

- k. Aberdeen Proving Ground Firing Record No. P-42745.
- l. OCM Item 34008 dated 6 December 1951.
- m. Subcommittee Report Y-295.
- n. OCM 34444 dated 9 October 1952, Subject: Security Policy for GB Filled Munitions.
- o. OCM Item 35212 dated 11 March 1954.
Subject: Booster M125 (T23) - Classification as Substitute Standard Type and other items.
- p. SR 700-51-190 dated 4 June 1951.
- q. File OO 400/955 (S) (CMLWR-C) from Chief Chemical Officer to Chief of Ordnance 24 August 1953, Subject: Standardization of Chemical Warfare Munitions.
- r. File AGAC-C (M) 381 TSS1 (27 Apr 53) G3, Subject: Chemical and Biological Warfare Readiness.
- s. File OO 471/2061 (misc) (S); CMLWX-T dated 2 October 1952; Subject: Adequacy of Press Fit closure in GB filled Artillery Shell.
- t. File OO 471/3049 (misc) from CCO to Ch. Chemical Officer dated 23 November 1953, Subject: Shell, Gas of the 105mm, T173 and 105mm, T173 and 155mm, T77 types.

2. DISCUSSION:

a. Development of Shell, Chemical, 155-mm, T77 was initiated and approved by reference 1a. In order to complete the development by the desired date, the T77 Shell for Engineering and Development Tests were produced by modification of Shell, Chem, 155-mm, M104 which were available. The modifications comprised:

- (1) Removing the rotary band and rebanding with a rotating band similar to those used on the M107 and M110 Shell.
- (2) Providing new nose adapters to fit the increased burster size required for properly disseminating the filler.
- (3) Providing new and larger burster casings and burster charges.

b. Initially a small number of shell with several sizes of burster casings and burster charges were manufactured and delivered to the Chemical Corps. These shell were filled by the Chemical Corps, and a series of tests were conducted at Army Chemical Center to establish a burster charge for the best dispersion of GB in an airborne cloud. Under the conditions of these tests a shell design with an agent burster ratio of 2 to 1 was selected as producing the best results. A supply of shell with this 2 to 1 ratio were produced. These shell were supplied the Chemical Corps for filling. A number of the shell were GB filled for tests by the Chemical Corps at their

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Dugway Proving Ground, and the remainder were simulated filled (furfural) for firing at Aberdeen Proving Ground and at Army Field Forces Board No. 1.

c. Chemical Corps evaluation of the T77 (M121) Shell is reported in reference 1b. This report indicated satisfactory results in all phases except the corrosion test on which the report stated:

"Corrosion tests not yet completed, results will be reported in a supplement to this report. Only one shell (No. 289) of all those used in the test program was found to leak. This leak was definitely due to a burster well fabrication defect which was caused by an improper solder seal between the burster well body and closure plug."

Reference 1b recommended:

"On the basis of the test phases completed, the Shell, 155-mm, Howitzer, Gas, T77, Filled GB, is satisfactory in regards to all military characteristics with the exception of the corrosion tests."

d. Reference 1c supplements reference 1b subsequent to completion of Chemical Corps cyclic surveillance of Shell, GB, 155-mm, T77. This report stated:

"The projectile allowed no leakage during extended periods of simulated climatic storage, and showed no evidence of corrosion by the agent for which it is designed, after such storage."

The recommendations were as follows:

"On the basis of test results incorporated in basic Final Engineering Report No. 14, dated 1 May 1952, as supplemented by surveillance data outlined herein, it is recommended that Shell, 155-mm, Howitzer, Gas, T77 (Filled GB), as submitted, be considered satisfactory as regards filling the stated military requirement and meeting the stated military characteristics." Later correspondence between Chief Ordnance and Chief Chemical Office, reference 1t, indicated that some difficulties might be expected from leaks at silver soldered joints.

e. Results of Aberdeen Proving Ground are reported in references 1d and 1e. The Aberdeen tests included range and accuracy tests in comparison with Shell, HE, 155-mm, M107 as well as excess pressure tests and sympathetic propagation tests. The range and accuracy tests indicated that Firing Table 155-Q-2, with a correction for $1\frac{1}{2}\%$ increase air density is applicable when firing the T77 Shell. That is, the Shell T77 may be fired using FT 155-Q-2 for the weight zone marked on the shell, but the range will be shorter than that of a HE Shell, M107 in the same weight zone by an amount equal to the effect of an increase of $1\frac{1}{2}\%$ in air density. The excess pressure tests indicated that the burster could be expected to safely withstand the maximum pressure in the M1 Howitzer. The propagation tests indicated that Shell T77 assembled with Burster Charge T69 and stored in piles would not propagate sympathetically if one of the shell in the pile was detonated. On the recovery test, examination of the recovered rounds

revealed that there was no deformation, or separation of metal parts on any round.

f. Shipment of 149 Shell, Chemical, 155-mm T77 furfural loaded was made to Army Field Forces Board No. 1. Reference 1f covered this shipment. Information on the density and weight zone corrections indicated in paragraph 2e above was supplied to Army Field Forces, and the opinion of Army Field Forces was asked whether or not firing tables would be needed for firing the T77 Shell. Army Field Forces Board No. 1 conducted tests on the Shell, Chemical, 155-mm, T77 and their report is covered in reference 1g. This report recommended:

"a. Shell, Chemical, 155-mm, T77 be considered suitable for Field artillery use with regards to accuracy and stability."

"b. Firing Table 155-Q-2 be considered suitable for use with Shell, Chemical, 155-mm, T77."

g. Construction of the items to be standardized is shown on the following drawings:

- (1) Shell, Chem, 155-mm, M121 (T77) P-82762, P-82763 (75-4-199, 75-4-200).
- (2) Casing, Burster, M15 (T29E1) P-826119 (73-1-247.) (being prepared)
- (3) Charge, Burster, M37 (T69) P-82764 (73-1-246.)

It is expected that a number of engineering changes will be made on those drawings (excluding the fuze) both to facilitate production from new forgings instead of from modification of existing shell, and to eliminate one or more silver solder joints similar to the joint cited in paragraph 2c above.

h. It is desirable to specify one piece construction for the shell body (less fuze adapter) and one piece construction for the burster casing in order to eliminate the possibility of leaks thru silver soldered joints. Current production of 20000 of the T77 (M121) shell bodies is with a body adapter silver soldered to the shell body. On future production every effort will be made to eliminate any shell body joint in the chemical cavity.

i. The present drawings for Casing, Burster, shows both a two piece design closed with a plug silver soldered to the bottom of the tubing, (T29) and also a one piece design to be made by cold forming (T29E1). The latter design is in manufacture for the current production of 20000 shell cited in paragraph 2h above. It is intended to eliminate the two piece design from the drawing and make the one piece design mandatory.

j. GB was standardized by reference 1h. Paragraph 3c of this reference recommended that:

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"GB itself be classified as a RESTRICTED item, that the symbol GB, when used alone be UNCLASSIFIED; etc."

This recommendation was approved by higher authority. An UNCLASSIFIED category for the filled T77 Shell would meet the requirements quoted above as the GB itself would be under cover, hermetically sealed within the shell body.

k. Reference 1i in paragraph 2h classifies as SECRET munitions developed, or under development, for dissemination of the nerve gases until such time as munitions are standardized for operation use and issue. When munitions are standardized for operation use and issue, the appropriate classification for such will be designated by the agency having prime cognizance in accordance with applicable current directives of higher authority.

l. All ballistic tests of the T77 Shell were conducted with Fuze, PD, M51 (Series) since a more satisfactory fuze was not available at the time. The Chemical Corps indicated that somewhat better terminal ballistics could be expected with a faster operating fuze. Consequently the mechanical Fuze, PD, T237E1 and the electrical Fuze, PD, T244 have been under development under authority of reference 1j for use on all rotated GB shell. The T244 Fuze which will be an optimum type to include minimum functioning time and graze sensitivity is still in the preliminary stages of development.

m. Reference 1p is a special regulation covering Logistic Responsibility for Standard Commodity Classification, Major Group 90, Ordnance. This regulation assigns responsibility of toxic ammunition for rifled weapons as follows:

- (1) Ordnance Corps: Specifications, requirements and funds, purchase and inspection, storage and issue, and maintenance of the complete round and requirements and funds for the filler.
- (2) Chemical Corps: Specifications, purchase and inspection, storage and issue, and maintenance of the filler.

n. Subcommittee Report A-306 was originally submitted to the Ordnance Technical Committee in October 1952. Internal Ordnance Corps, non-concurrences were submitted due to possibility of "leakers" at the closure, both in assembly and storage. Procurement of 20000 each, T77 was undertaken, and joint surveillance tests on these 20000 shell filled GB, was arranged between the Ordnance Corps and the Chemical, see reference 1r. The withdrawal of the internal Ordnance Corps non-concurrences was to depend upon the successful conclusion of these tests. These tests have not yet been instituted.

o. By reference 1q the Chief Chemical Officer recommended to the Chief of Ordnance to immediately standardize the currently released CB ground munitions utilizing press fit closures. The following is quoted from this reference "----The Chemical Corps----has designed, investigated, studied and tested some thirty (30) different designs of closures. None have been found to excel the current design press fit closure. Approximately seven thousand (7000) press fit closures have been accomplished by this Corps

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in the past two years without detecting a single closure leak. This record was attained by careful inspection of metal parts by capable inspectors."

"Hesitancy to standardize these munitions and confusion relative to closures are due to fear of physical contact with agent GB. This agent is a more hazardous material than most; however, the Chemical Corps has developed adequate detection and protection devices---"

p. By 1st Ind to reference 1q Ordnance corps advised the Chemical Corps

"The Ordnance Corps is taking action to effect standardization of the 105mm and 155mm Howitzer GB Shells with the present closure design. The internal Ordnance non-concurrences to such action have been withdrawn."

q. The following information is pertinent to standardization of Shell, Chemical, 155-mm, M121 (T77) with Casing, Burster, M15 (T29); Charge, Burster, M37 (T69): with GB filling, but without fuze or propelling charges, both of which are separate items of issue.

- (1) Proposed using agencies: Army Field Forces, National Guard Bureau, and U. S. Marine Corps.
- (2) Related material: Howitzer, 155-mm, M1: Charge, Propelling, M3 and M4A1; Fuze, FD; T237E1; Primer, M2A4.
- (3) No existing items need to be modified or replaced by the GB filled Shell, 155-mm, M121 (T77).
- (4) The filled, assembled and fuzed shell will cost approximately \$51 each in production quantities.
- (5) The item meets current military characteristics for GB filled, non-persistent gas shell for the 155-mm, Howitzer, M1 except for possibly occasional "leakers" as indicated in paragraph 2c above.
- (6) The item is intended for immediate procurement.
- (7) Critical or strategic material used (exclusive of filler which is a standardized Chemical Corps item): Gilding metal of rotating bands and small quantities of brass and aluminum in the fuze.
- (8) Item is air transportable.
- (9) The Ordnance Corps is to be charged with responsibility for:
 - (a) Specification for the round (including all components except filler).
 - (b) Purchase and inspection of all parts, except filler.

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- (c) Determination of requirements and funding.
- (d) Assembly of the filled shell.
- (e) Storage and issue of the filled and assembled shell.
- (f) Maintenance of the filled and assembled shell.

The Chemical Corps is to be charged with responsibility for:

- (g) Specifications for the filler.
- (h) Purchase and inspection of the filler and the filling.
- (i) Storage and issue of the filler.
- (j) Maintenance of the filler.

r. Since Shell, Chem, 155-mm, M121 (T77) with Fuze, PD, T237E1, and Casing, Burster, M15 (T29E1); Charge, Burster, M37 (T69) with GB Filling covers a requirement for which there is at present no existing standard projectile, it is the opinion of the Subcommittee that it should be authorized as standard. It is also the opinion of the Subcommittee that development be continued in order to reduce the possibility of "leakers" and to obtain the fastest practical fuze functioning by electrical or mechanical means. Improvement of closure will be continued as a portion of Project TAL-1546 (D/A 504-04-004) in connection with development of Shell, Chemical, 105-mm, T302. Development of the faster electric fuze will be continued as a portion of Project TAL-2706 (D/A 505-02-023).

s. Funds for procurement of 177,794 fuzed Shell, Chem. 155-mm, T77 (GB filled) were authorized by references ll and lm. This authorization was subsequently reduced to 20,000 rounds. On 14 June 1954, the Chief of Staff approved a revision of reference lr. The revised directive eliminates the stockpile concept of chemical munitions and directs computations on an MRMR basis as of 1 July 1954. Funds for the procurement of the round will be required to meet the computed MRMR. Funds to procure 60,000 rounds have been approved by G4 and will be made available to Industrial Division.

3. RECOMMENDATIONS:

The Subcommittee recommends that:

- a. Shell, Chemical, 155-mm, M121 (T77); Casing, Burster, M15 (T29E1); Charge, Burster, M37 (T69); be classified as Standard Types.
- b. The filled shell be designated "Shell, Gas, GB, Non-Persistent, 155-mm, M121 (T77)."
- c. Firing Table FT 155-Q-2 be revised to include Shell, Gas, GB, Non-Persistent, 155-mm, M121 (T77).

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d. Improvement in method of closure be continued as a portion of Proj. TAL 1546 (D/A 504-04-004).

e. The security classification of Shell, Gas, Non-persistent (GB), 155-mm, M121 (T77) together with its component parts, drawings, and specifications be UNCLASSIFIED except that complete details of the methods of manufacture of GB is classified SECRET; its chemical composition is UNCLASSIFIED, the methods of handling, antidotes and physiological effects of the filler are UNCLASSIFIED. Also, the amount of stocks of M121 shell available or about to become available should be classified CONFIDENTIAL. Correspondence concerning stocks of M121 ammunition may be CONFIDENTIAL, or UNCLASSIFIED at the discretion of the originating office in accordance with the subject of the communication, provided such communication does not reveal information leading to the quantities available for use.

f. This report be placed in the Secret category.

g. Logistic responsibilities are to be as assigned in SR 700-51-190 dated 4 June 1951 (this SR is currently under review).

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Action By: Amm Br, Ord Res & Dev Div.
Res & Mats Br, Ord Res & Dev Div.
Amm Br, Industrial Division.
Amm Supply Br, Field Service Div.
Requirements Br, Field Service Div.

Approval by higher authority is required.

APPROVED BY ORDNANCE COMMITTEE

23 SEP 54

/S/ A. W. STODDARD
Col, Ord Corps
Secretary

APPROVED
/S/ M. H. CLARK
Col, Ord Corps
Chairman Pro Tem

APPROVED BY ORDER OF
THE SECRETARY OF THE ARMY

/S/ GARRARD FOSTER, Lt Col, GS
For the Deputy Chief of Staff for
Logistics

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ORDNANCE COMMITTEE
ITEM 35518

23 SEP 54

A-512
Hrosenthal/sd/53401
9 August 1954

DEPARTMENT OF THE ARMY
Office of the Chief of Ordnance

FROM: Subcommittee on Ammunition
TO: The Ordnance Technical Committee
SUBJECT: Shell, Chem., 155-mm, M122 (T179); Casing,
Burster, M17 (T32)
Classified as Standard Type.

1. REFERENCES:

- a. OCM Item 33567 dated 5 February 1951, Subject:
Shell, Chemical, 105-mm, T173
Shell, Chemical, 155-mm, T179
Shell, Chemical, 8-inch, T174
Initiation of Development
- b. Test Division Chemical Corps, Chemical and Radiological Laboratories, Final Engineering Report No. 14 on Shell, 155-mm, Howitzer, Gas, T77, Filled GB; dated 1 May 1952 (Project No. 4-04-15-012)
- c. Test Division Chemical Corps, Chemical and Radiological Laboratories, Supplement to Final Engineering Report No. 14 on Shell, 155-mm, Howitzer, Gas, T77, Filled GB, dated 21 November, 1952 (Project No. 4-04-15-012)
- d. Aberdeen Proving Ground Firing Record P50359, 23 August to 29 September, 1951: Range Firing of Shell, Chem, T77, 155mm, Howitzer.
- e. Aberdeen Proving Ground Firing Record P-50774, 27 February 1952: To determine dimensional stability of Shell, Chemical, T179, for 155mm Gun, and satisfactoriness of components at 112% maximum rated gun pressure.
- f. Aberdeen Proving Ground Firing Record P-51481, 1 May 1952, 13 June 1952: To determine if Shell, Chemical, T179, for 155mm Gun can be Fired Using the Range Table for the M101 Shell, with Suitable Weight Zone Correction.
- g. Aberdeen Proving Ground Firing Record P-59204, 13 and 20 April, 1952: To determine if Shell, Chemical, T179, for Shell Chem 155mm T179.

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- h. D/F 00471/255 (155mm), (G3 470 (6 Jan. 53)) dated 23 January 1953, Subject: Shell, Chemical, 155mm, T179 and inclosing letter ATDEV - 10 471/1 (5 Jan 53) with letter GNBA - FAG 471 (FA 3452) from Headquarters AFF Board No. 1 dated 11 December 1952.
- i. CCTC Item 1890 dated 19 May 1946.
- j. SR 380-5-6 dated 18 June 1952.
- k. OCM Item 34444 dated 9 October, 1952 Subject: Security Policy for GB Filled Munitions.
 - l. SR 700-51-190 dated 4 June 1951.
- m. File 00 400/955 (s) (CMLWR-C) from Chief Chemical Officer to Chief of Ordnance, 24 August 1953, Subject: Standardization of Chemical Warfare Munitions.
- n. File AGAC-C (M) 381 TSSI (27 April 53) G3, Subject: Chemical and Biological Warfare Readiness.
- o. File 00 471/2061 (Misc)(S), CMLWX-T dated 20 October 1952, Subject: Adequacy of Press Fit Closure in GB filled Artillery Ammunition.
- p. File 00 471/3049 (misc) from CCO to Chief Chemical Officer dated 23 November 1953, Subject: Shell, Gas of the 105mm, T173 and 155mm, T77 Typos.
- q. Subcommittee Report A-3064 dated 24 July 1954 Subject: Shell, Chem, 155-mm, M121 (T77); Casing Burster, M15 (T29E1); Charge, Burster, M37 - Classified as Standard Type.
- r. Letter File 00471.82/420 and OCM item 34087.

2. DISCUSSION

a. Development of Shell, Chemical, 155-mm, T179 was initiated and approved by reference 1a. In order to complete the development by the desired date, the T179 Shell for Engineering and Development Tests were produced by modification of Shell, Chem, 155-mm, M104 which were available. The modifications comprised:

- (1) Providing new nose adapters to fit the increased burster size required for properly disseminating the filler.
- (2) Providing new and larger burster casings and burster charges.

b. Shell, Chemical, 155-mm, T179 as produced for development and engineering tests was identical with Shell, Chemical, 155-mm, T77 except for the rotating band. Therefore all evaluation by the Chemical Corps for tests required by them were conducted on the T77 shell. These tests included selection of burster ratio, evaluation of filler dissemination by

actual firing tests, and accelerated surveillance tests, none of which would be affected by the design of the rotating band.

c. Chemical Corps evaluation of the T77 Shell is reported in reference lb. This report indicated satisfactory results in all phases except the corrosion test on which the report stated:

"Corrosion tests not yet completed, results will be reported in a supplement to this report. Only one shell (No. 289) of all those used in the test program was found to leak. This leak was definitely due to a burster well fabrication defect which was caused by an improper solder seal between the burster well body and closure plug."

Reference lb recommended:

"On the basis of the test phases completed, the Shell, 155-mm, Howitzer, Gas, T77, Filled GB, is satisfactory in regards to all military characteristics with the exception of the corrosion tests."

d. Reference lc supplements reference lb subsequent to completion of Chemical Corps cyclic surveillance of Shell, GB, 155-mm, T77. This report stated:-

"The projectile allowed no leakage during extended periods of simulated climatic storage, and showed no evidence of corrosion by the agent for which it is designed, after such storage."

The recommendations were as follows:

"On the basis of test results incorporated in basic Final Engineering Report No. 14, dated 1 May 1952, as supplemented by surveillance data outlined herein, it is recommended that Shell, 155-mm, Howitzer, Gas, T77 (Filled GB), as submitted, be considered satisfactory as regards filling the stated military requirements and meeting stated military characteristics."

Later correspondence between Chief of Ordnance and Chief Chemical Officer (reference lb.) indicated that some difficulties might be expected from leaks at silver soldered joints.

e. Results of Aberdeen Proving Ground tests are reported in references ld to lg incl. The Aberdeen tests included range and accuracy tests in comparison with Shell, HE, 155-mm, M101, as well as excess pressure tests and sympathetic propagation tests. The latter test was conducted in with Shell, Chem, 155-mm, T77 which is the same as the T179 shell except for the size of the rotating band. The range and accuracy tests indicated that Shell, Chemical, T179 for 155-mm Gun, can be fired using the range table for the M101 shell, with suitable weight zone correction. The excess pressure test on five shell fired for recovery and measured before and after firing resulted in a maximum increase in diameter of shell of .002" during the firing. This firing was conducted with inert loaded

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bursting and inert fuzes. An examination of the shell after firing indicated excessive set back of the bursting material and some deformation of the bursting casing. This test was later repeated using T77 shell, a one piece bursting casing, and four different bursting loadings. These loadings were, inert material, cast tetrytol, and pressed tetryl pressed at two loading pressures. These were fired with inert fuzes. The results of this test indicated that:

- (1) The live bursting were in better condition after firing than the inert bursting.
- (2) The pressed tetryl bursting, which were compressed to 20,000 psi and 15,000 psi, were broken up but not separated as were the inert bursting and the tetrytol bursting.
- (3) All tetrytol bursting of the same lot which were fired with live fuzes, functioned satisfactorily in spite of the fact voids were produced in the bursting after firing.

The propagation test indicated that the shell assembled with Bursting Charge T69 and stored in piles would not propagate sympathetically if one of the shell in the pile was detonated.

f. Shipment of a lot of Shell, Chemical, 155-mm, T179 furfural loaded was made to Army Field Forces Board No. 1, who conducted tests on these shell. Their report is covered in reference 1h. This report recommended:

"a. Shell, Chemical, 155-mm, T179, is suitable for field artillery use with regard to accuracy and stability."

"b. Firing Table 155-3-2 is suitable for use with Shell, Chemical, 155-mm, T179".

g. Construction of the shell as fired on the engineering and Service Board tests is shown on the following drawings:

- (1) Shell, Chem, 155-mm, T179- Loading Assembly, P-83380 dated 15 February 52.
- (2) Shell, Chem, 155-mm, T179- Metal Parts Details, P83382 dated 15 February 1952.
- (3) Shell, Chem, 155-mm, T179 - Metal Parts Assembly, P-83381 dated 15 February 1952.

These drawings show multipiece construction for both the shell body and the bursting casing. It is desirable to eliminate the silver solder joints on both of these pieces in order to minimize possible leaks at such joints similar to the joint cited in paragraph 2c above. Therefore, the drawings have been revised to eliminate all silver solder joints and construction of the items to be standardized is shown on the following drawings:

- (1) Shell, Chem, 155-mm M122, (T179) Metal Parts Assembly. P-83381 rev. 11-15-53

(2) Casing, Burster, M17 (T32) P-85511 rev. 3-11-54

h. GB was standardized by reference li. Paragraph 3c of this reference recommended that:

"GB itself be classified as a RESTRICTED item, that the symbol GB, when used alone be UNCLASSIFIED; etc."

This recommendation was approved by higher authority. An UNCLASSIFIED category for the filled T179 Shell would meet the requirements quoted above as the GB itself would be under cover, hermetically sealed within the shell body.

i. Reference lj in paragraph 2h classifies as SECRET munitions developed, or under development, for dissemination of the nerve gases until such time as munitions are standardized for operational use and issue. When munitions are standardized for operation use and issue, the appropriate classification for such will be designated by the agency having prime cognizance in accordance with applicable current directives of higher authority.

j. All ballistic tests of the T77 Shell were conducted with Fuze, PD, M51 (Series) since a more satisfactory fuze was not available at the time. The Chemical Corps indicated that somewhat better terminal ballistics could be expected with a faster operating fuze. Consequently the mechanical Fuze, PD, T237E1 and the electrical Fuze, PD, T244 have been under development under authority of reference lr for use on all rotated GB Shell. Development of the T237E1 Fuze has been completed, and the item released for procurement with rotated GB Shell. The T244 Fuze which will be an optimum type to include minimum functioning time and graze sensitivity is still in the preliminary stages of development.

k. Reference ll is a special regulation covering Logistic Responsibility for Standard Commodity Classification, Major Group 90, Ordnance. This regulation assigns responsibility of toxic ammunition for rifled weapons as follows:

- (1) Ordnance Corps: Specifications, requirements and funds, purchase and inspection, storage and issue, and maintenance of the complete round and requirements and funds for the filler.
- (2) Chemical Corps: Specifications, purchase and inspection, storage and issue, and maintenance of the filler.

l. Reference lq was initially submitted to the Ordnance Technical Committee in October 1952. Internal Ordnance Corps non-concurrences were submitted due to possibility of "leakers" at the press fit closure, both in assembly and storage. Procurement of 20000 each T77 was undertaken, and joint surveillance tests on these 20,000 shell, filled GB, was arranged between the Ordnance Corps and the Chemical Corps. See ref lo. The withdrawal of the internal Ordnance Corps non-concurrences was to depend upon

the successful conclusion of these tests. These tests have not yet been instituted.

m. By reference 1m the Chief Chemical Officer recommended to the Chief of Ordnance to immediately standardize the currently released GB ground munitions utilizing press fit closures. The following is quoted from this reference.

"----- The Chemical Corps----- had designed, investigated, studied and tested some thirty (30) different designs of closures. None have been found to excel the current design press fit closure. Approximately seven thousand (7,000) press fit closures have been accomplished by this Corps in the past two years without detecting a single closure leak. This record was attained by careful inspection of metal parts by capable inspectors."

"Hesitancy to standardize these munitions and confusion relative to closures are due to fear of physical contact with agent GB. This agent is a more hazardous material than most; however, the Chemical Corps had developed adequate detection and protection devices-----."

n. By 1st indorsement to ref. 1m, Ordnance Corps advised the Chemical Corps "The Ordnance Corps is taking action to effect standardization of the 105mm, and 155mm Howitzer GP Shell with the present closure design. The internal Ordnance non-concurrences to such action have been withdrawn."

o. The following information is pertinent to standardization of Shell, Chemical, 155-mm, M172 (T179) with Casings, Burster, M17 (T32); Charge, Burster, M37 (T69); with GB filling, but without fuze or propelling charges, both of which are separate items of issue:

- (1) Proposed using agencies: Army Field Forces, National Guard Bureau, and U. S. Marine Corps.
- (2) Related material: Gun, 155-mm, M2, Charge, Propelling, M19 Fuze, PD, T237E1; Primer, M2A4.
- (3) No existing items need to be modified or replaced by the GB filled Shell, 155-mm, M122 (T179).
- (4) The filled, assembled and fuzed shell will cost approximately \$51 each in production quantities.
- (5) The item meets current military characteristics for GB filled, non-persistent gas shell for the 155-mm, Gun, M2 except for possibly occasional "leakers" as indicated in paragraph 2c above.
- (6) The item is intended for immediate procurement.
- (7) Item is air transportable.

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(8) The Ordnance Corps is to be charged with responsibility for:

- (a) Specifications for the round (including all components except filler).
- (b) Purchase and inspection of all parts, except filler.
- (c) Determination of requirements and funding.
- (d) Assembly of the filled shell.
- (e) Storage and issue of the filled and assembled shell.
- (f) Maintenance of the filled and assembled shell.

The Chemical Corps is to be charged with responsibility for:

- (g) Specifications for the filler.
- (h) Purchase and inspection of the filler and the filling.
- (i) Storage and issue of the filler.
- (j) Maintenance of the filler.

(9) Training and maintenance literature is required.

(10) This item is in Supply Class V for issue.

p. Since Shell, Chem, 155-mm, M122 (T179) with Casing Bursting, M17 (T32) with GB Filling covers a requirement for which there is at present no existing standard projectile, it is the opinion of the Subcommittee that development be continued in order to reduce the possibility of "leakers" and to obtain the fastest practical fuze functioning by electrical or mechanical means. Reference lq. recommends that development be continued on improvement of closures under Project TAL-1546 (D/A 504-04-004) and a faster fuze under Project TAL-2706 (D/A 505-04-023). Approval of this subcommittee report is not intended to modify the recommendations of Ref. lq as concerns development of improved closures or development of a faster fuze.

q. On 14 June 1954, the Chief of Staff approved a revision of reference ln. The revised directive eliminates the stockpile concept of chemical munitions and directs computations on an MRR basis as of 1 July 1954. Funding for the procurement of the round is being held in suspense pending resolution of the responsibility between Ordnance and Chemical Corps for the storage and issue of the complete filled round. Standardization at this time will allow the program to be implemented at the earliest possible date after decision.

3. RECOMMENDATIONS:

The Subcommittee recommends that:

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- a. Shell, Chemical, 155-mm, M122 (T179) and Casings, Burster, M17 (T32) be classified as Standard Types.
- b. The filled shell be designated "Shell, Gas, GB, Non-Persistent, 155-mm, M122 (T179)."
- c. Charge, Burster, M37 (T69) be authorized for use with the M122 shell.
- d. Firing Table, FT 155-S-2 be revised to include Shell, Gas, GB, Non-Persistent, 155-mm, M122 (T179).
- e. The security classification of Shell, Gas, Non-persistent (GB), 155-mm, M122 (T179) together with its component parts, drawings, and specifications be UNCLASSIFIED except that complete details of the methods of manufacture of GB is classified SECRET: its chemical composition is UNCLASSIFIED, the methods of handling, antidotes, and physiological effects of the filler are UNCLASSIFIED. Also, the amount of stocks of M122 shell available or about to become available should be classified CONFIDENTIAL. Correspondence concerning stocks of M122 munitions may be CONFIDENTIAL, or UNCLASSIFIED at the discretion of the originating office in accordance with the subject of the communication, provided such communication does not reveal information leading to quantities available for use.
- f. This report be placed in the SECRET category.
- g. Logistic responsibilities are to be as assigned in SR 700-51-190 dated 4 June 1951 (this SR is currently under review).

JOHN H. HINRICHS
Maj Gen, USA

J. B. MEDARIS
Brig Gen, USA

JOHN G. ZIERDT
Col, Ord Corps

LAWRENCE W. BYERS
Col, GS, OCAFF

F. G. BRYAN
Col, Ord Corps

S. A. HALL
Col, Ord Corps

M. H. CLARK
Col, Ord Corps

JOHN KELLER
Lt Col, Ord Corps
Nat'l Guard Bureau

H. H. EVANS
Lt Col, USMC

W.W. STOREY
Ord Corps

W. J. WISEMAN Jr.
Chemical Corps

H. G. ADAMS
Lt Col, Ord Corps

Action By: Amm Br, Ord Res & Dev Div.
Res & Mats Br, Ord Res & Dev Div.
Amm Br, Industrial Division
Amm Supply Br, Field Service Div.
Requirements Br, Field Service Div.

APPROVED
/S/ M. H. CLARK
Col, Ord Corps
Chairman Pro Tem

Approval by higher authority is required.

APPROVED BY ORDNANCE COMMITTEE 23 SEP 54
/S/ A. W. STODDARD, Col, Ord Corps
Secretary

APPROVED BY ORDER OF
THE SECRETARY OF THE ARMY

/S/ GARRARD FOSTER, Lt Col, GS

For the Deputy Chief of Staff for Logistics

Item 2935

READ FOR RECORD

Copy No. _____

(5 Pages)

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF CHEMICAL OFFICER
Chemical Corps Technical Committee
Army Chemical Center, Maryland

CMLWH

19 November 1954

MEMORANDUM FOR RECORD

SUBJECT: Air Force Project 5064, BW-CW Warheads for B-62 (S)

The attached data sheet for rewritten ARDC Project 5064, same subject as above, is reproduced herewith as information pertinent to related Chemical Corps research and development.

FOR THE CHAIRMAN, CHEMICAL CORPS TECHNICAL COMMITTEE:

T. S. Eckert

Incl
Data Sheet
Project 5064

T. S. ECKERT
Secy, CCTC

Item 2935

Project Data Sheet

1. PROJECT TITLE: BW-CW Warheads for B-62 (S)
2. SECURITY CLASSIFICATION: Top Secret
3. PROJECT NUMBER: 5064
5. REPORT DATE: 10 February 1954
6. BASIC FIELD OR SUBJECT: Strategic Air Development, B-62
7. SUB FIELD OR SUBJECT: Chemical, Biological and Radiological Weapons
- 7a. TECHNICAL OBJECTIVE: SA-11 - BW-3 - CW-3
8. COGNIZANT AGENCY: ARDC
9. DIRECTING AGENCY: WADC, Armament Laboratory
10. REQUESTING AGENCY: Hq, USAF
11. PARTICIPATION AND/OR COORDINATION: Dept. of the Army, Chemical Corps (P); Dept. of the Navy, Bu Aer, Bu Ord. (I)
12. CONTRACTOR AND/OR LABORATORY: Army Chemical Corps, Northrup Aviation Inc.
13. RELATED PROJECTS: a. Essential - 103A-B62 b. Related - None
14. DATE APPROVED: 22 February 1946
15. PRIORITY: 1-A
17. ESTIMATED COMPLETION DATES: Dev - July 1958 Test - July 1959
18. FISCAL ESTIMATES: 51-53 6.0; 54 - 2.0; 55 - 15.0; 57 - 13.0; 58-59 15.0; T - 66.0
19. SUPERSEDED PROJECTS: This project supersedes Project RDC-R-448-47 in part.
20. REQUIREMENT AND/OR JUSTIFICATION: This project will provide the B-62 missile with a BW-CW capability as expressed in the Statements of Military Characteristics for the Snark missile, dated 5 June 1951 from Headquarters USAF (See Item 1a). The authority for this project is contained in a letter (classification Secret) from Deputy Chief of Staff for Development, Hq, USAF, to Commanding General, Air Research and Development Command, Subject (Confidential) "USAF Guided Missile Warheads and Fuzes (Chemical Corps)" dated 22 March 1951. (Secret)
21. BRIEF OF PROJECT AND OBJECTIVE:
 - a. Brief. - The performance requirements as stated in the Military Characteristics for the BW Warhead require that the BW Warhead should be capable of:
 - (1) Effectively dispersing BW munitions in a uniform pattern over areas of various size determined by the warhead opening altitudes.
 - (2) Achieving reproducible ballistics.
 - (3) All weather employment.
 The performance requirements as stated in the Military Characteristics for the CW Warhead state that the warhead should be capable of:
 - (1) Establishing a uniform concentration of GB vapor over an area of approximately 2,700,000 square feet. This concentration shall extend from the surface to a height of 6 1/2 feet and shall be lethal to a man at rest within 30 seconds.

(2) Achieving reproducible ballistics.

(3) All weather employment. (Secret)

b. Approach. - It is presently planned to achieve the objectives mentioned in Box 21a above by the use of a large number of small CW and BW unit munitions clustered within the missile warhead compartment. It is necessary for efficient agent utilization (either BW or CW), that a nearly uniform casualty-producing concentration of agent be effected by the Warhead. It will therefore be necessary to develop a method of separating and dispersing the unit munitions from the warhead that will insure an effective and reproducible unit munition ground pattern. Several separation and dispersion systems are being examined but due to the lack of applicable data on unit munition separation and dispersion from supersonic missiles, no definite system has been established. The warhead designed is also being retarded due to the fact that the method of delivering the warhead to the proper position over the target has not been defined. At present it is not known whether the missile will be flown intact to this point or whether the warhead will be separated and follow a ballistic trajectory to the point of opening.

After the above mentioned problems have been resolved a preliminary warhead design will be established. It is expected that the design will consist of:

- (1) A cluster adapter (loaded weight 7000 lb.).
- (2) CW or BW unit munitions as applicable.
- (3) A suitable arming and fuzing system.
- (4) Means of achieving unit munition separation and dispersion.

This design will be subjected to the usual static tests. It will be dynamically tested using a fin stabilized test vehicle which will duplicate the terminal trajectory and velocity of the B-62 missile. From the results of these tests a prototype design will be established. Terminal ballistics, dispersion characteristics of unit munitions (inert) and complete warhead functioning will be determined, again using the fin stabilized test vehicle. These tests will have to satisfy the requirements of all engineering testing due to the following:

- (1) No facilities exist or are planned where a warhead of this size can be tested using live agent.
- (2) No facilities exist or are planned where the B-62 missile can be impacted, with live or inert unit munitions, and the results recorded. (Secret)

c. Tasks.

Task No. 1 - 50200 (Conf) CW Warhead for B-62

Contractor: Dept. of the Army, Chemical Corps,
Northrup Aviation Inc.

Object and Nature of Task: The object of this task is to develop a CW (GB) warhead for the B-62 missile. The warhead will consist of a 7000 lb. cluster of small component GB bombs which cluster will airburst and provide random distribution of component bombs

over a relatively large area. Pattern size will be controlled by varying altitude at which airburst is effected.

Coordination: WADC - Directorate of Air Weapons Systems, WCS
Development Operations Division, WCOES

Holloman Air Development Center, HDOR
Air Force Missile Test Center, MTOP
Dept. of the Army, Chemical Corps.

Task No. 2 - 50201 (Secret) BW Warhead for B-62

Contractor: Dept. of the Army, Chemical Corps
Northrop Aviation Inc.

Object and Nature of Task: The object of this task is to develop a BW (anti-personnel) warhead for the B-62 missile. The warhead will consist of a 7000 lb. cluster of small component BW bombs which cluster will airburst and provide random distribution of component bombs over a relatively large area. Pattern size will be controlled by varying altitude at which airburst is effected. (Secret)

d. Other Information. - The USAF has provided funds to the Army Chemical Corps to establish a project for the development of BW and CW warheads for the B-62. The Bureau of Aeronautics and Bureau of Ordnance of the Dept. of the Navy are listed as having interest in project since information on the BW-CW warhead developments may be useful in their missile and warhead development programs.

The past and proposed AMC funding support to this project is as follows:

FY'51-53	FY'54	FY'55	FY'56	FY'57	FY'58	FY'59
\$180,000 Est.	0	\$110,000	\$210,000	\$1,700,000	\$300,000	\$160,000

These funds will be used to support the service test program and will be expended on items such as unit munitions, cluster adapters and test vehicles.

An information copy of a TWX from Hq. USAF to Hq. ARDC dated 2 July 1953, was received by Wright Air Development Center directing that the requirements for the BW and CW Warheads for the B-62 still exists but that no funds will be available in FY'54 for research and development. (Secret)

e. Background History. - The Army Chemical Corps has been studying the problems associated with designing BW and CW Warheads for the B-62 Missile. This project is unique in that very little is known about the problems of supersonic unit munition delivery or operation. (See Item 21b). (Secret)

f. References:

- (1) Letter (Classification: Secret) from Deputy Chief of Staff for Development, Headquarters USAF to Commanding General, Air Research and Development Command, Subject (Confidential),

~~CONFIDENTIAL~~

~~SECRET~~
Item 2935

- "USAF Guided Missile Warheads and Fuzes (Chemical Corps)" dated 22 March 1951. Wright Air Development Center Control No. 51S-106220.
- (2) Statements of Military Characteristics for Biological and GB Warheads for SSM-A-3 (MX 775A) Snark Guided Missile (Secret) from Hq USAF dated 5 June 1951.
 - (3) TWX from Headquarters USAF to Headquarters Air Research and Development Command Cite AFRD 59902 dated 2 July 1953, WADC Control No. 53WC-33669.
 - (4) Air Force Guide No. 4 (Classification: Secret) First Edition, Addendum No. 6, 28 May 1953, "Standard Missile Characteristic", B-62, Snark. WADC Control No. 52WC-12086.
 - (5) Basic letter, (Classification: Secret) from Commanding General, Chemical Corps Research and Engineering Command to Commanding General, Air Research and Development Command, Subject (Confidential) "Chemical Warhead Requirements for USAF Guided Missiles" dated 6 November 1952, with: 1st Indorsement from Hq ARDC to Hq WADC dated 18 December 1952, 2nd Indorsement from Hq WADC to Hq ARDC dated 24 February 1953; and inclosures. WADC Control No. 53WC-8087. (Secret)

REASONS FOR SECURITY CLASSIFICATION: - Since this document reveals intent to obtain offensive capability in BW warfare, it is classified Secret in accordance with policy outlined in letter from Hq USAF (AFOAT) to all major Commands, dated 16 December 1952, Subject: "(Unclassified) Classification Guide for Matters Concerning Biological Warfare and Chemical Warfare".

DOWNGRADING OF SECURITY CLASSIFICATION: - This document shall retain the security classification of Secret until such time as equipment developed under this project has been used in wartime operations for a period of 90 days at which time classification will be reduced to Confidential or until such time as policy expressed in the BW-CW Security Guide mentioned above has been revised.

~~SECRET~~

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~~SECRET~~

READ FOR RECORD

Copy No.

(4 Pages)

Item 2936

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF CHEMICAL OFFICER
Chemical Corps Technical Committee
Army Chemical Center, Maryland

~~CONFIDENTIAL~~
17 November 1954

CML:WH

MEMORANDUM FOR RECORD:

SUBJECT: Air Force Project 5066, BW-CW Warheads for B-64 (S)

The attached data sheet for rewritten ARDC Project 5066, same subject as above, is reproduced herewith as information pertinent to related Chemical Corps research and development.

FOR THE CHAIRMAN, CHEMICAL CORPS TECHNICAL COMMITTEE:

T. S. Eckert

T. S. ECKERT
Secy, CCIC

Incl.
Data Sheet
Project 5066

~~CONFIDENTIAL~~
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WH5651

Item 2936
Project Data Sheet

1. PROJECT TITLE: BW-CW Warheads for B-64 (Secret)
2. SECURITY CLASSIFICATION: Top Secret
3. PROJECT NUMBER: 5066
5. REPORT DATE: 10 February 1954
6. BASIC FIELD OR SUBJECT: Strategic Air Developments, 104A
7. SUB FIELD OR SUBJECT: 6 - Chemical & Biological Weapons 7a. TECH OBJ.
8. COGNIZANT AGENCY: Air Research & Development Command SA-11
9. DIRECTING AGENCY: WADC, Armament Laboratory
10. REQUESTING AGENCY: Hq, USAF
11. PARTICIPATION AND/OR COORDINATION: Dept. of Navy - BuOrd, BuAer (I)
Dept of Army - Chemical Corps (P)
12. CONTRACTOR AND/OR LABORATORY: Army Chemical Corps; North American
Aviation, Inc.
13. RELATED PROJECTS: None
14. DATE APPROVED: 4 February 1946
15. PRIORITY: 1-A
17. ESTIMATED COMPLETION DATES: Dev. - 1960
Test - 1960
18. FISCAL ESTIMATES: FY 51-53 - 5M; 1954 - 2M; 1955 - 12M; 1956 - 14M;
1957 - 14M; 58-60 - 23M; T - 70M
19. SUPERSEDED REPORTS: This project supersedes Project RDC-R-448-45 in part.
20. REQUIREMENT AND/OR JUSTIFICATION: This project will provide the B-64 missile with a BW-CW capability as expressed in the Statements of Military Characteristics for the Navaho missile warheads, dated 5 October 1951. (See Item 21a.) The authority for this project is contained in a letter (classification: Secret) from Deputy Chief of Staff for Development, Hq USAF, to Commanding General, Air Research and Development Command, Subject: (Confidential) "USAF Guided Missile Warheads and Fuzes (Chemical Corps)", dated 22 March 1951. (Secret)
21. BRIEF OF PROJECT AND OBJECTIVE:
 - a. Brief: The performance characteristics as stated in the Military Characteristics for the BW Warhead state that it should be capable of:
 - (1) Effectively dispersing BW munitions in a uniform pattern over as large an area as possible for maximum effectiveness.
 - (2) Achieving a uniform, reproducible ground pattern of unit munitions.
 - (3) All weather employment.
 - The performance requirements as stated in the Military Characteristics for the CW(GB) Warhead state that it should be capable of:
 - (1) Establishing a uniform concentration of GB vapor over an area of approximately 2,700,000 sq. yds. This vapor concentration shall extend from the surface to a height of 6 1/2 feet and shall be lethal to a man at rest within 30 seconds.
 - b. Approach: This project is still early in the preliminary study phase and no definite methods of approach have been resolved as yet. One of the major problems that will be encountered in the development of a BW or a CW warhead for the B-64 is that of unit munition separation, dispersion and operation following release at supersonic speeds. Since these problems are common to all supersonic missiles,