATORY Cm1 Div, Cm1C Cm1 & Rad Labs (Refer to 21d Contract Information)		CONTRACT/W.O. NUMBER
9. DIRECTING AGENCY Cm1C R&E Cmd, A Cm1 C, Md.	10. REQUESTING AGENCY Cm1C		13. RELATED PROJECTS 4-04-15-016 4-08-06-006 4-08-07-017
11. PARTICIPATION AND/OR COORDINATION (AR) Army	14. DATE APPROVED 26 Sep 1946, CCTC item 1703		17. EST. COMPL. DATES RES. Cont DEV. TEST
19.	15. PRIORITY 1-B	16. MAJOR CATEGORY	OP. EVAL. FY 18. FISCAL ESTIMATES
20. REQUIREMENT AND/OR JUSTIFICATION		54	172M
GB is urgently required in large quantities as a toxic quick-acting, nonpersistent chemical agent for tactical use. (GB was designated a standard agent on 5 April 1951 (CCTC item 2310).) In addition, there exists an unfulfilled requirement for a quick-acting, persistent agent which, it is believed, will be filled by one of several G-type compounds. Information on corrosiveness, methods of stabilization and detection, and other chemical and physical properties is necessary.		55	170M
21. BRIEF OF PROJECT AND OBJECTIVE		56	100M
a. <u>Brief.</u> (Scientific Problem and Applied Research) Current plans in the Chemical Corps program include the development of improved processes for the synthesis of GB. Information will be obtained on the reactions involved, methods of analysis and control of intermediates, stabilization, and inhibition of corrosion. Research will be continued with GB to develop improved methods of detection, protection, and decontamination; to obtain basic thermodynamic data applicable to synthesis, analysis, and detection; and to improve methods of dissemination. A search will be made for a persistent G agent which is equally effective percutaneously as well as by other routes.		57	170M Cont
b. <u>Approach.</u>			
Effort is directed along seven major lines:			
1. Research will be conducted to improve existing processes for the manufacture of the more important G agents and to obtain physico-chemical data relevant to processes, intermediates, and agents. Determinations will be made of the effects of impurities on the stability of compounds and on the processes involved.			
2. Work will be conducted to develop new methods or to improve old methods for the analysis and evaluation of intermediates in the HTM, APC, or			
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21. b. Continued.

other processes. This will include spectroscopic and electrical methods.

- 3. Investigations will be carried out to improve methods of stabilization of G agents, assess their corrosiveness, and develop methods for prevention of corrosion.
- 4. Reactions of G agents will be investigated with the view of adapting the more promising ones into improved detection, protective, and decontamination devices.
- 5. Studies will be made with mixtures of GB and other compounds with the view of enhancing toxicity or other characteristics of military interest. This will include a search for a thickening agent for GB which will form a stable system suitable for airplane spray dissemination.
- 6. Various types of phosphorus compounds will be synthesized and screened for toxicity with the view of obtaining one which is quick acting and persistent.
- 7. Thermodynamic studies will be made to obtain basic information on the heats of formation and bond energies in G agents and intermediates. These are required to obtain data applicable to plant design requirements and to the development of methods of analysis, control and detection, and to stabilization.

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c. Subtasks. None.

d. Other Information. It is anticipated that research contracts on the following subjects will be effective during the fiscal year 1954:

- (1) Spot Tests for G Agents.
- (2) Thermodynamic Properties of G Agents.
- (3) Chemistry of G Agents.
- (4) Electrical Methods for Analysis and Detection of G Agents.
- (5) Resolution of Optically Active Phosphorus Compounds.

(1) Basic Research: The total funds allocated to this project are 172M. Approximately 75% of this amount is directed toward basic research, and the remaining 25% to applied research.



(2) Fund Estimate: (In units of thousand dollars)

Period	Total estimate	Army R&D funds	Procurement & production funds	Other identified army funds	Other agency funds
FY 1953	269	269			
FY 1954	172	172			
FY 1955	170	170			
FY 1956	100	100			

(3) Contract Information:

Contract DA-18-108-CML-2525

National Bureau of Standards  
 Washington 25, D. C.  
 Amount of obligation - \$90M  
 Progress during past year - \$30M  
 Accumulated progress - \$75M  
 Estimated completion date - 30 June 1954

Contract DA-18-108-CML-3563

Standard Oil Development Co.  
 Linden, N. J.  
 Amount of obligation - \$64M  
 Progress during year - \$32M  
 Accumulated progress - \$48M  
 Estimated completion date - 30 June 1954

Contract DA-18-108-CML-3697

University of Kansas  
 Lawrence, Kansas  
 Amount of obligation - \$14M  
 Progress during past year - \$9M  
 Accumulated progress - \$11M  
 Estimated completion date - 1 May 1954

Contract DA-18-108-CML-3786

Louisiana State University  
 Baton Rouge, La.  
 Amount of obligation - \$32M  
 Progress during year - \$20M  
 Accumulated progress - \$27M  
 Estimated completion date - 31 May 1954

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(4) Standardization Item: None.

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(5) Production Limitations & Critical Materials: None.

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e. Background.

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RDB PROJECT CARD		TYPE OF REPORT	Progress Report	REPORTS CONTROL SYMBOL		
1. PROJECT TITLE CW Agent Pilot Plants (CW AGT PILOT PLT)		2. SECURITY ██████████		3. PROJECT NUMBER 4-92-03-012		
6. BASIC FIELD OR SUBJECT Processing and Manufacturing Methods & Techniques & Equipment		7. SUB FIELD OR SUBJECT Chemical		5. REPORT DATE 31 Dec 53		
8. COGNIZANT AGENCY CmlC		12. CONTRACTOR AND/OR LABORATORY Plants Div, CmlC Cml & Rad Labs		7A. TECHNICAL OBJECTIVE CW-1a		
9. DIRECTING AGENCY CmlC R&E Cmd, A Cml C, Md.		13. RELATED PROJECTS		CONTRACT/W.O. NUMBER		
10. REQUESTING AGENCY CmlC		14. DATE APPROVED 11 Sept 1953, CCTC item 2730		17. EST. COMPL. DATES		
11. PARTICIPATION AND/OR COORDINATION (AR) Army		15. PRIORITY 1-B		RES. Cont		
		16. MAJOR CATEGORY		DEV. Cont		
				TEST Cont		
				OP. EVAL. Cont		
				FY 18. FISCAL ESTIMATES		
				54 1.749M		
				55 1.400M		
				56 950M		
				T 1.000M (Cont)		
19.						
20. REQUIREMENT AND/OR JUSTIFICATION Design, construction, installation, maintenance, and operation of pilot plants for the manufacture of CW agents and intermediates is required. Similar work is necessary in connection with pilot agent filling equipment and facilities.						
21. BRIEF OF PROJECT AND OBJECTIVE						
a. <u>Brief.</u> (Applied Research) The object of this project is to design, install, maintain, and operate pilot-plant equipment and facilities used in connection with the development and manufacture of CW agents.						
b. <u>Approach.</u> Work under this project will include the following:						
(1) Design and installation of a pilot plant for the manufacture of CW agents.						
(2) Operation and maintenance of this pilot plant.						
(3) Design, construction, installation, and operation of pilot agent filling plants.						
c. <u>Subtasks.</u> None.						
d. <u>Other Information.</u>						
(1) <u>Basic Research:</u> Under Universal Oil Products Prime Contract DA-18-108-CML-1879, Task DMHP 15 performed by Standard Oil Development, work was completed and a final report submitted on basic research performed on the pyrolysis reactions of dimethyl hydrogen phosphite (DMHP). Under this basic research task new analytical methods were developed which have made possible detailed analysis of the pyrolysis						
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CW Agent Pilot Plants

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products of DMHP. General details of the pyrolysis reactions were firmly established. It was found that the initial steps in the reaction may be catalyzed by BF<sub>3</sub> and that reaction completion is aided by higher reaction temperatures.

Action has been initiated to negotiate a contract directly with Standard Oil Development to extend this work to process laboratory scale.

(2) Fund Estimate: (In units of thousand dollars)

Period	Total estimate	Army R&D funds	Procurement & production funds	Other identified Army funds	Other agency funds
FY 1953	690	690			
FY 1954	1,749	1,749			
FY 1955	1,400	1,400			
FY 1956	950	950			

(3) Contract Information:

Contract DA-18-108-CML-1879 "Research Relative to GB Process  
 Universal Oil Products Co. Development"  
 Chicago, Ill.  
 Amt. of obligation - \$2,915M  
 Progress during the past year - \$1,269M  
 Accumulated progress - \$2,444M  
 Est. completion date - October 1954

(4) Standardization Item: None.

(5) Production Limitations and Critical Materials: None.

e. Background.

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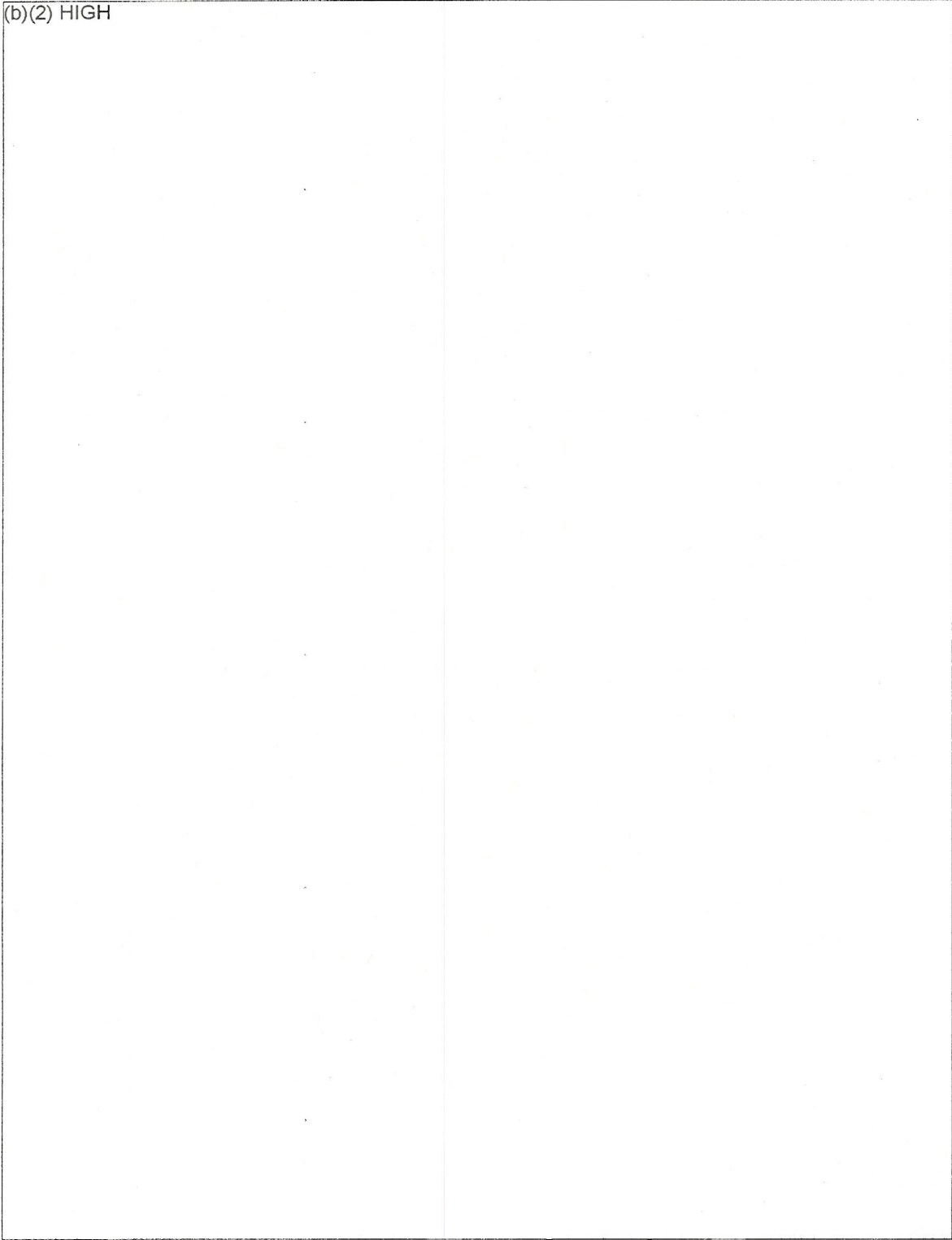
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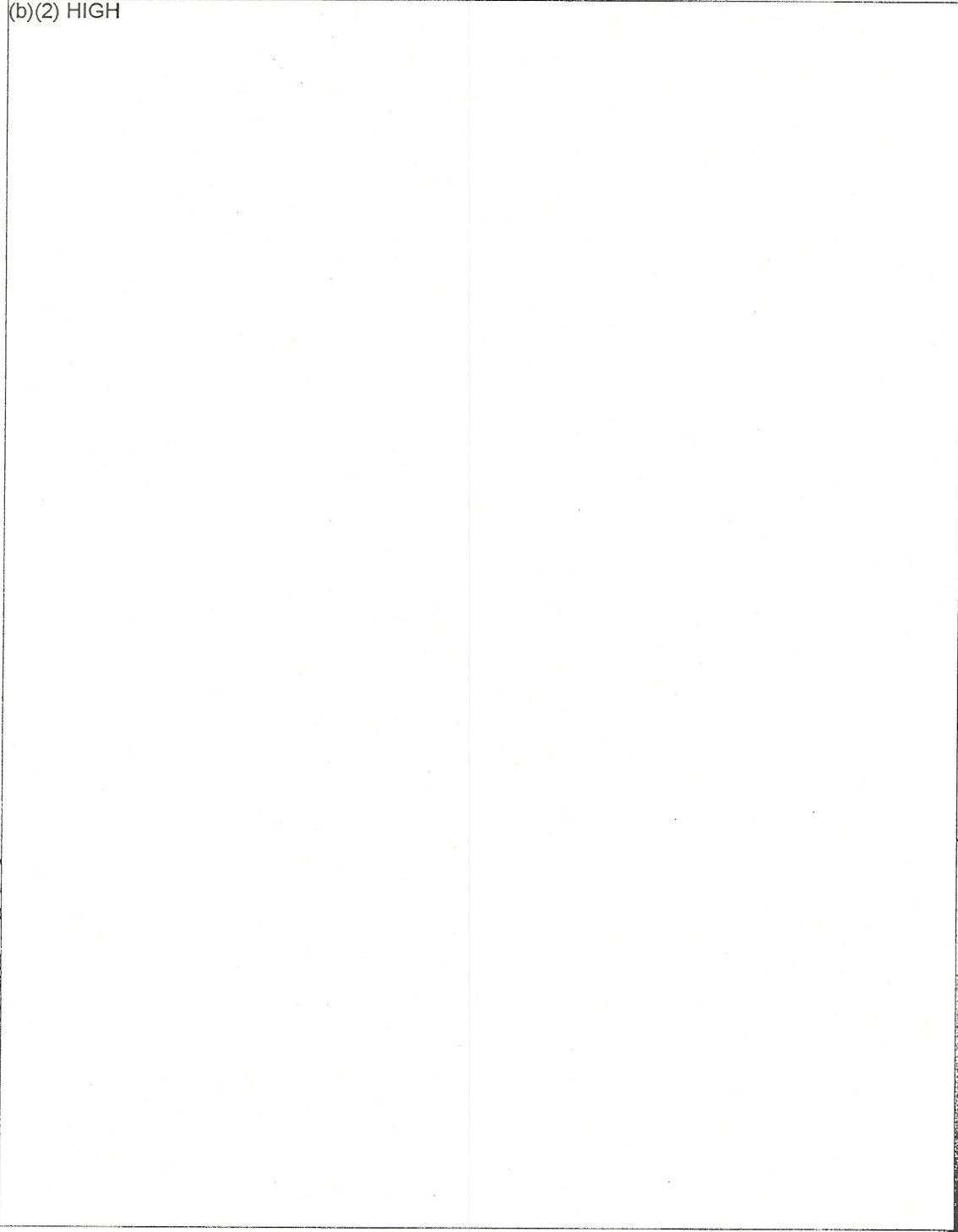
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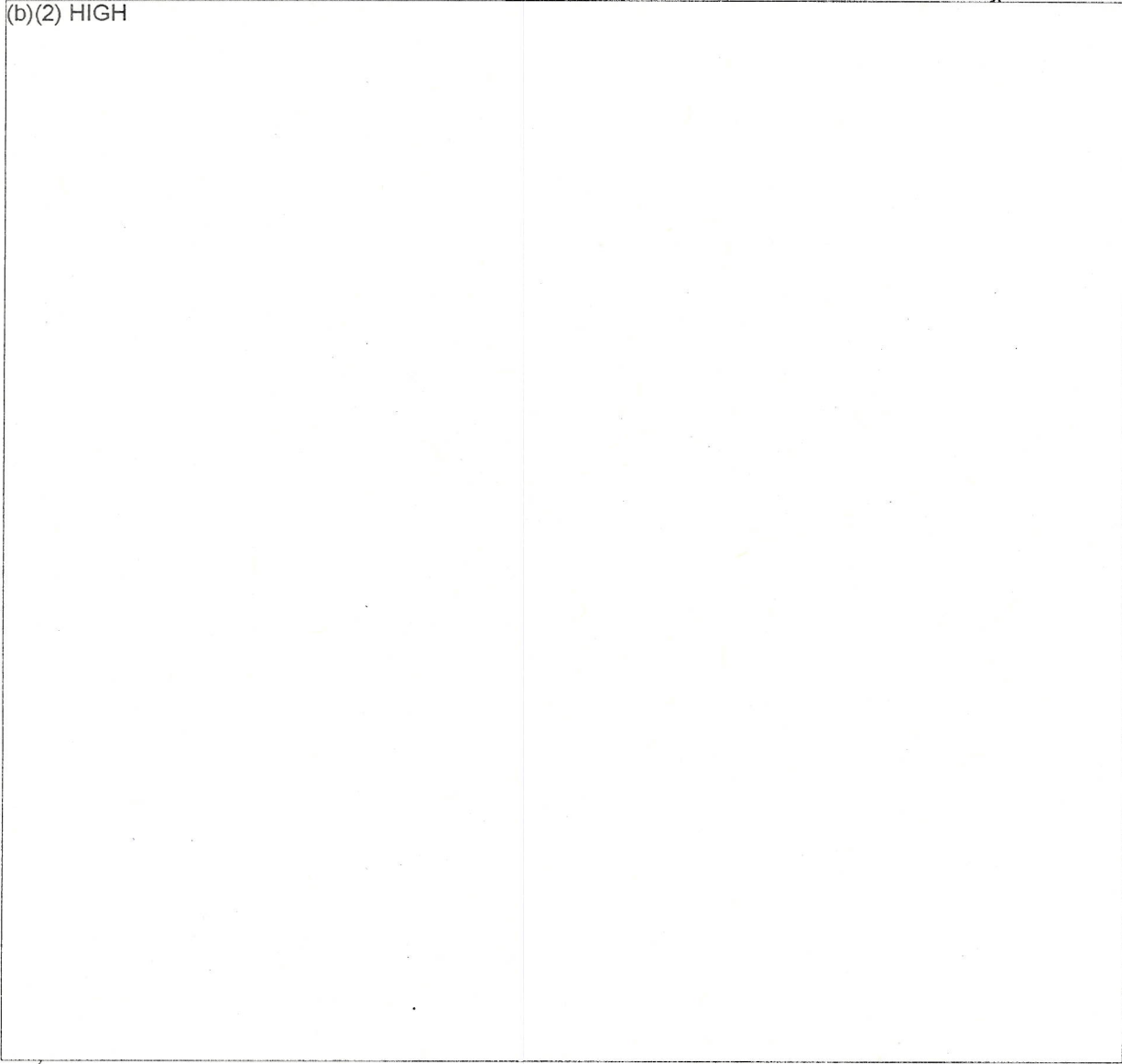
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f. Future Plans.

G Agents.

DMHP Process. Continue the investigations of Step I, on a pilot-plant scale, in those areas that are responsible for operating difficulties in the production facility.

Salt Process. Complete the development of Step IV and Step V. Study the necessity for pilot-plant investigation of by-product, (gaseous) recovery and/or disposal in Steps I and IV of this process.

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HTM Process. Complete the pilot-plant development.

Other G Agents. Begin the investigation in the process laboratory of production processes for other agents of this series.

Other Agents.

Q - Develop on process-laboratory scale a process for manufacturing this agent.

Gasoline Thickeners. Investigate, in the process laboratory, a continuous precipitation process for M3 and other metallic soaps.

Filling and Closing Facilities. Continue the development in the mechanical engineering laboratory of filling, closing, and inspection equipment for G-agent-filled munitions.

g. References.

- ETF 107.6-14/Final (Task OP-12, Vol I)  
Final Rpt on Task OP-12 by Westvaco dtd 20 March 1953.
- ETF 107.6-14/Final (Task DMHP-7, Vol II)  
Final Rpt on Task DMHP-7 by Vitro Corp. dtd 30 March 1953.
- ETF 107.6-14/Final (Task OP-2)  
Final Rpt on Task OP-2 by Vitro Corp. dtd 31 March 1953.
- ETF 107.6-14/Final (Task OP-12, Vol II)  
Final Rpt on Task OP-12 by Westvaco dtd 24 April 1953.
- ETF 107.6-14/Final (Task OP-12, Vol III)  
Final Rpt on Task OP-12 by Westvaco dtd 22 May 1953.
- ETF 107.6-14/Final (DMHP-10, Vol II)  
Final Rpt on Task DMHP-10 by Mathieson Cml Corp. dtd 20 August 1953.
- ETF 107.6-14/Final (DMHP-22)  
Final Rpt on Task DMHP-22 by Mathieson Cml Corp. dtd 21 August 1953.
- ETF 107.6-14/Final (Task OP-12, Vol IV)  
Final Rpt on Task OP-12 by Louis Schmerling, UOP Co. dtd 5 October 1953.
- ETF 107.6-14/Final (Task OP-1, Vol VI)  
Final Rpt on Task OP-1 by Mathieson Cml Corp. dtd 4 December 1953.

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<b>RDB</b>	
1. PROJECT TITLE	Environment (ENVIRON)
6. BASIC FIELD	Special Evaluati
8. COGNIZANT	Cml C
9. DIRECTING	CmlC R&E
10. REQUESTING	Cml C
11. PARTICIPAT	AR (Army)
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20. REQUIREME	elopment conditio have bee storage
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