AD

AD-E400 368

SPECIAL PUBLICATION ARLCD-SP-79003

SAFETY AND INTEROPERABILITY AGREEMENTS ON BILATERAL USE OF ARTILLERY, TANK, AND MORTAR AMMUNITION DURING TRAINING - GERMANY, THE UNITED KINGDOM, CANADA, THE NETHERLANDS, BELGIUM, FRANCE, AND THE UNITED STATES

WILLIAM J. PRYOR

OCTOBER 1979

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND
LARGE CALIBER
WEAPON SYSTEMS LABORATORY
DOVER, NEW JERSEY

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Date Entered)*

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: Special Publication ARLCD-SP-79003	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE *(and Subtitle)* Safety and Interoperability Agreements on Bilateral Use of Artillery, Tank, and Mortar Ammunition During Training - Germany, the United Kingdom, Canada, the Netherlands, Belgium, France, and the United States	5. TYPE OF REPORT & PERIOD COVERED: Summary Tech Report Mar 78 - May 79
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(e): William J. Pryor	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: ARRADCOM, LCWSL DRDAR-LCU, Munitions Systems Division Dover, NJ 07801	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS: ARRADCOM, TSD STINFO (DRDAR-TSS) Dover, NJ 07801	12. REPORT DATE: October 1979 13. NUMBER OF PAGES: 175
14. MONITORING AGENCY NAME & ADDRESS*(if different from Controlling Office)*	15. SECURITY CLASS. *(of this report)*: Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Bilateral safety agreements	Rationalization	Canada
NATO	Standardization and interoperability	Netherlands
Artillery		Belgium
Mortar	Germany	France
Tank	United Kingdom	

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

Discussions between the United States and Germany, the United Kingdom, Canada, the Netherlands, Belgium, and France on the bilateral use of artillery, tank, and mortar ammunition during training resulted in the safety and interoperability agreements contained in this report.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Date Entered)*

SECURITY CLASSIFICATION OF THIS PAGE(*When Data Entered*)

SECURITY CLASSIFICATION OF THIS PAGE(*When Data Entered*)

Bilateral Safety & Interoperability Agreements

May 1979

SUMMARY

Negotiations between the United States and six NATO countries (Germany, the United Kingdom, Canada, the Netherlands, Belgium, and France) resulted in a series of agreements on the exchange of ammunition for training purposes. Out of the 48 specific weapon systems proposed for use in the bilateral training program, agreements were signed on the use of 20 systems; 19 systems were phased out as not being common to both negotiating countries; 4 systems were determined to be unsuitable for training; and 5 systems were determined to be unsafe for bilateral use during training.

Technical data packages were provided to the participating countries on all of the approved ammunition components, and agreement was reached on the continuing exchange of engineering changes which might affect interoperability. Each agreement also contains provisions for the exchange of information relating to field incidents and malfunctions, as well as the results of malfunction investigations.

All agreements were reviewed in the United States by ARRCOM, TECOM, and AMSAA. After these agencies concurred, the agreements were officially transmitted by the Commanding General of ARRADCOM to CINCUSAREUR, DA, DARCOM, and ARRCOM. As a result of these agreements, TRADOC has instructed its training centers and schools to include ammunition interoperability in their curricula.

Technical bulletins have been (and are continuing to be) issued to inform United States field commands of the ammunition components for exchange. Discrepancies in interoperability of the approved ammunition and possible safety hazards which were not anticipated by the STANAG's were included in the agreements and will also be covered by technical bulletins.

A presentation on the Interoperability Agreement was made to the Military Agency for Standardization (MAS) Land Forces Interchangeability Working Party in November of 1978. As a result of this meeting and MAS's participation with the United States, other NATO nations have begun to establish agreements among themselves. Information briefings have been given to DCGMA, DARCOM, TRADOC, FORCECOM, and elements of DA and DOD and have been favorably received.

The first firing of ammunition components determined to be interoperable (8-inch (203 mm)) occurred between Germany and the United States and was featured in the Stars and Stripes and was shown on television in Europe.

TABLE OF CONTENTS

TABLES

INTRODUCTION

In war, it will be necessary for NATO members to use ammunition held in stock by other member nations. To this end the NATO Ammunition Interchangeability Working Party through MAS, has produced in STANAG 2839 "...catalogues of ammunition which can be fired safely from a specified weapon and thus be considered interchangeable in an emergency in war." However, the STANAG states: "the catalogues are not to be used for interchanging ammunition with a view of firing it on NATO training exercises..."

In most cases the ammunition/weapon combinations shown have not been subjected to verification firing tests nor detailed engineering analysis by the United States. However, computer analysis has indicated that interoperability would be generally acceptable in terms of ballistic characteristics.

CINCUSAREUR submitted an "ammunition initiative" (app A) recommending the United States and Germany interchange firings for artillery, tank, and mortar ammunition. CINCUSAREUR subsequently designated as additional countries for exchange: the United Kingdom, Canada, the Netherlands, Belgium, and France. The primary emphasis in these actions was to develop troop familiarity with the ammunition and troop confidence during training. The U.S. Department of the Army concurred in the proposed initiative, and negotiations were begun between the United States and the applicable country to develop agreements.

The first firing of ammunition components determined to be interoperable (8-inch) (203 mm)) occurred between Germany and United States and was featured in the Stars and Stripes and was shown on Armed Forces television in Europe (app B).

BENEFITS OF BILATERAL DISCUSSIONS AND AGREEMENTS

The benefits of the bilateral exchange of ammunition between each pair of participating NATO countries are of overwhelming importance. Of major significance is the fact that now, for the first time, it is possible for NATO troops to share a single supply source of ammunition. The benefits derived from eliminating unnecessary duplication during training go far beyond those of simple cost reduction, and include great improvement in the readiness posture of NATO. The bilateral exchange of ammunition will improve the ability of USAREUR and the European allies to defend Europe against the growing threat of the Warsaw Pact.

These discussions also reveal problems not anticipated by the STANAG's that can be corrected during partnership firing, thus improving the defense posture of the NATO allies. Also highlighted was the fact that many of the countries did not have the latest modifications to the United States technical data packages.

PROBLEMS DISCOVERED

Examples of some of the problems uncovered during discussions and initial training exercises are:

1. The German DM191A1 primer does not perform satisfactorily in the United States 8-inch (203 mm) M110A1 weapon.

2. The United States 155 mm and 8-inch (203 mm) propelling charges are packed without primers. The Netherlands charges are packed with both the M82 and MK4A2 primers. United States troops must be trained to discard the MK4A2 primer, and Netherland troops must supply their own primers during exchange firings.

3. Because different propellants are used in the German and United States 155 mm propelling charges, addendums to the firing tables must be supplied when ammunition is exchanged.

4. The Belgian stocks of 155 mm M3 and M4A2 propelling charges do not contain flash reducers; instead, the M2 flash reducer is issued separately. United States troops will require training to use the M2.

5. Germany will not use the M82 primer in its 155 mm M109G weapon because the black powder may contaminate the sliding breech and cause a safety problem.

6. The United Kingdom has not certified the 155 mm M107 with Composition B and so will only fire TNT until certification.

7. The United Kingdom has modified the rotating band on the 175 mm M437A2 projectile and the ramming system for the 175 mm M107 weapon. These modifications prevent interoperability.

8. Germany and Canada use APDS tank rounds that have a conductive-mix primer that is considered more sensitive than the United States primer. A clip attached to the cartridge case base provides a convenient means to protect the primer. United States troops must be trained in storing, handling, and firing of this round.

9. The United States 105 mm HEAT M456A1 tank rounds produce unusual cannon wear, which affects subsequent firing of the APDS round and causes the APDS round to be erratic. The United States has much more stringent condemnation requirements for the tube than our NATO allies. In partnership training exercises, differences in condemnation limits could seriously alter the effectiveness of the mission.

10. The STANAG for ammunition interchangeability did not list the United Kingdom L85 series and the L112 series artillery fuzes.

11. The United States had reservations regarding proof of safety of the United Kingdom 81 mm L15A4 projectile during accidental double loading. To preclude double loading, the training agreement stipulated reduced firing rates.

12. The Belgian stockpile reports mistakenly indicated that Belgium has 4.2-inch M329A1 projectiles. However, their data cards showed that the propelling charge was the M36 instead of the M36A1; therefore the correct designation for the projectile in the Belgian stockpile is the M329 - not the M329A1. The United States will not fire the M36 charge because of the probability of propellant detonation and tube failure.

BACKGROUND

Since 1973 when Congress first passed the public law directing the Department of Defense to consider standardization between the United States and the NATO allies, very little had been accomplished until just recently.

A major program within the DOD is the rationalization, standardization, and interoperability (RSI) program, which has been considered highly productive in achieving interoperability. In the following paragraphs, the chronology of events is provided.

The JCS in a memorandum to the USDDR&E in September of 1977 identified ammunition interoperability within NATO as the No. 2 and No. 3 priorities. (Note: No. 2 related to aircraft servicing and No. 3 to major calibers.)

DARCOM tasked ARRADCOM on 22 November 1977 to establish and implement the Army Ammunition Interoperability Plan (AAIP) covering all weapon systems and calibers.

CINCUSAREUR submitted its ammunition initiative in November of 1977.

Later, CINCUSAREUR indicated that the first partnership firing scheduled with Germany might involve the 8-inch in lieu of the 155 mm howitzers because of partnership unit scheduling. This action expanded the scope of study to include 8-inch and 175 mm weapons and ammunition to provide flexibility in the initial efforts to establish interchange firings.

In mid-November 1977 ARRADCOM advised CINCUSAREUR that it recognized the need for NATO standardization and fully intended to support CINCUSAREUR's initiative for ammunition interoperability. Toward this objective ARRADCOM sponsored a 2-day working meeting of the technical community (including ARRCOM, TECOM, and AMSAA) which concluded that a system safety release is possible by having an in-country team of technical experts conduct a technical review of the German designs and data. ARRADCOM at that time stipulated in detail the data required from Germany for the technical review and the basic makeup of the team.

CINCUSAREUR advised that coordination with the German Army was ongoing, and that, upon receipt of their approval, CINCUSAREUR would arrange for the bilateral technical data exchange. CINCUSAREUR further requested that consideration of the 155 mm, 175 mm, and 105 mm tank ammunition be given during the 8-inch (203 mm) meeting.

In January of 1978 ARRADCOM agreed to include 175 mm and 155 mm ammunition in the same meeting -- but not 105 mm tank ammunition, since different technical experts would be involved. ARRADCOM further repeated the need for the review and notified CINCUSAREUR that planning for the review would continue.

An advance team consisting of three ARRADCOM personnel visited BWB (Federal Office for Weapons Technology and Procurement) from March 21 to March 23, 1978, to lay the groundwork for establishing the safety and interoperability of the 8-inch, 175 mm, and 155 mm ammunition to permit their mutual use in partnership firing by United States and German troops in training exercises. Because of the cooperation of BWB personnel, a bilateral agreement for the 8-inch system was mutually agreed upon and signed by representatives of both countries at this meeting. BWB stated that they were not prepared at that time to discuss 155 mm and 175 mm systems and suggested a later meeting date.

A subsequent meeting was held at BWB from May 17 to 19, 1978, at which time an agreement was reached and signed for the 175 mm and 155 mm artillery and 105 mm tank ammunition/weapons systems.

The format and agreements reached with Germany were the basis for subsequent negotiations with the United Kingdom, Canada, Netherlands, Belgium, and France. Signed agreements are shown in appendix C.

ARRADCOM teams visited the United Kingdom in July 1978, Canada in October 1978, the Netherlands in November 1978, Belgium in February 1979, and France in May 1979. The 4.2-inch and 81 mm mortar ammunition was included in the agreements where applicable. The teams made comparative evaluations based on review of safety related firings of system components, technical data packages, field performance history, quality assurance and RAM commonality.

Technical data packages were provided to the participating countries on all of the approved ammunition components, and agreement was reached on the continuing exchange of engineering changes which might affect interoperability. Each signed agreement also contains provisions for the exchange of information relating to field incidents and malfunctions, as well as the results of malfunction investigations (app D).

All agreements were reviewed in the United States by ARRCOM, TECOM, and AMSAA. After these agencies concurred, the agreements were officially transmitted by the Commanding General of ARRADCOM to CINCUSAREUR, DA, DARCOM, and ARRCOM. As a result of these agreements, TRADOC has instructed its training centers and schools to include ammunition interoperability in their curricula.

Technical bulletins have been (and are continuing to be) issued to inform United States field commands of the ammunition components approved for exchange (app E). Discrepancies in interoperability of the approved ammunition and possible safety hazards which were not anticipated by the STANAG's were included in the agreements and will also be covered by technical bulletins.

A presentation on the Interoperability Agreement was made to the Military Agency for Standardization (MAS) Land Forces Interchangeability Working Party in November of 1978. As a result of this meeting and MAS's participation with the United States, other NATO nations have begun to establish agreements among themselves. Information briefings have been given to DCGMA, DARCOM, TRADOC, FORCECOM, and elements of DA and DOD and have been favorably received.

ACCOMPLISHMENTS

Out of the 48 specific weapon systems proposed for use in the bilateral training program, agreements were signed on the use of 20 systems (app C); 19 systems were phased out as not being common to both negotiating countries; 4 systems were determined to be unsuitable for training; and 5 systems were determined to be unsafe for bilateral use during training. Table 1 shows a matrix of countries and systems discussed.

Typical ammunition components and typical weapons are shown in appendixes F and G.

METHOD OF REVIEW

ARRADCOM established a team of engineers which consisted of a team leader and a person responsible for each of the following aspects: fuze, propellant charge, projectile, quality assurance, and weapons system (table 2).

In each negotiating country, the team also examined process parameters, acceptance criteria, field functioning data, field incidents, and similarities and differences between technical data packages of both negotiating countries.

Upon return to the United States, concurrences from AMSAA, ARRCOM, and TECOM were obtained, which, in some cases, required minor changes to be made to the agreements.

The reviews were performed by weapon families (artillery, tank, and mortar) as follows:

1. Artillery (HE)

    a. 8-inch (203 mm)
    b. 175 mm
    c. 155 mm

2. Tank (105 mm)

    a. APDS
    b. HEAT

3. Mortar

    a. 81 mm
    b. 4.2-inch

Table 1. Interoperability matrix[a]

Weapon category	Round category	Germany	The United Kingdom	Canada	The Netherlands	Belgium	France
ARTILLERY	8-inch (203 mm)	YES	YES	NA	YES	YES	NA
	155 mm	YES	YES	YES	YES	YES	YES
	175 mm	YES	NO	NA	**	NA	NA
TANK	105 mm APDS	YES	NA	YES	*	*	NA
	105 mm HEAT	YES	NA	NA	*	YES	NA
MORTAR	4.2-inch HE	NA	NA	NA	YES	NO	NA
	4.2-inch Illum	NA	NA	NA	YES	YES	NA
	81 mm HE	NA	YES	YES	NO	NO	NO

[a] Legend:
YES - country has weapon system and ammunition is interoperable.
NA - country does not have weapon system or does not use this ammunition.
NO - ammunition and/or weapon system not interoperable or being phased out.
* - country does not use live rounds for training.
** - country does not train with this weapon system.

Table 2. U.S. Interoperability Team members and countries visited

Team member	Germany	The United Kingdom	Canada	The Netherlands	Belgium	France
V. Lindner	X	X	X	X	X	X
W. Pryor	X	X	X	X	X	X
A. Roseff		X	X	X	X	X
K. Russell	X					
J. Decker	X					
E. Wurzel		X	X	X	X	
R. Nitzsche		X	X	X	X	
LTC Asanovitch	X					
L. Baker				X	X	
R. Corn	X					
W. Joseph	X					

NEGOTIATIONS WITH GERMANY

Artillery Ammunition (HE)

8-Inch (203 mm)

In the initial vist to Germany the advance team determined that fabrication of 8-inch projectile metal parts (MPTS) and loading of the high explosive (TNT) were performed to equivalent United States specifications and the projectile had an excellent safety record among German troops. Therefore, the projectile was determined to be interoperable.

The German propellant charges for the 8-inch systems (DM12 and DM22) were made to United States technical data packages and also were interoperable.

Although Germany has modified the 8-inch weapon, many of the modifications do not affect the ballistics and were not considered a deterrent to partnership firings. The one modification that did affect the exchange firing was the change to the firing pin design. Germany changed the spring to increase the firing pin energy. The Germans also use nitrocellulose instead of black powder in the DM191A1 primer, which increases the energy output by at least 50%. At the time the original agreement was signed, it was believed by both Germany and the United States that this difference in primers would not be a problem. However, during partnership firings by the United States troops using the German primer (DM191A1), two misfires occurred and many firings required multiple lanyard pulls. Until an investigation (joint United States and Germany) can be completed, the agreements were modified to require the United States troops to use their own primer and the German troops to use theirs. The fact that the German primer was not interoperable in the United States weapons was not anticipated by the STANAG's.

The German fuze (DM241) is the same design as the United States M572 fuze, with the exception the German fuze uses the DM42 safe and arming device (S&A) in lieu of the United States M125A1 S&A. It was determined that the DM42 S&A has a dual safety; i.e., it needs setback and spin to arm, and the fuze explosive train is out of line until it is armed. The time required for booster arming is slightly less for the German fuze - 50 meters from the weapon versus 66 meters for the United States M572 fuze. Because of the excellent safety record of the DM241 fuze, it was judged to be safe and interoperable.

175 mm

The 175 mm ammunition/weapon system was negotiated by the full United States Interoperability Team during the second visit to Germany.

The German MPTS for the DM11 projectile were all procured in the United States, were HE loaded (Comp B) in Germany to essentially the same technical data package as the United States, and so are interoperable.

A discussion ensued on fallback (i.e., a round not fully rammed) and the results. The Germans had not attributed their short rounds with this projectile to fallback; they attributed the short rounds to the fact that the obturator remained on the projectile after firing. They were unaware of the United States design modification to the obturator which insures separation of the obturator from the projectile. This modification was given to the Germans. Thus the NATO countries were made aware of the latest technical data packages and the reason for the changes.

Discussion also disclosed that the Germans were considering modification of the rotating band according to the United States Mod H (which was developed, but not incorporated by the United States) on their training rounds to improve projectile retention. However, they were not considering modifying their HE stockpiled rounds at that time. The Germans were informed if they modified the bands in the future, they would not be interoperable with the United States weapons.

The two teams agreed that partnership firings would only be performed at zones 1 and 2 for two reasons:

1. Range restrictions.

2. The majority of safety incidents occurred at zone 3.

The Germans stated they have not made any modifications to the 175 mm M107 weapon that would affect interoperability other than change in the firing spring previously discussed (8-inch (203 mm)) which prevents exchange of the primer.

155 mm

The 155 mm ammunition/weapon system was negotiated by the full United States Interoperability Team during the second visit to Germany.

The MPTS for the DM21 projectile were made in the United States or made to identical technical data packages in Europe. The acceptance testing for the European fabricated MPTS were subjected to a comprehensive safety test similar to the United States TECOM test. Because of the excellent field safety record of the DM21 and the similarity to United States fabrication and testing requirements, it was concluded that the round is interoperable.

The Germans had reservations about firing Composition B loaded M107 projectiles, since they have only loaded TNT into their projectiles. The German national position is to conduct a comprehensive investigation of Composition B prior to allowing its use. However, after being made aware of the United States position (no restriction on firing either Composition B or TNT), the Germans agreed to consider firing Composition B. In the interim the exchange firings with Germany will be restricted to TNT only.

The propellant charge in use by Germany and the United States are of different design and use different propellants. The United States uses M1 propellant for both the M3A1 (green bag) and M4A2 (white bag) charges, whereas the Germans use M30 propellant in their green bag DM42B1 and M1 propellant in their white bag DM62 charge. Use of these different propellants results in a difference in muzzle velocity - which will have to be corrected during partnership firings by the gun crews. A correction sheet (addendum to firing table) must be made available to the United States troops. Thus a problem not covered by the STANAG was corrected. Technical bulletins have been issued to the field commands describing the similarities and differences between the components.

The Germans have made a major change to the M109 weapon that affects interoperability. They replaced the swing breech with a sliding breech. This change precludes the use of the United States M82 primer in the M109 German weapon, because a safety problem could exist after firing as little as 50 rounds. The Germans believe that residue from the black powder will cause loss of breech sealing, with possible fire danger to the crew. To prevent a possible safety hazard, the agreements provide that the United States troops must use their own primer M82 and the Germans must use their own primer DM191A1. This possible safety hazard was not covered in the STANAG.

Tank Ammunition (105 mm)

Background

The tank ammunition weapon system was negotiated by the full United States Interoperability Team during the second visit to Germany.

The 105 mm tank ammunition is the subject of an American-British-Canadian-Australian standardization agreement, ABCA ARMY STD 147A (QSTAG 147A). The agreement identifies technical documents in terms of drawings and specifications controlling the manufacture of the ammunition. Ammunition rounds listed in the original agreement are:

Round, 105 mm: TK, APDS, L28A1 - United Kingdom design

Round, 105 mm: TK, HESH, L35A1 - United Kingdom design

Cartridge, 105 mm: HEAT, M456 - United States design

The United States adopted the two United Kingdom rounds with the exception that the igniter in the primer was replaced by a United States design. The United Kingdom primer is a conductive-mix design and is considered sensitive to static discharge. Occurrences of accidental primer initiation when tested by the United States reinforced the United States plan to develop a bridgewire type igniter. In addition, field manuals restricted firing of United Kingdom ammunition by United States troops. To achieve an interoperability and safe firing agreement, the teams thoroughly reviewed and discussed primer sensitivity and safety history. The following information was highlighted.

In the late 1960's the United States Army Test and Evaluation Command (TECOM) conducted safety and performance tests with the United Kingdom APDS L52A2 round and with the L45A1 DS/T training round. Both rounds contain the L1A4 primer, with the conductive-mix igniter. No safety hazards were encountered during firing of the L45A1 round.[1]

TECOM concluded that the L1A4 primer for the United Kingdom 105 mm APDS-T L52A2 projectile is not susceptible to activation by electromagnetic fields as tested under TECOM Procedures 700-700, Interim Pamphlet 35-111. TECOM recommended that the United States adopt the United Kingdom 105 mm APDS L52A2 projectile for standardization.[2]

---

[1] Reference: Military Potential Test of United Kingdom Cartridge 105 mm, Tank B.E. Screening Smoke, L39A1 and DS/T Tank Practice, (L45A1).

[2] Reference: Final Report on Engineering Test of Cartridge 105 mm United Kingdom APDS-T L52A2; APG Report No. 3047, dtd Feb 1969 w/change 1.

With this background knowledge, a meeting was held with German technical experts to exchange technical data and conduct technical discussions covering the armor defeating APDS and HEAT type cartridges.

APDS Cartridge

The APDS rounds in the German field stock are the United Kingdom L28A1 (DM13) and the L28A1 with tikanium dioxide liner (DM13B1). Because there are few DM13 rounds left in stock, they were not included in the agreement. These rounds are manufactured by the United Kingdom to United Kingdom drawings and specifications. Approximately 138,000 rounds have been fired in Germany without a safety related incident. The United States M392A2 cartridge is manufactured to an equivalent TDP except for the primer - the United Kingdom primer has a conductive-mix igniter, and the United States primer has a bridgewire igniter. The United States team reviewed the German field firing experience with rounds having the United Kingdom primer to determine safety performance. The German field firing data show that the following rounds, each containing the United Kingdom L1A4 primer, were fired without a safety related incident:

APDS	138,338
HESH	334,090
APDS-TP	315,000
Total	787,428

Information obtained from the United Kingdom, prior to the meeting with Germany, indicated that approximately 500,000 training rounds have been fired by the United Kingdom without a safety incident. Based on the large number of rounds fired by both the United Kingdom and Germany without a safety incident, the team concluded that the United Kingdom manufactured APDS round with conductive-mix primer is safe to fire when observing the appropriate handling procedures. This decision represents a change in the United States position regarding this primer.

The United Kingdom ammunition is packaged with a metal clip attached to the base of the cartridge case and covering the head of the primer. In approving safety of rounds with the United Kingdom conductive-mix primer, the United States considered it essential that the clip be retained in place until just prior to loading in the weapon. German tank crews had complained about handling ammunition with the clip; therefore, they were permitted to remove the clip prior to stowing ammunition in vehicles. Germany considers the condition more dangerous if the clip is left on for the longer time because of problems in removing the clip with the vehicle moving or with the turret in stabilized

mode. Germany believes personnel are continually being grounded in the tank and therefore, protection of the primer by the clip is not needed.

Gun Tube Wear and APDS Performance

The problem experienced with the United States APDS ammunition in worn gun tubes was reviewed with Germany. The corrective fix applied to the projectile was discussed, and drawings of the correction (renovation) were provided. Germany was advised that the tube condemnation criterion for wear was changed from 0.075 inch (1.90 mm) to 0.056 inch (1.42 mm) land wear, measured at 25.25 inches (641 mm) from the rear face of the tube. This change was made to remove tubes from service that exhibit secondary land and groove wear large enough to cause erratic projectile flight even with renovated ammunition. Germany was provided Watervliet report ARLCB-TR 70034, "The Influence of Late Wear Life - 105 mm M68 Gun Tubes on Discarding Sabot Ammunition Flight Stability", dated July 1977. The report summarizes gun wear data from field inspection and test results used to identify specific tube wear conditions affecting projectile flight performance.

Germany presented tube wear inspection data from one battalion of 50 tanks. The data show that the tubes do exhibit secondary wear. Their training requirements call for firing 35% HEAT type rounds, and these firings cause the down-tube wear. A bar chart showing "life remaining" for the 50 tubes indicated only seven tubes with greater than 50% life remaining. Since the German tube condemnation criterion is 0.100 inch (2.54 mm) land wear, measured at 25.94 inches (641 mm) from the rear face of the tube, the 50% point approximates our condemnation of 0.056 inch (1.42 mm) at 25.25 inches (641 mm). Imposing our condemnation criterion would severely limit useable tubes based on the 50-tube sample. Germany agreed to inspect gun tubes for secondary wear and limit wear to the following, for confidence firing only.

Primary land wear	0.072 in.	(1.83 mm)
Secondary land wear	0.100 in.	(2.54 mm)
Secondary groove wear	0.120 in.	(3.05 mm)

In tests conducted by the United States, it was determined that any one of these conditions, independently, can cause erratic projectile flight. The STANAG's did not make provisions for the effect of tube wear on flight stability.

Germany has modified its tube condemnation criterion to condemn tubes when land wear exceeds 0.100 inch (2.54 mm) at any of the following points, measured from the rear face of tube: 25.94, 28, 30, or 32 inches (659, 711, 762, or 813 mm). Also, Germany is conducting a tube-life evaluation based on new first-round-hit requirements and based on the planned introduction of fin-stabilized AP ammunition. This effort, in conjunction with secondary wear considerations, may result in a further revision to their tube condemnation criterion.

HEAT-T Cartridge

The HEAT-T cartridge M456A1 held in German field stock is the United States design. An earlier model (consisting of a "two-piece" body design) resulted in inbore prematures. Those affected lots have been taken out of use and converted to training cartridges by replacement of the HE loaded projectile with an empty training projectile. Since the current design of the M456A1 contains a one-piece body and is held in stock by both the United States and Germany, both teams considered interoperability with this design only. This M456A1 cartridge with the one-piece body is produced by Poudreries Reunies de Belgique (PRB) for Germany. PRB is licensed by the United States to manufacture the M456A1 using the United States TDP. PRB supplies Belgium, as well as Germany. Germany has not had a safety related problem with the M456A1 in 88,000 rounds fired. In addition, Germany is not aware of any malfunction with the M456A1 stocks held by the Belgians - although no official report has been received from the Belgians.

The German round is assembled using brass cartridge cases, rather than the steel cases that are used by the United States. The Germans prefer brass because they believe steel gives more problems of split cases during firing.

Since the M456A1 rounds held by Germany are manufactured to the United States TDP, and since firing experience shows no safety related problem, the rounds are considered interoperable and safe to fire.

Training Rounds

Although training ammunition was excluded from the interoperability agreement, the following information was discussed, relative to the APDS and HEAT-type training rounds, and technical documentation was exchanged.

APDS Training Cartridge - DM88

Germany uses the United Kingdom L45A1 round (U.S. M724A1), manufactured by Eurometaal, with the following exceptions: (1) the primer contains a bridgewire igniter in lieu of the United Kingdom conductive-mix igniter, and (2) M1 type propellant, manufactured by the Dutch, is used in lieu of triple base propellant. (The United States previously used triple base propellant (M30) but has also switched to the M1 propellant.) Initial stocks of training ammunition obtained from the United Kingdom were expended in training.

HEAT-T Training Cartridge - DM68

Germany uses the United States designed M490 cartridge. The projectile MPTS weight was adjusted from the nominal 22.35 pounds (10.14 kg) to 22.7 pounds (10.30 kg),matching the weight of the M456A1 HEAT projectile. The propellant used is M30, manufactured by Wasag in Germany and Caulille in Belgium. High pressure problems that resulted from the use of M30 propellant in cold temperature firings have been corrected. Problems in high temperature firings have caused certain lots of TP ammunition to have temperature restrictions (-40^{o}C to 40^{o}C).

Mortar Ammunition

Neither the 4.2-inch nor the 81 mm mortar ammunition was discussed with Germany since that country does not carry this ammunition in its inventory.

NEGOTIATIONS WITH THE UNITED KINGDOM

Artillery Ammunition (HE)

8-Inch (203 mm)

The 8-inch (203 mm) projectile MPTS presented no problems or restrictions since all the MPTS were fabricated in the United States and were loaded either in the United States or in the United Kingdom with TNT to United States specifications.

The propellant charges (M1 and M2) were fabricated in the United States and are identical for both countries.

The United Kingdom nomenclature for its 8-inch weapon is the M110; however, that weapon is really a modified M110 since it is comprised of an M2 or M2A1 cannon on the M110 chassis. This creates no problem for safety or interoperability except that, because of the different configuration of the firing lock, the MK4A2 primer must be used in lieu of the M82 primer. This is another example where these bilateral discussions uncovered a difference in nomenclature that was not covered by the STANAG.

The agreement signed by both countries makes note of this difference. However, during 1979 the United Kingdom intends to convert their weapon to the M110A1 and it will then use the M82 primer. The agreement will be revised when this conversion is made.

The M557 PD and M520 MT fuzes are of United States manufacture and are interoperable. The M572 PD fuze performance data, TDP, and safety record will be reviewed by The Royal Ordnance Board (equivalent to the U.S. TECOM). If all aspects are found to be satisfactory, this fuze will be added to the agreements by revision.

The United Kingdom L85A2 and L112A1 fuzes are similar to the United States M557 and M572 PD fuzes except for:

1. The United Kingdom fuzes contain either the L7A1 or the L7A2 gaine instead of the M125A1 booster (which includes the S&A mechanism). The primary difference is that the United Kingdom fuzes have acceleration operated detent which locks one of the rotor spin locks.

2. The burning time of the delay for the United Kingdom fuzes is reduced from 0.05 second to a range of 0.02 to 0.03 seconds.

175 mm

The United States and United Kingdom projectiles M437A2 are fabricated in the United States; however, the United Kingdom has modified its projectile by removing a portion of the lip of the obturating band to assure projectile seating when employing the two-stage ramming system. This change is the United States modification H that was never incorporated by the United States because the United States does not use the two-stage ramming system. Interoperability is therefore not feasible. The STANAG notes that modification of the range table is required for this modified projectile but does not prohibit interchange firings. The interoperability teams agreed that the differences in the ramming systems of their respective weapons and the obturating bands of their projectiles preclude ammunition interchangeability for training purposes.

155 mm

The United Kingdom purchased all of its 155 mm M107 projectiles from the United States completely HE loaded; therefore, no safety or interoperability problems exist in exchanging ammunition. However, the United Kingdom had reservations about firing projectiles loaded with Composition B because The Royal Ordnance Board has not yet certified Composition B for this round. The United Kingdom team agreed to formally ask the board to certify the Composition B filler. In the interim the agreement will only allow TNT rounds to be exchanged in partnership firings.

The United Kingdom uses the same propelling charges as the United States. These charges are purchased in the United States or are made in the United Kingdom to identical requirements, so no safety or interoperability problems exist in exchanging these charges.

The United Kingdom modified the forcing cone on the M109A1 weapon (M185 cannon) from a steep angle to a shallow angle ratio changed from 1 in 10 to 1 in 5 . This change does not create a safety problem; however, the United Kingdom has never fired the United States M557 fuze with these modified cones. The United Kingdom agreed to fire this fuze subject to safety restrictions imposed by The Royal Ordnance Board.

The United States originally started using a steep angle on the cone because initial data indicated that that angle would reduce the sticker problem in low zone firings. However, subsequent data did not substantiate this conclusion. Also, the steep angle created another problem; because of a mismatch between the forward edge of the rotating band on the M107 and the forcing cone, a situation existed that could allow fallback to occur. In conducting ramming tests on the M185 cannon with the steep angle, the United States determined that by lightly grooving the cone on a new tube, fallback did not occur (i.e., retention values were maintained). After approximately 200 rounds had been fired, heat checking of the cone showed the same retention values. Therefore, the United States still has the steep angle in its M109A1 system.

The United States has no reservations regarding the use of the United Kingdom L85A2 PD fuze. It is basically the same as the M557 with the exception that when the fuze is set for delay, the time will be in the range from 0.02 to 0.03 seconds after impact instead of 0.05 seconds.

Tank Ammunition (105 mm)

The United Kingdom does not maintain an inventory of 105 mm APDS or 105 mm HEAT ammunition used by the United States so no agreements were negotiated.

Mortar Ammunition

4.2-Inch

The United Kingdom does not carry this ammunition in its inventory.

81 mm

The teams discussed the differences between the United Kingdom L16A1 and L16A2 weapons and the United States M29 and M29A1 weapons. They also discussed the rationale for restricting the maximum charge for the United Kingdom L15A4 projectile to five increments when firing in the United States M29 or M29A1 weapon. The upper pressure limit at $70^{o}F$ ($21^{o}C$) for the United States weapon is 9,200 psi (63.4 MPa) and for the United Kingdom weapon it is 10,700 psi (73.8 MPa).

The United Kingdom MK II charge develops 10,700 psi (73.8 MPa) at full charge and the United States charge develops 8,400 psi (57.9 MPa); therefore, for safety, the agreements require the United States troops not to fire above five increments (8,200 psi (56.5 MPa)) when using United Kingdom ammunition in United States weapons.

Because of the difference in propelling charges, the troops must exchange firing tables when ammunition is exchanged.

The agreements also restrict the rates of fire during training exercises to prevent double loading.

NEGOTIATIONS WITH CANADA

Artillery Ammunition (HE)

8-Inch (203 mm)

The Canadian Government does not maintain an 8-inch (203 mm) system in in its inventory.

175 mm HE

The Canadian forces do not carry this weapon system or ammunition in their inventory.

155 mm

Canada purchases all of the 155 mm M107 projectiles and M557 PD and M564 MT fuzes from the United States or they are fabricated in Canada to essentially the United States TDP. Therefore, there is no safety or interoperability problem in exchanging ammunition.

The Canadians were queried whether the forcing cone in their weapon was the United States design or the British modification. It was affirmed that no changes had been made to the forcing cone, so the weapons are identical.

The M82 primer and the M4A2 and M3A1 propelling charges used by both countries are identical to that of United States manufacture and, therefore, are interoperable.

Tank Ammunition (105 mm)

APDS

The APDS rounds in the Canadian field stock are the C35A1. These rounds are fabricated to essentially the same TDP as the United States cartridge M392A2 and L36A1. The Canadian L28A1 is also fabricated to the same equivalent TDP except the L1A4 primer is a conductive-mix type.

The rationale as to use and safety of the L28A1 by United States troops is the same as that for the German APDS round.

Tube condemnation criteria for the United States and Canada were reviewed. No changes were required because Canada does not use HEAT projectiles, which are the major cause of secondary wear in the tube.

HEAT

Canada does not maintain an inventory of 105 mm HEAT ammunition used by the United States.

Mortar Ammunition

4.2-Inch

Canada does not carry this ammunition in its inventory.

81 mm

The agreement drafted by the United States team for purposes of discussion included the L16A2 weapon. However, the Canadian forces do not have the L16A2 weapon; therefore, this weapon was deleted from the final agreement. The Canadian propelling charge, although identical to the United Kingdom MK II charge, has a different nomenclature - L33A1 is the designation for the primary cartridge and L32A1 is the designation for the augmenting cartridge. The same restriction that applies to the United Kingdom round (i.e., the maximum charge that can be fired in the United States M29 and M29A1 weapons is charge five) still applies.

Because of the difference in propelling charges, the troops must exchange firing tables when ammunition is exchanged.

It was agreed that each country's troops must use their own misfire drill.

The Canadian fuze No. 162 MK10 is armed when leaving the muzzle. Therefore, the United States will not use this fuze, and it was deleted from the proposed agreement.

The agreement also restricts the rates of fire during training exercises to prevent double loading.

NEGOTIATIONS WITH THE NETHERLANDS

Artillery Ammunition (HE)

8-Inch (203 mm)

The Netherlands uses the 8-inch M106 projectile fabricated in the United States or the M106C1 projectile fabricated in Europe to essentially the same TDP as the United States M106.

The propelling charges M1 and M2 are of the United States fabrication. The charges M1C1 and M2C1 are fabricated to essentially the same TDP as the United States M1 and M2. However, the Netherlands charges are packed with both the MK2A4 and the M82 primers, whereas the M82 primer is supplied separately to the United States troops. The United States troops must discard the MK2A4 primer when ammunition is exchanged.

The Netherlands M557 and M557C1 fuzes were fabricated in Italy to essentially the same design, performance, and safety requirements as the United States fuze.

175 mm

It was agreed that the 175 mm weapon system interchange firing should not be pursued since the Netherlands has only one reserve battalion capable of firing the 175 mm system in 1979. Therefore, no training exercises will be undertaken with this weapon.

155 mm

The Netherlands uses the 155 mm M107 projectile fabricated in the United States. Therefore, there is no problem in interoperability. The Netherlands projectile M107B2 is United States manufactured and is an M101 projectile modified to the M107 configuration (band cut down). Therefore, it is acceptable. The Netherlands projectile M107C1 is fabricated in Netherlands to essentially the same TDP as the United States M107.

The United States M4A2 and M3A1 charges and the Netherlands M3C1 and M4C3 charges are fabricated to essentially equivalent TDP's and provide the same ballistics. However, the Netherlands charges are packed with both the MK2A4 and the M82 primer, whereas the M82 primer is supplied separately to the United States troops. The United States troops must discard the MK2A4 primer when ammunition is exchanged.

The Netherlands M557 and M557C1 fuzes were fabricated in Italy to essentially the same design, performance, and safety requirements as the United States fuze.

Tank Ammunition (105 mm)

The Netherlands uses only training ammunition for all training exercises. Since the purpose of these agreements is to cover the exchange of live ammunition, no agreements were necessary.

Mortar Ammunition

4.2-Inch HE

The Netherlands purchases all the M329A1 projectiles from the United States, and these rounds are identical to the United States rounds. For the M329C1, the Netherlands purchased the M329 round from the United States and modified the propelling charge from the M36 to M36A1 which upgraded the projectile to the M329A1. Therefore these rounds are interoperable.

The Netherlands M557 and M557C1 fuzes were fabricated in Italy to essentially the same design, performance, and safety requirements as the United States fuze.

4.2-Inch Illuminating

The United States projectile M335A2 and the Netherlands projectile M335C1 were fabricated to essentially equivalent TDP's. The Netherlands M335C1 is the United States M335 modified to the M335A1, including modification of the propelling charge M36 to M36A1.

The Netherlands fuze NR151 is essentially the same as the United States M501A1 except the Netherlands removed the PD element and replaced it with a dummy head (only the MT function remains).

81 mm

The Netherlands does not issue 81 mm mortar ammunition to their troops and it is phasing this system out. Therefore, no agreement was signed for 81 mm mortar ammunition.

NEGOTIATIONS WITH BELGIUM

Artillery Ammunition (HE)

8-Inch

The United States projectile M106 and the Belgian projectile M106 are fabricated and loaded in the United States.

The Belgian propelling charges (M1, M2), primer (M82) and fuzes (M557, M564) are all fabricated in the United States and so are interoperable and safe to fire in peacetime partnership firings.

175 mm

The Belgian forces do not carry this weapon system or ammunition in their inventory.

155 mm

The United States projectile M107 and a portion of the Belgian stockpile of M107 projectiles are of United States manufacture. Belgium has also purchased a small quantity of M107 projectiles in Belgium manufactured to the United States technical data package.

Belgium has only loaded TNT to the equivalent United States TDP requirements and specifications and so the agreement limited the exchange of rounds to TNT loading only.

The United States fuzes M557 and M564 and the Belgian fuzes M557 and M564 are of United States manufacture.

The United States M3A1 charge and the Belgian M3 charge are fabricated to essentially equivalent TDP except the Belgian charge uses 3.0 ounces (85 grams) of black powder in the igniter pad instead of CBI. The United States M4A2 charge and the Belgian M4A1 are similar except the Belgian charge uses black powder instead of CBI and the charge does not include a flash reducer. Flash reducer M2 may be used with the Belgian charge but is a separate item of issue. The United States troops will require training in the use of the M2 flash reducer. The Belgian troops will provide the United States troops with the M2 flash reducer during training exercises.

Tank Ammunition (105 mm)

APDS

The Belgian Army uses only training ammunition for all training exercises. Since the purpose of these agreements is to cover the exchange of live ammunition, no agreement was signed.

One benefit derived from these discussions was Belgium reported erratic flights when training with their APDS rounds. The United States explained that erratic flight problems were experienced in firing the M329A2 rounds in worn tubes. The United States conducted tests to determine what worn tube criteria could be established to correct this problem. Belgium was unaware that a worn tube could be a problem and was provided with the United States tube condemnation limit.

HEAT

The United States cartridge M456A1 and the Belgian cartridge M456A1 (fabricated in Europe) are fabricated to the United States TDP and the evaluation has determined that they are interoperable. The agreement restricts the M456A1 cartridge to the "one-piece" body design only.

The United States gun tube M68 and the Belgian gun tubes L7A2 and L7A3 are interoperable.

Mortar Ammunition

4.2-Inch HE

The discussion revealed that the Belgian M329A1 projectile is mistakenly marked A1. The charge is really the M36 in lieu of the M36A1. The United States has retrofitted all charges to the A1 configuration.

No agreement was signed because the United States will not fire the M36 charge because of the probability of propellant detonation and tube failure.

4.2-Inch Illumination

The United States projectile M335A2 and the Belgian projectile M335A2 are of the United States fabrication and are identical and therefore interoperable.

The United States fuze M565, propelling charge M36A1, ignition cartridge M2A2, and the respective components used by the Belgian Army are all of the United States manufacture and are identical.

81 mm

No agreement was signed for this system because the Belgian Army only has the M43A1 projectile, and the United States does not consider this round safe due to erratic flight.

NEGOTIATIONS WITH FRANCE

Artillery Ammunition (HE)

8-Inch

The French Government does not maintain an 8-inch (203 mm) weapon system in its inventory.

175 mm

France does not carry this weapon system in its inventory.

155 mm

The United States projectile M107 and the French projectile M107 are made to essentially the same TDP. France only uses TNT loaded projectiles for training; therefore, the agreement limited the exchange of rounds to TNT only.

The United States fuze M557 and the French fuze M557 are made essentially to the same TDP.

The United States M3A1 charge and the French M3 charge are fabricated to essentially equivalent TDP's except the French charge uses 3.0 ounces (85 grams) of black powder in the igniter pad instead of CBI. The United States M4A2 charge and the French M4A1 are similar except the French charge uses black powder instead of CBI and the charge does not include a flash reducer. Flash reducer M2 may be used

with the French charge, but the reducer is a separate item of issue. The United States troops will require training in the use of the M2 flash reducer. French troops will provide the United States troops with the M2 flash reducer during training exercises.

The Franch F3Am weapon and the United States M109 series weapon have comparable projectile performance characteristics. The French F3Am weapon uses only the MK2A4 primer, whereas the M109 series will use only the M82 primer. Therefore, primers will not be exchanged.

Tank Ammunition (105 mm)

Since the French troops do not maintain an inventory of 105 mm APDS and 105 mm HEAT ammunition used by the United States, no agreements were negotiated.

Mortar Ammunition

4.2-Inch

The French troops do not carry this weapon system in their inventory.

81 mm

The French forces have depleted their stocks of United States design M374A2 and M43; consequently, they have taken the United States mortar M1 out of service.

They have replaced these rounds with French models 44 and 61, which are lighter than United States designs and which fire at lower pressures.

The systems were not interoperable because of the pressure limit on the French tube and because of the small quantities of mortars with the French troops in Germany.

FUTURE ACTIONS

Future actions to be taken by the participating countries are:

1. Upon approval by Headquarters, USDA, implement the Army Ammunition Interoperability Plan (AAIP) covering all weapon systems and all sizes of ammunition.

2. Negotiations will be pursued between the United States and Norway, Greece, Italy, and Turkey.

3. Continue preparing technical bulletins for distribution to the participating countries on weapon and ammunition systems for which interoperability agreements have been signed.

APPENDIX A

EARLY INITIATIVE CORRESPONDENCE

DEPARTMENT OF THE ARMY
HQ, US ARMY, EUROPE AND SEVENTH ARMY
THE COMMANDER IN CHIEF
APO 09403

AEAGC-ATC 12 December 1977

Herrn
Generalleutnant Horst Hildebrandt
Inspektaur des Heeres
Bundesministerium der Verteidigung
Postfach 1328
5300 Bonn 1

Dear General Hildebrandt:

The purpose of this letter is to solicit your support for ammunition exchange firings between German and US units. General Reichenberger and I have discussed ammunition exchange firings, and we are convinced that this is an excellent method to promote interoperability of ammunition and troop confidence.

My staff has prepared a plan to exchange ammunition for the same type and caliber weapons between partnership units and other US and German Artillery units training at Grafenwoehr. Controls will be established to ensure that safety considerations are observed.

If you support this approach, we can begin firing in March 1978. Your support of ammunition exchange firings will help to ensure that interoperability is not just a good idea, but a fact.

Sincerely,

GEORGE BLANCHARD
General, USA
Commander in Chief

CF:
LTG Reichenberger

FROM: Federal Ministry of Defense
Army Chief of Staff
5300 Bonn 1
P.O. Box 1328

23 Jan 78

TO: General George S. Blanchard
Commander in Chief
HQ USAREUR
69 Heidelberg

Dear George:

Thank you very much for your letter of 12 Dec 77 regarding mutual support of our units with ammunition for the purpose of gaining experience in inter-operability in the ammunition sector.

I welcome all efforts to test the exchangeability of ammunition in peace time. Joint firing projects of partnership units at the Grafenwoehr troop training site offer good prerequisites for such tests. In this regard I propose that joint control groups accompany the firing practices under the viewpoint of safety requirements.

Request you forward my staff the plan prepared by your staff for the ammunition to be exchanged. The resulting required measures may then be initiated by my staff, possibly in cooperation with your officers.

Sincerely yours,

GEN. HILDEBRANDT
C/S

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY, EUROPE, and SEVENTH ARMY
THE COMMANDER IN CHIEF
APO 09403

AEAGD-MM

4 May 1978

Herrn
Ministerialdirigenten
Peter Runge
Bundesministerium für Verteidigung
- RUE VII -
Coerdelerstrasse 113

5300 - Duisdorf

Dear Herr Runge:

I am pleased to learn that we have recently completed a bilateral agreement confiming the interoperability of FRG and US 8-inch ammunition. Moreover, we have agreed to inform each other of technical data revisions and of any field firing incidents which may occur.

We are most appreciative of the professionalism and spirit of cooperation that marked this effort. Herr Menzel and his staff at the Bundesamt Wehrtechnik and Beschaffung were especially cooperative and efficient. Herr Rotter did much to establish the importance of the objective and to lay the ground work for its successful attainment. Herr Doctor Koch worked tirelessly on details, played a major role in the efficient accumulation and presentation of data, and established an atmosphere of competent collaboration.

We look forward to the successful completion of the next step, which is to address the interoperability of 155mm and 175mm ammunition. I suggest that we mutually establish a target date for these two projects. We propose completion of the technical review for the 155mm and the 175mm ammunition by the end of May and June 1978, respectively. We invite your consideration of this proposed schedule.

Sincerely yours,

GEORGE S. BLANCHARD
General, USA
Commander in Chief

[illegible] 1 [illegible]

[illegible]ZYUW RUFDAAA1[illegible]40 227[illegible]-UUUU--RUECEKA.
Z[illegible] UUUUU
[illegible] AUG 77
FM CINCUSAREUR HEIDELBERG GERMANY//AEACD-MM//
TO RUEA[illegible]UD/DA WASHDC//DAMA-WSW/DAMA-CSM//
INFO RUEADWD/DA WASHDC//DACS-DPA/DALO-SMD/DAMO-RQ/DAIG-SEO/
[illegible]/CDRDARCOM ALEX VA//DRCSF/DRCIRD/DRCRSI//
RUSNAAA/USCINCEUR VAIHINGEN GERMANY
RUCIAFE/CDRARRCOM ROCK ISLAND IL
RUFDRXY/COMCENTAG SECKENHEIM GERMANY
RU[illegible]/SHAPE BELGIUM
[illegible]NA/USMISSION NATO BRUSSELS BELGIUM
[illegible]CEKA/CDRARRADCOM DOVER NJ/DRDAR-LCR//
RULNAPG/CDRARRADCOM APG MD//DRDAR-BLL-FT//
ZEN/CG 3TSC HEIDELBERG GERMANY
BT
UNCLAS
SUBJ: USAREUR AMMUNITION INTEROPERABILITY INITIATIVE
A. CINCUSAREUR MSG, AEACD-MM, 121303Z MAY 77 (U) NOTAL
B. CINCUSAREUR MSG, AEACD-MM, 191243Z MAY 77 (U) NOTAL
C. LTR, CDRARRADCOM, DRDAR-BLL-FT, SUBJ: INTERCHANGEABILITY OF ARTILLERY AMMUNITION, DTD 29 JUN 77 (U) NOTAL

PAGE 2 RUFDAAA1040 UNCLAS
D. LTR, CDRARRADCOM, DRDAR-LCR, SUBJ: AMMUNITION INTERCHANGEABILITY DTD 15 JUL 77 (U) NOTAL
E. FONECON BETWEEN MR. FANT, HQ USAREUR, ODCSLOG, AND LTC WICKLIFFE, HQ DA, DAMA-WSW, 26 JUL 77
F. FONECON BETWEEN MR. FANT AND LTC TOWNSEND, HQ DA, DAMA-CSM, 28 JUL 77
SHAPE FOR USNMR AND ACOFS LANDA DIV
US MSN TO NATO FOR C, US ARMY REP FOR NATO MAS
1. REF A SUMMARIZED PROBLEMS OF AMMO INTERCHANGEABILITY AS DISCUSSED AT USAREUR MUNITIONS CONFERENCE, MAY 77, AND REQUESTED ASSISTANCE IN ESTABLISHING SUBJ INITIATIVE. REF B REQUESTED COPY OF PROPOSED BRIEFING ON AMMO INTERCHANGEABILITY FOR PREVIEW. REF C PROVIDED DETAILED INFO AND FURNISHED COPIES OF CORRESPONDENCE ASSURING THAT CURRENT ARTILLERY WPNS AND AMMO (155MM, 8-INCH, AND 175MM) IN THE HANDS OF NATO NATIONS ARE FULLY INTERCHANGEABLE AND SAFE TO FIRE; FIRING TABLES ARE BEING DEVELOPED FOR DISTRIBUTION; INFO ON INVESTIGATION AND PLANNED TEST FOR INTERCHANGEABILITY OF DEVELOPMENTAL 155MM WPNS/AMMO WAS FURNISHED. REF D FURNISHED COPY OF PROPOSED BRIEFING IN RESPONSE TO REF B; BRIEFING CONTAINS INFO/ASSURANCES OF INTERCHANGEABILITY AND SAFETY FOR CURRENT NATO ARTY WPNS/AMMO

PAGE 3 RUFDAAA1040 UNCLAS
SIMILAR TO REF C. FONECONS, REFS E AND F, PROVIDED CONFIRMATION OF THE FACT THAT CURRENT NATO ARTY WPNS/AMMO ARE CONSIDERED TO BE FULLY INTERCHANGEABLE AND SAFE TO FIRE.
2. COPIES OF PROPOSED REVISIONS TO FIRING TABLES, FURNISHED IN REFS C AND D, INDICATE THAT NO DIFFERENCES IN RANGE ARE ANTICIPATED WHEN FIRING IDENTICAL COMBINATIONS OF ARTILLERY COMPLETE ROUNDS IN THE VARIOUS NATO NATIONS' APPLICABLE WEAPONS.

3. IT IS CONSIDERED THAT THE INFORMATION PROVIDED IN THE ABOVE REFERENCES IS SUFFICIENT TO SATISFY US CERTIFICATION REQUIREMENTS AS [illegible] IN REF A, PARA 1C. WE ARE COORDINATING WITH FRG COUNTERPARTS TO OBTAIN CONCURRENCE IN SCHEDULING A BILATERAL JOINT FAMILIARIZATION/CONFIDENCE FIRING EXERCISE AS THE INITIAL EFFORT TO ESTABLISH SUBJ INITIATIVE.

4. FOLLOWING ARE DETAILS OF THE PLAN FOR THIS FIRST EFFORT:

A. OBTAIN AGREEMENT BETWEEN US/FRG COUNTERPARTS ON DETAILS AND SCHEDULING OF THE EXERCISE.

B. SCHEDULE JOINT EXERCISE. EARLIEST FIRING ANTICIPATED MID OCT 77, USING US/GE PARTNERSHIP UNITS TO DO THE INTERCHANGE FIRINGS.

C. FIRST INTERCHANGE FIRING

(1) WEAPONS - 155MM HOW, US M109A1 AND FRG M109

(2) AMMUNITION

(A) PROJECTILE, HE, US M107 AND FRG DM21

(B) PROPELLING CHARGES, US M3 AND M4A1 AND FRG DM52 AND DM42

(C) FUZE, PD, US M572 AND FRG DM241

(D) PRIMER, PERCUSSION, US M82 AND FRG M82(US)

D. SUBSEQUENT INTERCHANGE FIRINGS. WEAPONS - 8-INCH HOW, 175MM GUN AND 105MM TANK GUN FOR BOTH COUNTRIES AND SELECTED MATCHING ROUNDS OF AMMUNITION. FIRM SCHEDULES FOR THESE AS WELL AS THE INITIAL, C ABOVE, ARE NOT YET ESTABLISHED. ESTIMATED COMPLETION OF THE INTERCHANGE FIRING SERIES WITH FRG, FEB 78.

E. SAFETY CONSIDERATIONS - FIRING WILL NOT BE OVERHEAD OF TROOPS. ALL OTHER ESTABLISHED RANGE SAFETY PROCEDURES WILL BE OBSERVED. AS STATED IN PARA 3 ABOVE, IT IS CONSIDERED THAT WE HAVE SAFETY CERTIFICATION FOR FIRING OF THE ARTY SYSTEMS ABOVE. BEFORE ACTUAL INTERCHANGE FIRING EXERCISE(S), REQUEST SIMILAR CERTIFICATION FOR THE 105MM TANK GUN AND AMMO, INCLUDING APPROPRIATE FIRING TABLE DATA.

F. EACH UNIT WILL RECORD THE RESULTS OF THE FIRINGS, INCLUDING ACCURATE ACCOUNTING OF LOT NUMBERS OF ALL COMPONENTS AND DETAILS OF

THE BALLISTIC PERFORMANCE.

7. EXPERIENCE AND OBSERVATIONS OBTAINED FROM THE EXERCISE WILL BE FURNISHED ALCON FOR INFORMATION.

8. UPON COMPLETION OF JOINT FAMILIARIZATION/CONFIDEN?CE FIRINGS WITH FRG AS ABOVE, WE PLAN TO FOLLOW ON WITH BILATERAL EXERCISES BETWEEN US AND CANADA, UK, BELGIUM, THE NETHERLANDS, AND FRANCE, SUBJECT TO AGREEMENT WITH THE COUNTRIES AND AS SCHEDULING ON FIRING RANGES PERMITS. THE INTERCHANGEABLE WEAPON SYSTEMS BETWEEN US AND THE VARIOUS NATO COUNTRIES VARY. THE EMPHASIS WILL BE PLACED ON APPLICABLE ARTILLERY SYSTEMS AND THE 105MM TANK GUN. ADDITIONALLY, THE 81MM AND 4.2-INCH MORTAR SYSTEMS ARE BEING CONSIDERED. THE EFFORT IS TO ACCOMPLISH THESE JOINT EXERCISES WITH A MINIMUM OF DELAY AND DEMONSTRATE THE VALIDITY OF INTERCHANGEABILITY IN THE NATO COMMUNITY.

9. REQUEST CONCURRENCE. FURTHER REQUEST ASSISTANCE IN EXPEDITING THE AVAILABILITY OF CERTIFICATION FOR THE 105MM TANK GUN, 81MM AND 4.2-INCH MORTAR/AMMO SYSTEMS.

10. USAREUR ACTION OFFICER, MR. HART, AEAGD-MM, TELEPHONE AUTOVON [illegible].

PT C2501 273 210306

RTTUZDSW RUEADWDC215 2701714-UUUU--RUEOEKA.
ZNR UUUUU ZDS VOL CCN X DESTROY ALL OTHERS
R 2715C4Z SEP 77 ZDS
FM HQDA WASH DC //DAMA-CSM-CA//
TO RUFDAAA/CINCUSAREUR HEIDELBERG GERMANY //AEAGD-MM//
RUKLDAR/CDRDARCOM ALEX VA //DRCSF//
INFO RUKLDAR/CDRDARCOM ALEX VA //DRCIRD/DRCBSI//
RUCIAFB/CDRARRCOM ROCK ISLAND ILL
RUEOEKA/CDRARRADCOM DOVER NJ //DRDAR-LC//
RULNAPG/DIRBRL ABERDEEN PG MD //DRDAR-BU-FT//
RUEADWD/HQDA WASH DC //DAMO-RQ/DALO-SMD/DAMA-PPI/
DAMO-DAIRO//
BT
UNCLAS
SUBJ: USAREUR AMMUNITION INTEROPERABILITY INITIATIVE
A. CINCUSAREUR MSG, AEAGD-MM, 150743Z AUG 77, SAB (NOTAL).
1. PART I FOR ALL. THIS HQ SUPPORTS THE USAREUR INITIATIVE AND CONCURS IN THE FIRING PROGRAM OUTLINED IN REF. IT IS UNDERSTOOD THAT NO ADDITIONAL FUNDS ARE AVAILABLE TO SUPPORT THESE PROGRAMS, BUT FIRINGS SHOULD BE CONDUCTED AS PART OF THE TRAINING PROGRAM.
2. PART II FOR CDR DARCOM. REQUEST INFORMATION REQUESTED IN PARA 4E AND 7 OF REF, CONCERNING SAFETY CERTIFICATION & FIRING TABLE DATA

PAGE 2 RUEADWDC215 UNCLAS
BE PROVIDED HQUSAREUR. USAREUR POC IS MR. FANT, AEAGD-MM, AVN 435-6611.
BT
#0215

NNNN

PT 02299 272 014943

FTTUZEIX RUKLDAR3078 2712000-UUUU--RUEOEKA.
ZNR UUUUU ZDK ZUI RUEACSA8913 2712355 (SVC)
P 282000Z SEP 77
FM CDRDARCOM ALEX VA//DRCSF-S//
TO RUECEKA/CDRARRADCOM DOVER NJ//DRDAR-LC/DRDAR-SF//
RULNAPG/CDRTECOM APG MD//DRSTE-SF//
INFO RULNAPG/CDRARRADCOM APG MD//DRDAR-BRL-FT//
RUEADWD/DA WASH DC//DAMA-CSM-CA/DAIG-SD//
RUFDAAA/CINCUSAREUR HEIDELBERG GERMANY//AEAGD-MM//
BT
UNCLAS
SUBJ: USAREUR AMMUNITION INTEROPERABILITY INITIATIVE
A. AEAGD-MM MSG, R150743Z AUG 77, SAB (NOTAL.
B. HQDA (DAMA-CSM-CA) MSG, R271504Z SEP 77, SAB (NOTAL).
1. A ANNOUNCES AN INTENTIONON THE PART OF USAREUR TO PERFORM A JOINT US-FRG INTERCHANGE FIRING PROGRAM. B NOTIFIES ALCON OF THEIR SUPPORT OF SUCH A PROGRAM AND REQUESTS, FROM DARCOM, THE VERIFICATION OF SAFETY FOR THE FIRINGS AS WELL AS FIRING TABLE INFORMATION. FIRINGS WILL BE PERFORMED WITH VARIOUS COMBINATIONS OF AMMUNITION AND WEAPONS BELOGNING TO BOTH GERMANY AND THE US AND MAY INCLUDE 81 MM AND 4.2 INCH MORTAR SYSTEMS, 105MM TANK GUN, AND 155MM, 175MM AND 8INCH ARTILLERY WEAPONS.

PAGE 2 RUKLDAR3078 UNCLAS
2. THE FIRST PROGRAM OF FIRINGS INVOLVE THE 155MM HOWITZER USING THE FOLLOWING COMBINATIONS OF WEAPON AND AMMUNITION COMPONENTS:
A. WEAPON -155MM HOW, US:M109A1 AND FRG, M109.
B. AMMUNITION:
(1) PROJECTILE, HE, US, M107 AND FRG, DM21.
(2) PROPELLING CHARGES, US, M3AND M4A1 AND FRG, DM62 AND DM42.
(3) FUZE, PD, US, M572, AND FRG, DM241.
(4) PRIMER, PERCUSSION, US, M82 AND FRG, M32 (US).
3. SINCE THE FIRST FIRING IS PLANNED TO BE PERFORMED IN MID-OCTOBER, I REQUEST THAT THE FOLLOWING BE FORWARDED TO CINCUSAREUR ATTN: AEAGD-MM, AS SOON AS POSSIBLE:
A. INFORMATION RELATIVE TO THE SAFETY VERIFICATIONOF THE ABOVE WEAPON/AMMO COMBINATIONS.
B. FIRING TABLE DATA FOR THE WEAPON/AMMO COMBINATION.
4. IN ORDER TO EXPEDITE ACTIONSM, COORDINATION AMONG DARCOM SUBORDINATE COMMANDS AND WITH CINCUSAREUR IS ENCOURAGED AND NECESSARY. USAREUR ACTION OFFICER IS MR. FANT, AUTO 435-6611. POC FOR DARCOM IS MR. LLOYD, AUTOVON 284-9340.
BT
#3078

NNNN

PT 00443 309 030228

RTTUZYUW RUFDAAA5794 309030Z-UUUU--RUEOEKA.
ZNR UUUUU
R 041603Z NOV 77
FM CINCUSAREUR HEIDELSERG GERMANY //AEAGD-MM//
TO RUFLOWA/CDRVII CORPS MOEHRINGEN GERMANY //AETSGC-T//
RUFTFRA/CDRV CORPS FRANKFURT GERMANY //AETFGC-T//
RUFLFTA/CDRSEVENTH ARMY TNG COMD GRAFENWOEHR GERMANY
INFO RUEADWD/DA WASHDC //DAMA-CSM-CA/DAIS-SD//
RUKLDAR/CDRDARCOM ALEX VA //DRCSF/DRCIRD/DRCRSI//
RUEOEKA/CDRARRADCOM DOVER NJ //DRCDAR-LC/DRCDAR-SF//
RULNAPG/CDRARRADCOM APG MD //DRDAR-GRL-FT//
RULNAPG/CDRTECOM APG MD //DRSTE-SF//
RUFLIIA/CDR21ST SUPCOM KAISERSLAUTERN GERMANY //AERLO-L//
RUFTFDC/CDR21ST SUPCOM ZWEIBRUECKEN GERMANY //AERCA//
RUFYTJA/CDR72D ARTY GP WERTHEIM GERMANY //AETSAT-BSC//
RUFYTWA/CDR41ST ARTY GP BABENHAUSEN GERMANY //AETVA-C//
RUFTTEA/CDR42D ARTY GP GIESSEN GERMANY //AETVG-C//
RUFYTRA/CDR21CTH ARTY CP HERZOGENAURACH GERMANY //AETSAT-
G-SC//
RUFDRXX/CENTAG SECKENHEIM GERMANY //G4//
RUFLHIA/CDR1D1ST ORD BN HEILBRONN GERMANY
ST

PAGE 2 RUFDAAA5794 UNCLAS NATO UNCLAS FOR NATO ADDRESSEE
UNCLAS NATO UNCLAS FOR NATO ADDRESSEE
SUBJ: USAREUR AMMUNITION INTEROPERABILITY INITIATIVE
A. CINCUSAREUR, AEAGC-ATC, MSG 040731Z OCT 77 (U) NOTAL.
B. CINCUSAREUR, AEAGD-MM, 111323Z OCT 77 (U) NOTAL.
C. CINCUSAREUR, AEAGD-MM, MSG 211023Z OCT 77 (U).
D. FONECON BETWEEN MR FANT, HQ USAREUR, ODCSLOG, AND CPT MAYON, HQ
7TH ATC, 1 NOV 77.
E. BRIEFING OF CINCUSAREUR ON STATUS OF SUBJ, 2 NOV 77.
1. REF A EXPLAINED BASIC CONCEPT PLAN FOR SUBJ INITIATIVE. REF
B SPECIFIED US AND FRG 8 INCH AMMO RDS PLANNED FOR INTERCHANGE FIRING
AND REQUESTED FURTHER TECH/SAFETY DATA IF REQUIRED. REF C FURNISHED
EVALUATION CRITERIA TO BE USED IN ARTILLERY AMMO INTERCHANGE FIRINGS.
IN REF D, DETAILS OF A PROCEDURE FOR A CONTROLLED INITIAL INTERCHANGE
FIRING OF 8 INCH HOW AMMO WAS DISCUSSED. DURING BRIEFING, REF E, THE
CINCUSAREUR CONCURRED IN A PLAN, WHEN APPROVED BY THE GERMAN ARMY
CHIEF OF STAFF, TO PROCEED WITH AN INITIAL CONTROLLED INTERCHANGE
ARTILLERY FIRING EXERCISE.
2. UPON CONCURRENCE FROM CHIEF OF STAFF GERMAN ARMY, IT IS PLANNED
TO PROCEED WITH AN INITIAL INTERCHANGE FIRING BETWEEN US AND FRG
UNITS. IN ANTICIPATION THAT CONCURRENCE IS FORTHCOMING, REQUEST

PAGE 3 RUFDAAA5794 UNCLAS NATO UNCLAS FOR NATO ADDRESSEE
PLANS BE FINALIZED FOR A CONTROLLED JOINT FIRING EXERCISE BETWEEN 8
INCH UNITS: US 72D FA GP, 3/35TH FA AND FRG 12TH ARTY REGT, C/A 28
NOV 77.
3. DUE TO LACK OF FORMAL TEST DATA, CONUS AGENCIES ARE UNABLE TO
PROVIDE STANDARD SAFETY CERTIFICATION FOR INTERCHANGE FIRING OF NATO
ARTILLERY AMMO/WEAPON SYSTEMS AT THIS TIME. WHILE CERTIFICATION IS
DENIED, NO TECH OR SAFETY OBJECTION HAS BEEN NOTED THAT WOULD PRO-

HEDIT OR CAST DOUBT UPON THE SUCCESS OF INTERCHANGING THE NATO ARTILLERY AMMO.
4. IN THE ABSENCE OF STANDARD SAFETY CERTIFICATION, REQUEST YOU PROCEED WITH THE INITIAL INTERCHANGE FIRING EXERCISE AS A CONTROLLED EXERCISE FOR VALIDATION PURPOSES. AS A MINIMUM, CONTROLS SHOULD CONSIST OF:
A. EXPOSURE OF NO MORE THAN ONE GUN CREW OF EACH PARTICIPATING NATION.
B. EACH CREW WILL FIRE AN OBSERVER MISSION OF ITS OWN AMMO BEFORE INTERCHANGING.
C. UNIT PERSONNEL WILL CLOSELY MONITOR THE FIRING CREWS AND COLLECT DATA AS REQUESTED IN REF C FOR EVALUATION BY UNIT/7TH ATC/HQ USAREUR PERSONNEL.

PAGE 4 RUFDAAA5794 UNCLAS NATO UNCLAS FOR NATO ADDRESSEE
D. FIRING WILL NOT BE OVERHEADS OF PERSONNEL.
E. WHEN INITIAL FIRING IS COMPLETED TO THE SATISFACTION OF THE UNITS AND 7TH ATC, DATA WILL BE FORWARDED FOR REVIEW BY HQ USAREUR AND TO AGENCY(S) DESIGNATED BY FRG, IF DESIRED, FOR FINAL SAFETY RELEASE OF THE SYSTEM FIRED.
F. DETAILS OF THE FIRING PROCEDURES, INCLUDING ADDITIONAL SAFETY CONTROLS DEEMED APPROPRIATE, SHOULD BE ESTABLISHED BY THE 7TH ATC IN COORD WITH THE ARTY UNITS TO ASSURE MAXIMUM SAFETY AND A SATISFACTORY EVALUATION OF INTERCHANGEABILITY:
G. IN CONNECTION WITH PROCEDURAL DETAILS, THIS HQ CONCURS IN THE GENERAL PLAN DISCUSSED, REF D, WHICH CONSISTS OF (FOLLOWING OBSERVER MISSION WITH ITS OWN AMMO):
(1) EXCHANGE 20 ROUNDS TOTAL WITH GERMAN UNIT (DIRECT EXCHANGE OF AMMO).
(2) EACH COUNTRY USE ONE WEAPON AND ITS OWN FIRING TABLES.
(3) FIRE OTHER COUNTRY AMMO FOR REGISTRATION.
(4) FOLLOW UP, FIRING REMAINDER OF OTHER COUNTRY AMMO WITH "WILL ADJUST" MISSION.
(5) RANGE, AS MUTUALLY AGREED.
(6) COLLECT DATA AS ACCURATELY AS POSSIBLE.

PAGE 5 RUFDAAA5794 UNCLAS NATO UNCLAS FOR NATO ADDRESSEE
5. PARTICULAR CARE MUST BE OBSERVED TO EXCHANGE PROPERLY IDENTIFIED AMMO. AMMO SURVEILLANCE PERSONNEL IN THE SUPPORTING ORDNANCE BATTALIONS, SHOULD ASSIST AS NEEDED TO ASSURE PROPER IDENTITY. FOR FIRING AT GRAFENWOEHR, 101ST ORD BN HAS THESE PERSONNEL AVAILABLE.
6. DURING THE BRIEFING, REF E, THE CINCUSAREUR EMPHASIZED THE FOLLOWING OBJECTIVES:
A. INSURE THAT THE NATO AMMO IS TRULY INTERCHANGEABLE.
B. DETERMINE WHAT KIND OF CAVEATS ARE NEEDED TO INSURE REAL INTEROPERABILITY, I.E., APPROPRIATE FIRING TABLES TO BE USED; IS THERE OVERHEAD FIRING RESTRICTION CRITERIA, ETC.
C. MAKE THIS INFO AVAILABLE WITHIN NATO AND PARTICULARLY CENTAG.
7. USAREUR ACTION OFFICER IS MR FANT, AEAGD-MM, HBG MIL (2121) 6611.
BT
#5794

NNNN

NNNNRTTUZYUW RUEOEKA5042 3221855-UUUU--RUFDAAA RUEADWD RUKLDAR RULNAPG
RUCIAFA RUCIAFB.
ZNR UUUUU
R 1818157 NOV 77
FM CDRARRADCOM DOVER NJ//DRDAR-LCS//
TO RUFDAAA/CINCUSAREUR HEIDELBERG GER//AEAGD-MM/MR FANT//
INFO RUEADWD/HQDA WASHDC//DAMA-CSM/CH MUN DIV COL H.R. BAILEY//
RUKLDAR/CDRUSADARCOM ALEX VA//DRCDMD BRIAN DUNNETZ/DRCDE-DF R
HAPPICK/DRCRE COL HAUN//
RULNAPG/CDRUSATECOM ABERDEEN MD//DRSTE-FA ARTY COL TED GREGORY/
JIM BYRNE//
RULNAPG/CDRAMSSA ABERDEEN PG MD//J SPERAZZA/S GERRARD//
RUCIAFA/PM110E2 ROCK ISLAND IL//LTC HURST//
RUCIAFB/CDRUSAARRCOM ROCK ISLAND IL//DRSAR-AS ARM SYS OFC COL KELLY/
LOG ENG DIR L ARTIOLI/MULVIHILL//
RULNAPG/DIRBRL ABERDEEN PG MD//DRDAR-BLL DR MURPHY//
BT
UNCLAS
SUBJ: USAREUR AMMUNITION INTEROPERABILITY INITIATIVE
A. MSG, ARRADCOM (DRDAR-LC) 0813252 NOV 77 (SAB)
B. MSG, CINCUSAREUR AEAGD-MM 0416032 NOV 77 (SAB)
1. THIS HQ RECOGNIZES THE NEED FOR NATO STANDARDIZATION AND INTENDS TO FULLY SUPPORT YOUR INITIATIVE FOR AMMUNITION INTEROPERABILITY.

PAGE TWO RUEOEKA5042 UNCLAS
WE FURHTER CONCUR IN THE CONCEPT OF BILATERAL FIRINGS OF THE 8 INCH SYSTEM AS THE FIRST OF THE MAJOR CALIBER SYSTEM FIRINGS AND AS SOON AS POSSIBLE.
2. REF A RECOMMENDED THAT ALL PROPOSED FIRINGS NOT BE CONDUCTED UNTIL A SAFETY TEST PROGRAM WAS FORMULATED. IN ORDER TO GIVE MAXIMUM SUPPORT TO THE INITIATIVE, A TWO DAY WORKING MEETING OF THE TECHNICAL COMMUNITY WAS CONDUCTED AT ARRADCOM, THE PURPOSE OF WHICH WAS TO PREPARE A PLAN OF ACTION TO EXPEDITE US/FRG 8 INCH INTEROPERABILITY FIRINGS (REF B)
3. THE WORKING GROUP CONCLUDED THAT A SYSTEM SAFETY RELEASE IS POSSIBLE BY CONDUCTING A TECHNICAL REVIEW OF FRG DESIGNS AND DATA BY AN IN COUNTRY TEAM OF TECHNICAL EXPERTS. THE TEAM CONSISTING OF PERSONNEL FROM ARRADCOM/ARRCOM/TECOM WILL BE AUTHORIZED TO VERIFY THE SAFETY OF FIRING THE FRG AMMUNITION LISTED BELOW IN THE US M110 HOWITZER. IT IS ASSUMED THAT THE FRG WILL SATISFY ITSELF REGARDING THE USE OF US AMMUNITION. IF THE REVIEW IS UNFAVORABLE A SAFETY TEST PROGRAM OF NO MORE THAN 450 ROUNDS WILL BE REQUIRED TO (CONDUCTED IN GERMANY ON AN EXPEDITED BASIS) PROVIDE AN UNRESTRICTED SAFETY RELEASE. THE WORKING GROUP FURHTER CONCLUDED THAT IF FIRINGS MUST BE CONDUCTED IN THE IMMEDIATE FUTURE THEY

PAGE THREE RUEOEKA5042 UNCLAS
SHOULD BE CONDUCTED WITH TROPPS UNDER COVER. WE FULLY APPRECIATE THE IMPLICATION OF THIS RESTRICTION
4. ARRADCOM HAS TAKEN ACTION WITH THE FRG LIAISON OFFICER TO COMMENCE COLLECTING DATA FOR THE TECH REVIEW WHICH CAN BE ACCOMPLISHED WITHIN TWO WEEKS AFTER THE DATA IS PROVIDED. THIS REVIEW COULD BE CONDUCTED AT BWB, KOBLENZ. THEATER CLEARANCES AND OTHER NECESSARY AUTHORIZATIONS FOR APPROXIMATELY 7 PEOPLE ARE REQUESTED
5. OUR CURRENT EFFORTS ARE LIMITED TO THE M110 HOWITZER AND THE M1Ø6 FAMILY OF AMMUNITION. YOUR COMMAND WILL SHORTLY SEE THE INTRODUCTION OF THE NEW LONG TUBE M110A1E1, M188E1 PROPELLING CHARGE, AND THE M5Ø9 PROJECTILE. WE WILL TAKE INITIATIVE TO STRUCTURE A PROGRAM TO DEVELOP AN INTEROPERABILITY PROGRAM FOR THE NEW SYSTEM AND WILL COORDINATE WITH YOUR HQ
6. REQUEST YOUR HQ TAKE ACTION TO OBTAIN THE FOLLOWING DATA FROM FRG FOR REVIEW BY HE EVALUATION TEAM AT A CONVENIENT LOCATION IN FRG:
A. DRAWINGS & SPECIFICATIONS FOR:
(1) MATERIALS
(2) END ITEM COMPONENTS
(3) SUB-ASSEMBLIES

PAGE FOUR RUEOEKA5042 UNCLAS
(4) ASSEMBLY
B. ACCEPTANCE INSPECTION CRITERIA
C. DESIGN SAFETY OR OTHER FORMAL SAFETY TESTS, E.G., INITIAL PRODUCTION, ETC
D. MIL STD 331 FUZE TESTS
E. ONE REPRESENTATIVE SAMPLE OF LOT ACCEPTANCE TEST RESULTS AND ALL WAIVERS
F. ESTIMATED NUMBER OF ITEMS FIRED (IDENTIFY ZONES)
G. ACCIDENT AND INCIDENT RECORDS
H. APPROPRIATE TECHNICAL MANUALS
I. STOCKPILE SURVEILLANCE PROCEDURES AND RESULTS
J. ANY PROCESS DESCRIPTIONS AVAILABLE
K. FIRING TABLES
L. OTHER PERTINENT DATA
THE ABOVE INFORMATION IS REQUIRED FOR EACH OF THE FOLLOWING ITEMS:
FRG NOMENCLATURE

PROJECTILE, HE, DM11
CHARGE, PROPELLING, WHITE BAG, DM22
CHARGE, PROPELLING, GREEN BAG, DM12
REDUCER, FLASH PROPELLING, DM1

PAGE FIVE RUEOEKA5042 UNCLAS
PRIMER PERCUSSION, DM191
FUZE, PD, DM241
ANY OTHER FRG ITEM DESIGNATED FOR THIS SYSTEM AND INTENDED FOR INTERCHANGE
7. THIS MSG HAS BEEN CONCURRED IN BY USATECOM AND USAARRCOM. POINT OF CONTACT (POC) AT THIS HQ IS MR. JOSEPH SALAMON (DRDAR-LCS, 880-4849)

171 348 204332

TTU UW RUFDAAA3027 3482044-UUUU--RUEOEKA.
ZNR UUUUU
R 141103Z DEC 77
FM CINCUSAREUR HEIDELBERG GERMANY//AEAGD-MM//
TO RUEOEKA/CDRARRADCOM DOVER NJ//DRDAR-LC/DRDAR-SF//
INFO RUEADWD/DA WASHDC//DAMA-CSM-CA/DAIG-SD//
RUKLDAR/CDRDARCOM ALEX VA//DRCSF/DRCIRD/DRCRSI//
RUFFFRA/CDRV CORPS FRANKFURT GERMANY//AETFGC-T//
RUFLCWA/CDRVII CORPS MOEHRINGEN GERMANY//AETSGC-T//
RUFLFTA/CDRSEVENTH ARMY TNG COMD GRAFENWOEHR GERMANY
BT
UNCLAS
SUBJ: USAREUR AMMUNITION INTEROPERABILITY INITIATIVE
A. CDRARRADCOM, DRDAR-LCS, 181815Z NOV 77 (U)
1. REF REQUESTED USAREUR ESTABLISH A TECHNICAL DATA EXCHANGE MEETING WITH THE FRG ARMY AND PROVIDE THEATER CLEARANCE FOR ATTENDEES.
2. COORDINATION WITH THE FRG ARMY IS ONGOING FOR INTEROPERABILITY FIRING. UPON RECEIPT OF FRG ARMY APPROVAL, THIS HQ WILL MAKE THE NECESSARY ARRANGEMENTS FOR BILATERAL TECHNICAL DATA EXCHANGE MTGS. ESTIMATED TIMEFRAME FOR DATA EXCHANGE IS JAN 78.
3. WHEN THE TECHNICAL DATA EXCHANGE IS APPROVED, REQUEST ARRADCOM

PAGE 2 RUFDAAA3027 UNCLAS
CONSIDER EXAMINATION OF 155MM HOW, 175MM GUN AND 105MM TANK AMMUNITION DURING SAME MEETING.
4. APPROVAL FOR RELEASE OF US CLASSIFIED INFO TO FRG IS THE RESPONSIBILITY OF THE PARTIES PARTICIPATING IN THE DATA EXCHANGE.
5. RECENT CONTACT WITH THE GERMAN TERRITORIAL SOUTHERN COMMAND (GTSC) INDICATES THAT THE 8-INCH GERMAN ARTILLERY UNITS UTILIZE THE US M110 8-INCH HOWITZER WITHOUT MODIFICATION WITH GERMAN MFG AMMUNITION. CONSIDERING THIS INFO, IS THE TECHNICAL DATA REVIEW STILL REQUIRED FOR THE 8-INCH AMMO PRIOR TO SAFETY RELEASE?
6. USAREUR ACTION OFFICER IS MAJ GRIFFARD, AEAGD-MM, TELEPHONE AUTOVON 435-6249.
BT
#3027

NNNN

NNNNRTTUZYUW RUEOEKA0250 0091540-UUUU--RUFDAAA RUEADWD RUKLDAR RUCIAFB RULNAPG RUFHOL.
ZNR UUUUU
R 0914592 JAN 78
FM CDR ARRADCOM DOVER NJ //DRDAR-LCS//
TO RUFDAAA/CINCUSAREUR HEIDELBERG GERMANY //AEAGD-MM// MAJ GRIFFARD//
INFO RUEADWD/HQ DA WASH DC //DAMA-CSM//
RUKLDAR/CDR USA DARCOM ALEX VA //DRCDMD/BRIAN DONNETZ/DRCRE COL HAUN/ DRCIRD/DRCSF//
RUCIAFB/CDRUSARRADCOM ROCK ISLAND IL //DRCPM-110/DRSAR-AS/DRSAR-LE//
RULNAPG/CDRUSATECOM ABERDEEN PG MD //DRSTE-ST/J BYRNE//
RUFHOL/AMEMBASSY BONN GERMANY //LTC F MEHRTENS//
BT
UNCLAS
SUBJECT: USAREUR AMMUNITION INTEROPERABILITY INITIATIVE
A. CINCUSAREUR MSG 141103Z DEC 77 SAB
B. ARRADCOM MSG 011549Z DEC 77 SAB
C. DARCOM MSG 282000Z SEPT 77 SAB
D. CINCUSAREUR MSG 111323Z OCT 77 SAB
E. ARRADCOM MSG 181815Z NOV 77 SAB
1. REF A REQUESTED ARRADCOM CONSIDER EXAMINATION OF 155MM/HOWITZER, 175MM GUN AND 105MM TANK CANNON AMMUNITION IN ADDITION TO 8-INCH HOWITZER AMMUNITION AT THE BILATERAL TECHNICAL DATA EXCHANGE WITH

PAGE 2 RUEOEKA0250 UNCLAS
FRG. OUR 8-INCH TEAM PREVIOUSLY IDENTIFIED (REF B) CAN CONDUCT THE REQUIRED EXAMINATION OF 155MM HOWITZER AND 175MM GUN AMMUNITION DURING THE SAME MEETING. TEAM MEMBERSHIP WILL BE AUGMENTED BY THE ADDITION OF LTC E. M. ASANOVICH (OFFICE PM-CANNON ARTILLERY WEAPONS SYSTEM).
2. 105MM TANK CANNON AMMUNITION WILL REQUIRE A DIFFERENT TEAM OF EXPERTS THAN THE ARTILLERY TEAM. THE TANK TEAM MEMBERSHIP IS BEING IDENTIFIED. WHEN COMPLETE, ITS AVALABILITY FOR REVIEW WILL BE PROVIDED.

3. REF A PROVIDED INFORMATION THAT THE FRG 8-INCH ARTILLERY UNITS WOULD UTILIZE UNMODIFIED US M110 HOWITZERS WITH GERMAN-MANUFACTURED AMMUNITION. GIVEN THIS CIRCUMSTANCE, VERIFICATION OF THE NEED FOR AN 8-INCH REVIEW WAS REQUESTED. THE REVIEW IS STILL REQUIRED IN ORDER TO:

A. ESTABLISH THAT GERMAN AMMUNITION MANUFACTURED TO U.S. SPECIFICATIONS IS INDEED EQUIVALENT AS FAR AS SUCH ITEMS AS MANUFACTURING TECHNIQUES, INSPECTION TECHNIQUES, INSPECTION LEVELS, ETC.

B. DETERMINE WHETHER DATA EXISTS TO PROVIDE A SUFFICIENT LEVEL OF CONFIDENCE THAT SAFETY WILL BE MAINTAINED AT ALL ZONES TO BE

PAGE 3 RUEOEKA0250 UNCLAS

CONSIDERED.

4. ARRADCOM WILL CONTINUE PREPARING TO CONDUCT THE REVIEWS. IO IS ASSUMED THAT THE AMMUNITION WEAPON CONBINATIONS REMAIN AS STATED IN PERVIOUS MESSAGE TRAFFIC (REF C AND D). THESE ARE:

155MM

A. WEAPON - 155MM HOW US M109A1 AND FRG M109

B. AMMUNITION:

(1) PROJECTILE, HE, US, M107 AND FRG, DM21.

(2) PROPELLING CHARGES, US, M3 AND M4A1 AND FRG, DM62 AND DM42.

(3) FUZE, PD, US, M572, AND FRG, DM241.

(4) PRIMER, PRECUSSION, US, M82 AND FRG, M82 (US).

175MM

C. WEAPON - US 175MM M107 AND FRG M107G.

D. AMMUNITION:

(1) PROJECTILE, HE, US M437A2, FRG DM11.

(2) PROPELLING CHARGE, US M86 SERIES (CHARGE 1 OR 2), FRG DM12 OR DM22.

(3) FUZE, PD, US M572, FRG DM241.

(4) PRIMER, PERCUSSION, US M82, FRG M82 (US).

8-INCH

PAGE 4 RUEOEKA0250 UNCLAS

E. WEAPON - US 8-INCH (203MM) M110 AND FRG 203MM M110G.

F. AMMUNITION:

(1) PROJECTILE, HE, US M106, FRG M106 (US).

(2) PROPELLING CHARGES, GREEN BAG, US M1, FRG DM12, WHITE BAG, US M2, FRG DM22.

(3) FUZE, PD, US M572, FRG DM241

(4) PRIMER, PERCUSSION, US M82, FRG M82 (US).

5. IT IS REQUESTED THAT WEAPON/AMMUNITION COMBINATIONS FOR THE [illegible] TANK CANNON FIRINGS BE IDENTIFIED SO THAT TANK TEAM MEMBER-SHIP/PLANS CAN BE FINALIZED. DATA ON THE 155MM HOWITZER, 175MM GUN, AND 120MM TANK CANNON SIMILAR TO THAT REQUESTED FOR THE 8-INCH SYSTEM IN PARAGRAPH 4 C OF REFERENCE E IS REQUIRED.

6. IT IS FURTHER REQUESTED THAT AS MUCH ADVANCE NOTICE OF BILATERAL TECHNICAL DATA EXCHANGE MEETING DATES TO BE PROVIDED AS POSSIBLE.

&

APPENDIX B

STARS AND STRIPES ARTICLE

German howitzers fire American ammunition down range. The guns are from the 12lst Field Arty Bn, 12th Regt, III (German) Korps.

G-A gunners' ammo swap pans out

G-A GUNNERS' AMMO SWAP PANS OUT

Story and photo by JOHN SAVARD
Nürnberg bureau chief

GRAFENWÖHR, Germany (S&S) - When German and American gun crews swapped ammunition to fire their eight inch howitzers here, nobody was absolutely certain what would happen. It had never been done before.

In theory, it was possible to use German eight inch rounds in American howitzers and vice versa. But the theory had never been proven.

After a couple of short speeches by German and American commanders to mark the occasion, Btry C, 3rd Bn, 35th Arty of the American VII Corps and Btry 4, 121st Field Arty Bn, 12th Regt III (German) Korps started working.

First, both batteries spotted and hit down-range targets using their normal ammunition. After hitting their targets, they changed ammunition. The Germans fired American projectiles and the Americans fired German projectiles.

The German gunners quickly scored direct hits on their target. Then they fired their entire battery of four guns and the salvo of 200-pound US projectiles landed on target within 60 meters of each other.

On the other side of the hill, American crews quickly noticed there was less smoke from the German ammunition.

But there was a problem with primers - tiny explosive caps used to set off the explosion which fires the round. Two primers refused to fire.

American artillery officers at the scene said the primers probably were produced at the same time by the same company. They said all primers in that batch would be tested.

After finding primers that worked, American gun crews also started hitting down-range targets. Now everyone knew both types of ammunition worked in German and American howitzers.

Commanders said they were glad to know they could swap ammunition if necessary during combat. But they added that the real benefit was to the artillerymen from both countries who can count on each other and each other's equipment.

APPENDIX C

SIGNED AGREEMENTS BETWEEN COUNTRIES

- US fuze M572 and GE fuze DM241 have both undergone extensive testing. While design differences do exist, both fuzes incorporate dual safeties and have been successfully tested in accordance with US Test and Evaluation Command safety test procedures and criteria. GE has field fired approximately 50,000 DM241 fuzes on 8 Inch, 175mm and 155mm projectiles without a single safety related incident.

- US primer M82 and GE primer DM191A1 are of different designs. Both have undergone extensive firing. GE has field fired approximately 180,000 primers in the 155mm, 175mm and 8 Inch/203mm systems with no safety related incidents.

CONCLUSIONS

It is concluded that current GE and US field stocks of 8 Inch/203mm high explosive rounds are interoperable and safe to fire from howitzers M110, M110A, and GE M110 with the following exception:

> GE will use only the DM191A1 primer; the US will use only the M82 primer.

It is recommended that a configuration advisory procedure for exchange of any technical data package revisions and related information should be established to assure continued interoperability.

For GE
Interoperability Team:. . . . . V. Cook 2/10 78 (Dr. Koch, BVB WM VI 4)

For US
Interoperability Team:. . . . Victor Lindner Oct 24 1978

BILATERAL AGREEMENT

ON

INTEROPERABILITY OF FRG & US

8" AMMO/WEAPON SYSTEMS

INTRODUCTION

The FRG and US Artillery Interchangeability Teams have completed a review of the 8 Inch/203mm HE ammunition/weapon system interoperability. Interoperability was evaluated on a complete round (projectile, prop charge, fuze, primer) basis. System components evaluated are as follows:

	US	FRG
Projectile	M 106	DM 21
Prop Charge	M1, M2	DM 12, DM 22
Fuze	M 572	DM 241
Primer	M 82	DM 191A1
Weapon	M 110, M 110A1	M 110G

The team evaluations are based on review of the following data

- Safety related firings of system components
- Technical data packages including lot by lot FRG historical data
- Acceptance testing

FINDINGS

- US projectile M106 and FRG projectile DM21 are fabricated to identical technical data packages. High explosive (TNT) loading is done under equivalent requirements and specifications. Approximately 75,000 DM21 projectiles have been field fired with no projectile safety related incidents.

- US charges (M1 and M2) and FRG charges (DM12 and DM22) are fabricated to equivalent technical data packages. Approximately 75,000 FRG charges have been fired without safety related incidents.

- US fuze M572 and FRG fuze DM241 have both undergone extensive testing. While design differences do exist, both fuzed incorporate dual safeties and have been successfully tested in accordance with US Test and Evaluation Command safety test procedures and criteria. FRG has field fired approximately 50,000 DM 241 fuzes on 8 Inch, 175mm and 155mm projectiles without a single safety related incident.

- US primer M82 and FRG primer DM191A1 are of different designs. Both have undergone extensive firing. FRG has field fired approximately 180,000 primers in the 155mm, 175mm and 8 Inch/ 203mm systems with no safety related incidents.

CONCLUSIONS

Based on the foregoing analysis it is concluded that current FRG and US field stocks of 8inch high explosive rounds are interoperable and safe to fire from Howitzers M110, M110A1 and M110G.

It is further concluded that a configuration advisory procedure for exchange of any technical data package revisions and related information should be established to assure continued interoperability.

For FRG
interoperability team: 23/3 78

For US
interoperability team: 3/23/75

BILATERAL AGREEMENT

ON

INTEROPERABILITY OF GE & US

175mm AMMO/WEAPON SYSTEMS

INTRODUCTION

GE and US Artillery Interoperability Teams have completed a review of the 175 mm ammunition/weapon system interoperability. Interoperability was evaluated on a complete round (projectile, prop charge, fuze, primer) basis. System components evaluated are as follows:

	US	GE
Projectile	M437A1, M437A2	DM11
Prop Charge	M86A2	DM22, DM32
Fuze	M572	DM241
Primer	M82	DM191A1
Weapon	M107	M107 (G)

The team evaluations are based on review of the following data:

- Safety related firings of system components
- Technical data packages. INCLUDING MANUFACTURING DATA
- Acceptance testing data
- Field performance history

FINDINGS

1. US and GE weapons M107 and M107(G) are essentially identical.

2. US Projectile M437A2 and GE Projectile DM11 were fabricated to identical technical data packages. High explosive Comp B loading is done in the FRG and US under equivalent requirements and specifications.

3. The US Fuze M572 and GE Fuze DM 241 have both undergone extensive testing. While design differences do exist both fuzes have been successfully tested in accordance with US Test and Evaluation Command safety test procedures and criteria. GE has field fired approximately 5o,ooo DM 241 Fuzes on 8 Inch, 175mm and 155mm Projectiles without a single safety related incident. Of these most were fired in 175 mm. The US has fired over 2,ooo,ooo M572 fuzed projectiles in the 175mm Weapon with no fuze related critical malfunctions.

4. US Primer M82 and GE Primer DM191A1 are of different designs. Both have undergone extensive firing. GE has field fired approximately 18o,ooo primers in the 155mm, 175mm and 8 Inch/ 2o3mm systems with no safety related incidents. Some misfires have occurred in use of the DM191A1 primer in US M11oA1 8 Inch SP Howitzer during firings.

5. US Charge M86A2 and GE charges DM22 and DM32 are fabricated to equivalent technical data packages. The US has not had any critical failures attributable to the M86 series propelling charge and only one critical failure for all other causes in 960,000 firings at zones 1 and 2. GE has not had any critical failures attributable to the DM22 and DM32 propelling charges in 20,000 firings at zones 1 and 2. The number of GE high explosive firings is extremely limited (177). Since the FRG Technical Data Package is essentially identical to the US Technical Data Package, it was agreed that the performance of the GE high explosive DM11 projectile would be equivalent to that of the US M437A2.

CONCLUSIONS

1. Based on the foregoing findings, it is concluded that the FRG and US field stocks of 175mm high explosive complete rounds are interoperable and safe to fire from Howitzer M107 and M107(G) with the following operational provisions:

a. Firings will be DM-22, and zones 1 and 2 of M86A2 and DM-32 .

b. GE will use only the DM191A1 Primer; the US will use only the M82 Primer.

2. It is recommended that a configuration advisory procedure for exchange of any technical data package revisions and related information should be established to assure continued interoperability.

For GE
Interoperability Team _____ 17 May 78

For US
Interoperability Team _____
17 May 1978

BILATERAL AGREEMENT

ON

INTEROPERABILITY OF GE & US

155 mm AMMO/WEAPON SYSTEMS

INTRODUCTION

The US and FRG Artillery Interoperability Teams have completed a review of the 155mm HE ammunition/weapon system interoperability. Interoperability was evaluated on a complete round (projectile, propelling charge, fuze, primer) basis. System components evaluated are as follows:

	US	GE
Projectile	M107	DM21
Propelling charge	M3A1, M4A2	DM42B1, DM62
Fuze	M557	DM241, DM211
Primer	M82	DM191A1
Weapon	M109,M109A1 M109A2, M109A3	M109G

The team evaluations are based on review of the following data:*

- Safety related firings of system components
- Technical data packages including lot by lot GE historical data
- Acceptance testing
- Field performance history

* It was agreed that formal data would be provided by the FRG to the US by the end of June 1978. The US will supply data on Composition B firings to the FRG in the same time frame.

FINDINGS

1. US projectile M107 and GE projectile DM21 are fabricated to essentially identical technical data packages. High explosive loading is done under equivalent requirements and specifications. Approximately 292,000 DM21 TNT loaded projectiles have been field fired with no projectile safety related incidents. The US has fired approximately 22 million TNT loaded projectiles with a critical failure rate of approximately one in two million; and has fired approximately two million Composition B loaded projectiles with one critical failure.

2. The US M4A2 charge and the FRG DM42B1 charge are fabricated to equivalent technical data packages. The US M3A1 charge and GE DM62 are of different design but are considered to be equivalent as to safety and performance. Approximately 129,000 DM42B1 charges and 370,000 DM 62 charges have been fired without safety related incidents.

3. US fuze M557 and Fuze DM241 have undergone extensive testing. While design differences do exist, both have been successfully tested in accordance with US Test and Evaluation Command safety test procedures and criteria. GE has field fired approximately 50,000 DM241 fuzes on 8-inch, 175mm and 155mm projectiles without a single safety related incident. The US has fired over 15 million M557 fuzes projectiles in the 155mm weapon with no fuze related critical malfunctions. The FRG also uses the DM211 fuze as a standard component. Technical data and field performance history of this fuze will be provided to determine its interoperability.

4. US Primer M82 and GE Primer DM191A1 are of different designs. Design differences between US M82 and GE DM191A1 primers and the US and GE primer, breech, propelling charge interfaces preclude interoperability of the primers. The FRG considers that the M82 primer may have excessive residue on the breech to prevent operation. The US has experienced some misfires using the DM191A1 primer in the M110A1 weapon.

CONCLUSIONS

1. Based on the foregoing analysis, it is concluded that current GE and US field stocks of 155mm high explosive complete rounds are interoperable and safe to fire from Howitzer M109, M109A1, M109A2, M109A3 and M109G with the provisions that GE will use only the DM191A1 primer and the US will use only the M82 primer; and the DM211 fuze will be used by the US upon the provision of acceptable test and field history data.

2. It is further concluded that the configuration advisory procedure for exchange of any technical data package revisions and related information should be established to assure continued interoperability.

For GE
Interoperability Team _____ 14.5.78

For US
Interoperability Team _____
May 14, 1978

BILATERAL AGREEMENT ON INTEROPERABILITY OF GE AND US 105 MM TANK AMMUNITION/WEAPON SYSTEM

Introduction

The FRG and US interoperability teams have completed a review of the 105 mm tank ammunition/weapon system. Interoperability was evaluated for the following:

US	FRG
Cartridge 105 mm APDS-T, M 392 A2 and L36 A1	Patrone 105 mm x 617 DM 13 B1
Cartridge 105 mm HEAT-T, M 456 A1	Cartridge 105 mm HEAT-T M 456 A1
Tube, 105 mm M 68	Tube, 105 mm L7 A1

The team evaluations are based on review of the following data:

- Technical Data Packages
- Safety related field incidences
- Tube wear criteria

Findings

1. The US and FRG cartridges 105 mm HEAT-T, M 456 A1 are fabricated to equivalent technical data packages.
   For the purpose of this agreement the M 456 A1 refers to the one-piece body design only. A review of field usage shows that approximately 88,000 M 456 A1 rounds, made under license production, have been fired by the FRG with no safety related incidents.

2. The US Cartridge 105 mm APDS-T, M 392 A2 and FRG Patrone 105 mm x 617 DM 13 B1 are fabricated to equivalent technical data packages with the exception of the primer.

3. The igniter assembled in the primer utilized in the FRG APDS is a UK design. A clip is attached to the cartridge case base to protect the primer. The UK primer is used in 105 mm tank ammunition used by the UK, FRG, other NATO nations and Israel.

The igniter design has been considered in the US to be capable of accidental initiation as compared to the US designed igniter. In view of this, a detailed review was made by the team of the field history of firing rounds with the UK primer. It was determined that approximately 790,000 rounds have been fired by the FRG without a safety related incident. In addition, approximately 500,000 rounds have been fired by the UK without a safety related incident.

Based on the above field usage experience with the UK primer, without a safety related incident, it is concluded that Patrone 105 mm x 617 DM 13 B1 with this type of primer is safe to fire when observing the appropriate handling procedures.

4. The US tube wear condemnation criterion is established at 0.056 inches (1,42 mm) of wear measured at 25.25 inches (641 mm) from the rear face of tube. This limits the severity of unusual wear patterns which occur due to the firing of HEAT-T type rounds. The wear pattern is characterized by second wear maxima (secondary wear) occurring 1 to 25 inches (25 to 635 mm) from the origin of rifling and can exceed the wear at the origin of rifling. Erratic projectile flight can be anticipated with US APDS ammunition in gun tubes exhibiting high secondary wear. Current FRG tube wear condemnation criteria is established at 0.1 inches (2,54 mm) of wear at any of the following points measured from the rear face of tube:
25.94 inches (658,9 mm), 28 inches (711,2 mm), 30 inches (762,0 mm) 32 inches (812,8 mm).
The tube condemnation criteria for both nations is undergoing technical review.
To maintain effectiveness when firing US APDS ammunition, gun tubes should be limited to wear profiles below that known to adversely affect projectile flight.

Conclusions

Based on the foregoing analysis it is concluded that current FRG and US field stocks of 105 mm Tank Ammunition listed in this agreement are interoperable and safe to fire from M 68 and L7 A1 tubes.

It is further concluded that a configuration advisory procedure for exchange of any Technical Data Package revisions and related information should be established to assure continued interoperability.

For FRG
interoperability team .....

For US
interoperability team .....

BILATERAL AGREEMENT
ON
INTEROPERABILITY OF UK & US
8" AMMO/WEAPON SYSTEMS

INTRODUCTION

The UK and US Artillery Interchangeability Teams have completed a review of the 8 inch/203mm ammunition/weapon system interoperability. Interoperability was evaluated on a complete round (projectile, prop charge, fuze, primer) basis. System components evaluated are as follows:

	US	UK
Projectile	M106	M106
Prop Charge	M1, M2	M1, M2
Fuze	M572*, M557	M557, M520 L85A2 L112A1
Primer	M82	MK2A4
Weapon	M110, M110A1	M110 (UK)**

The team evaluations are based on review of the following data

- Safety related firings of system components
- Technical data packages

* M572 to be interoperable after completion of UK review and approval of TDP and performance data.

**M2 and M2A1 CANNONS fitted on M110 chassis.

FINDINGS

- US projectiles M106 and UK projectile M106 are of US manufacture.
- US charges (M1 and M2) and UK charges (M1 and M2) are of US manufacture.
- US fuze M572 will be reviewed by the UK to determine its acceptability for interoperable use by UK Forces. The M557 and M520 Fuzes are both of US manufacture.

- UK fuzes L85A2 and L112A1 are design modifications of the US M557 and M572 respectively and have been determined to be interoperable in US weapon

- UK primer MK2A4 is of US manufacture; US and UK firing locks in their respective weapons are of different design. This factor precludes interoperability of primers between the US and UK forces.

CONCLUSIONS

Based on the foregoing analysis, it is concluded the current UK and US field stocks of 8 inch high explosive rounds are interoperable and safe to fire from Howitzers M110, M110A1 and M110 (UK) with the exception that the UK will use the MK2A4 primer and the US will use the M82 primer. In addition, upon satisfactory review and analysis of fuze M572 (by the UK) this fuze will be added to the M557 and M520 as interoperable between the services.

It is further concluded that a configuration advisory procedure for exchange of any technical data package revisions and related information should be established to assure continued interoperability. Reporting procedures will also be established for providing field incident and equipment failure information.

FOR UK
Interoperability Team .....
J.P. FERRY Brigadier DHWP
21 July 78

FOR US
Interoperability Team .....
V LINDNER
24 July 78

BILATERIAL AGREEMENT

ON

INTEROPERABILITY OF UK & US

175 mm AMMO/WEAPON SYSTEMS

INTRODUCTION

UK and US Artillery Interoperability Teams have completed a review of the 175 mm ammunition/weapon system interoperability. Interoperability was evaluated on a complete round (projectile, prop charge, fuze, primer) basis. System components evaluated are as follows:

	US	UK
Projectile	M437A1, M437A2	M437A2 (DB MOD) *
Prop Charge	M86A2	M86A2
Fuze	M572	M572
Primer	M82	M82
Weapon	M107	M107 (UK) **

The team evaluations are based on review of the characteristics of the ammo/weapon systems.

*Rotating band modified for double ramming application and the shell are marked accordingly.

** Double rammer installed.

1. US and UK weapons M107 are identical except that the UK has installed a two stage ramming system for seating the projectile. The US uses a single stage ramming system and employs a " T " bar gage supplied with each weapon to assure proper seating.

2. The US and UK Projectiles M437A2 were both fabricated in the US against the applicable US Technical Data Package. The UK has modified its projectiles by removing a portion of the lip of the obturating band to assure projectile seating when employed with the two stage ramming system. The US Projectiles are not modified.

3. The US Primer M82 has been fabricated in the US and is used by both the US and the UK.

4. The US Propelling Charge M86A2 has been manufactured in the US and is used by both the US and UK.

5. The US Fuze M572 has been made in the US and is used by both the US and the UK.

CONCLUSIONS

1. The US and the UK agree that differences in the ramming systems of their respective weapons and the obturating bands of their projectiles preclude ammunition interchangeability for training purposes.

2. A configuration advisory procedure will be established for exchange of technical data package revisions. Reporting procedures will also be established for providing field incident and equipment failure information.

21 July 1978

For UK

Interoperability Team J. P. Ferry
Brigadier DHWP

26 July 1978

For US

Interoperability Team V. Lindner

BILATERAL AGREEMENT

ON

INTEROPERABILITY OF UK & US

155mm AMMO/WEAPON SYSTEMS

INTRODUCTION

The US and UK Artillery Interoperability Teams have completed a review of the 155mm HE ammunition/weapon system interoperability. Interoperability was evaluated on a complete round (projectile, propelling charge, fuze, primer) basis. System components evaluated are as follows:

	US	UK
Projectile	M107	M107*
Propelling charge	M3A1, M4A2	M3A1, M4A2
Fuze	M557	L85A2,M557
Primer	M82	M82
Weapon	M109, M109A1 M109A2, M109A3	M109 (UK)**

The team evaluations are based on review of the following data:

- Safety related firings of system components
- Technical data packages
- Field performance history

*UK firings to be limited to TNT filled shell until review by UK staff of Comp B data supplied by US.

**UK version of the M109 has a modified forcing cone. UK forcing cone angle is now 1 in 10; the US uses a 1 in 5 design.

FINDINGS

1. US projectile M107 and UK projectile M107 are identical and of US manufacture. The US has fired approximately 22 million TNT loaded projectiles with a critical failure rate of approximately one in two million; and has fired approximately two million Composition B loaded projectiles with one critical failure. The UK will fire only TNT loaded projectiles until such time as they can evaluate the above performance data and release Comp B for interoperability firings.

2. The US and UK M4A2 and M3A1 charges are identical and are of US manufacture or UK manufacture to the US data package.

3. The UK L85A2 fuze has been determined to be interoperable in US Weapons. The US 557 fuze has been determined to be interoperable in UK weapons subject to certain national restrictions in the M109A1(UK).

4. US Primer M82 and UK Primer M82 are identical and of US manufacture.

CONCLUSIONS

1. Based on the foregoing analysis, it is concluded that current UK and US field stocks of 155mm high explosive complete rounds are interoperable and safe to fire from Howitzer M109, M109A1, M109A2, M109A3 and M109A1 (UK) with the provisions that the UK will, in the interim, use only TNT loaded projectiles and L85A2 fuzes subject to National Safety Approval of Comp B loading. The UK will only fire the M557 fuze subject to national safety restrictions.

2. A configuration advisory procedure will be established for exchange of technical data package revisions to assure continued interoperability. Reporting procedures will also be established for reporting field incident and equipment failure information.

21 July 1978

For UK

Interoperability Team J.P Ferry
Brigadier

26 July 1978

For US

Interoperability Team V Lindner

BILATERAL AGREEMENT
ON
INTEROPERABILITY OF UK AND US
81MM MORTAR AMMO/WEAPON SYSTEMS

INTRODUCTION

The US and UK Technical Teams have completed a review of the 81mm HE Ammunition/Weapon System Interoperability. Interoperability was evaluated on a complete round (projectile, propelling charge, fuze) basis. System Components evaluated are as follows:

	UK	US
Projectile	L15A4	M374A2, M374A3
Propelling Charge	MKII	M90A1, M205
Fuze	L35A1	M567, M524A6
Weapon	L16A1, L16A2	M29 M29A1

The Team evaluations are based on:

Safety related firings of system components

Field performance history

Component induced stresses

FINDINGS

The US ammunition (M374A2 and M374A3) can be fired at a rate of 12 rounds per minute in L16A1 and 15 rounds per minute in the L16A2 Mortar. US firing tables must be used.

The UK ammunition (L15A4 fuzed with L35A1 Fuze) can be fired in the M29 and M29A1 Mortar with the following restriction: The maximum charge used shall be five (5) increments. UK firing tables must be used. The rates of fire are the same as currently specified for the M374A2 in the M29/M29A1 Tube.

CONCLUSIONS

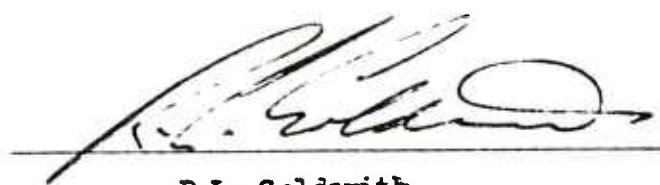
Based on the foregoing findings, it is concluded the UK and US field stocks of 81mm High Explosives complete rounds are interoperable and safe to fire in ground emplaced configurations with the following provisions:

The US troops must remove the sixth increment of the MKII Charge before firing in the US M29A1 Mortar.

The UK troops can fire the M374A2 and M374A3 at a rate limited to 12 rounds per minute in the L16A1 and 15 rounds per minute in the L16A2.

When firing the L15A4, US troops will use the UK firing tables; when firing the M374 Series rounds, the UK troops will use the US firing tables.

FOR UK

Interoperability Team 

R.L. Goldsmith

FOR US

Interoperability Team 

Victor Lindner

BILATERAL AGREEMENT
ON
INTEROPERABILITY OF UK AND US
81MM MORTAR AMMO/WEAPON SYSTEMS

INTRODUCTION

The US and UK Technical Teams have completed a review of the 81mm HE Ammunition/Weapon System Interoperability. Interoperability was evaluated on a complete round (projectile, propelling charge, fuze) basis. System Components evaluated are as follows:

	UK	US
Projectile	L15A4	M374A2, M374A3
Propelling Charge	MKII	M205
Fuze	L35A1	M716, M567, M524A6
Weapon	L16A1, L16A2	M29A1

The Team evaluations are based on:

Safety related firings of system components

Field performance history

Component induced stresses

FINDINGS

The US ammunition (M374A3) can be fired at a rate of 12 rounds per minute in L16A1 and 15 rounds per minute in the L16A2 Mortar. US firing tables must be used.

The UK ammunition (L15A4 fuzed with L35A1 Fuze) can be fired in the M29 Series Mortar with the following restriction: The maximum charge used shall be five (5) increments. UK firing tables must be used.

CONCLUSIONS

Based on the foregoing findings, it is concluded the UK and US field stocks of 81mm High Explosives complete rounds are interoperable and safe to fire in ground emplaced configurations with the following provisions:

The US troops must remove the sixth increment of the MKII Charge before firing in the US M29A1 Mortar.

The UK troops can fire the M374A3 at a rate limited to 12 rounds per minute in the L16A1 and 15 rounds per minute in the L16A2.

When firing the L15A4, US troops will use the UK firing tables; when firing the M374 Series rounds, the UK troops will use the US firing tables.

FOR UK

Interoperability Team _____

(R L GOLDSMITH)
DLWP
4-8-78

FOR US

Interoperability Team _____

Victor Lindner
July 31, 1978

BILATERAL AGREEMENT

ON

INTEROPERABILITY OF CA AND US

155MM HE AMMUNITION/WEAPON SYSTEMS

INTRODUCTION

1. The CA and US Interoperability Teams have completed a review of the 155mm HE ammunition/weapon system interoperability. Interoperability was evaluated on a complete round (projectile, propelling charge, fuze, primer) basis. System components evaluated are as follows:

	US	CA
Projectile	M107	M107
Propelling Charge	M3A1, M4A2	M3*, M3A1, M4A1*, M4A2
Fuze	M557, M564, M514A1	M557, M564, M514A1
Primer	M82	M82
Weapon	M109, M109A1, M109A2, M109A3	M109A1

* These charges do not have flash reducers.

2. The team evaluations are based on review of the following data:

a. safety related firings of system components;

b. technical data packages; and

c. field performance history.

FINDINGS

3. US projectile M107 and CA projectile M107 are fabricated to essentially equivalent technical data packages.

4. The M4A2 and M3A1 charges used by both countries are identical and are of US manufacture. The M3 and M4A1 used by CA are of CA manufacture to technical data packages essentially equivalent to US technical data packages.

5. The M557, M564, and M514A1 fuzes were each made to essentially equivalent technical data packages and have been determined to be interoperable in CA and US weapons.

6. The US primer M82 and CA primer M82 are fabricated to essentially equivalent technical data packages.

CONCLUSIONS

7. Based on the foregoing analysis, it is concluded that current CA and US field stocks of 155mm high explosive complete rounds, as identified herein, are interoperable and safe to fire from Howitzers M109, M109A1, M109A2, and M109A3.

8. A configuration advisory procedure will be established for exchange of technical data package revisions to assure continued interoperability. Reporting procedures will also be established for reporting field incident and ammunition/ weapon failure information.

5 October, 1978

For CA H.J. Stein

Interoperability Team Col H.J. Stein

For US Victor Lindner

Interoperability Team Victor Lindner

BILATERAL AGREEMENT

ON

INTEROPERABILITY OF CA AND US

105MM APDS-T TANK AMMUNITION/WEAPON SYSTEM

INTRODUCTION

1. The CA and US Interoperability Teams have completed a review of the 105mm APDS-T tank ammunition/weapon system. Interoperability was evaluated for the following:

	US	CA
Cartridge	M392A2 L36A1	L28A1 C35A1
Tube	M68	L7A1

2. The Team evaluations are based on review of the following data:

a. technical data packages;

b. safety related field incidences;

c. tube wear criteria; and

d. field performance history

FINDINGS

3. The US cartridges, M392A2 and L36A1 and CA cartridge C35A1 are fabricated to essentially equivalent technical data packages. The L28A1 is also fabricated to the same equivalent technical data package except that the primer is a conductive mix type (L1A4).

4. The primer utilized in the CA L28A1 cartridge is a UK design. A clip is attached to the cartridge case base to protect the primer. The UK primer is used in the 105mm tank ammunition used by the UK, GE, other NATO nations and Israel. The igniter design has been considered in the US to be capable of accidental initiation as compared to the

US designed igniter. In view of this, a detailed review was made by the team of the field history of firing rounds with the UK primer. It was determined that approximately 790,000 rounds have been fired by GE without a safety related incident. In addition, approximately 500,000 rounds have been fired by the UK, and 50,000 by CA, without a safety related incident. Based on the above field usage experience with the UK primer, without a safety related incident, it is concluded that cartridge L28A1 with this type of primer is safe to fire when observing the appropriate handling procedurews.

5. The tube condemnation criteria for the US and CA were reviewed. No changes were required because CA does not use HEAT projectiles which cause secondary wear in the tube.

CONCLUSIONS

6. Based on the foregoing analysis, it is concluded that current CA and US field stocks of 105mm APDS-T tank ammunition listed in this agreement are interoperable and safe to fire from M68 and L7A1 tubes.

7. A configuration advisory procedure will be established for exchange of technical data package revisions to assure continued interoperability. Reporting procedures will also be established for reporting field incident and ammunition/ weapon failure information.

5 October, 1978

For CA H J Stein
Interoperability Team Col H.J. Stein

For US Victor Lindner
Interoperability Team Victor Lindner

Revision 1
Nov 78

NOV 21 1978

BILATERAL AGREEMENT ON INTEROPERABILITY OF CA AND US 81MM MORTAR AMMO/WEAPON SYSTEMS

INTRODUCTION

1. The CA and US Interoperability Teams have completed a review of the 81mm HE mortar ammunition/weapon system interoperability. Interoperability was evaluated on a complete round (projectile, fuze, propelling charge) basis. System components evaluated are as follows:

	US	CA
Projectile/Fuze	M374A2/M524A6, M374A3/M567	M374A2/M524A6, L15A4/L35A1
Propelling Charge	M90A1 (with/ M374A2), M205 (with/M374A3)	M90A1 (with/M374A2). Primary Cartridge L33A1. Augmenting cartridges consisting of L32A1 (three equal 180 grain increments) L34A2 (three equal 285 grain increments) (See Note 1)
Weapon	M29, M29A1	L16A1

2. The Team evaluations are based on:

   a. Safety related firings of system components;

   b. Field performance history;

   c. Component induced stresses; and

   d. Technical data packages.

FINDINGS

3. The US ammunition (M374A2 and M374A3) can be fired at a sustained rate of 12 rounds per minute in the L16A1 and 15 rounds per minute in the L16A2 Mortar. US firing tables must be used. In case of misfires CA

NOTE 1: The CA L34A2 propelling charge is identical [illegible] M Charge

troops must use CA misfire drills.

4. The CA ammunition (L15A4 fuzed with L35A1 Fuze) can be fired in the M29 and M29A1 Mortar with the following restrictions:

a. The maximum charge used shall be five (5) increments consisting of the three (3) L32A1 increments and two (2) L34A2 increments.

b. CA firing tables must be used.

The sustained rates of fire are the same as currently specified for the M374A2 in the M29/M29A1 Tube, i.e. 4 rounds per minute in the M29 and 8 rounds per minute in the M29A1.

CONCLUSIONS

5. Based on the foregoing Findings, it is concluded that CA and US field stocks of 81mm High Explosive complete rounds, as identified herein, are interoperable and safe to fire in ground emplaced configurations with the following provisions:

a. One increment of the L34A2 Cartridge must be removed when firing the maximum permissible charge in the US M29 and M29A1 Mortars.

b. For CA/US Interoperability firings, the maximum rate of fire shall be at the herein specified sustained rates of fire. In case of misfires, CA troops will use CA misfire drills and US troops will use US misfire drills.

c. When firing the L15A4, CA firing tables will be used; when firing the M374 series rounds, US firing tables will be used.

6. A configuration advisory procedure will be established for exchange of technical data package revisions to assure continued interoperability.

Reporting procedures will also be established for reporting field incident and ammunition/weapon failure information.

For CA

Interoperability Team _____

For US

Interoperability Team _____

Victor Lindner,

BILATERAL AGREEMENT

ON

INTEROPERABILITY OF CA AND US

81MM HE MORTAR AMMUNITION/WEAPON SYSTEMS

INTRODUCTION

1. The CA and US Interoperability Teams have completed a review of the 81mm HE mortar ammunition/weapon system interoperability. Interoperability was evaluated on a complete round (prejectile, fuze, propelling charge) basis. System compenents evaluated are as follows:

	US	CA
Projectile/Fuze	M374A2/M524A6, M374A3/M567	M374A2/M524A6, L15A4/L35A1
Propelling Charge	M90A1 (with/ M374A2), M205 (with/M374A3)	M90A1 (with/M374A2). Primary cartridge L33A1. Augmenting cartridges consisting of L32A1 (three equal 180 grain increments) L34A2 (three equal 285 grain increments) (see note 1)
Weapon	M29, M29A1	L16A1

2. The Team evaluations are based on:

a. safety related firings of system components;

b. field performance history;

c. component induced stresses; and

d. technical data packages.

FINDINGS

3. The US ammunition (M374A2 and M374A3) can be fired at a rate of 12 rounds per minute in the L16A1 mortar. US firing tables must be used. In case of misfires CA misfire drills must be used.

NOTE: 1. The CA propelling charge is identical to the UK MK II charge.

4. The CA ammunition (L15A4) can be fired in the M29 and M29A1 mortars with the following restrictions:

a. The maximum charge used shall be five (5) increments consisting of the three (3) L32A1 increments and two (2) L34A2 increments.

b. CA firing tables must be used.

The rates of fire are the same as currently specified for the M374A2 in the M29/M29A1 tube.

CONCLUSIONS

5. Based on the foregoing findings, it is concluded that CA and US field stocks of 81mm High Explosive complete rounds, as identified herein, are interoperable and safe to fire in ground emplaced configurations with the following provisions:

a. One increment of the L34A2 cartridge must be removed when firing the maximum permissible charge in the US M29 and M29A1 mortars.

b. The CA troops can fire the M374A2 and M374A3 at a rate limited to 12 rounds per minute in the L16A1. In case of misfires, CA misfire drills must be used.

c. When firing the L15A4, CA firing tables will be used; when firing the M374 series rounds, US firing tables will be used.

6. A configuration advisory procedure will be established for exchange of technical data package revisions to assure

continued interoperability. Reporting procedures will also be established for reporting field incident and ammunition/ weapon failure information.

5 October, 1978

For CA H.J. Stein

Interoperability Team Col H.J. Stein

For US Victor Lindner

Interoperability Team Victor Lindner

ON

INTEROPERABILITY OF NETHERLANDS AND UNITED STATES

8" AMMO/WEAPON SYSTEMS

INTRODUCTION

1. The NL and US Ammunition Interoperability Teams have completed a review of the 8-inch/203mm ammunition/weapon system interoperability. Interoperability was evaluated on a complete round (projectile, prop charge, fuze, primer) basis. System components evaluated are as follows:

	US	NL
Projectile	M106	M106, M106C1
Prop Charge	M1, M2	M1, M1C1, M2, M2C1
Fuze	M557	M557, M557C1
Primer	M82	MK2C1, M82C1, M82, MK2A4
Weapon	M110, M110A1	M110

The team evaluations are based on review of the following data:

- Safety related firings of system components
- Technical data packages
- Acceptance testing
- Field performance history.

FINDINGS

2. The NL uses the US projectile M106 and the NL-manufactured M106C1 projectile which is fabricated to essentially the same technical data package as the US M106. High explosive (TNT) loading is done under equivalent requirements and specifications. Approximately 25,000 M106C1 and M106 projectiles have been field fired with no projectile safety related incidents.

3. The NL uses the US prop charges M1 and M2 and the NL-manufactured M1C1 and M2C1 which are fabricated to essentially the same technical data packages as the US M1 and M2. Approximately 25,000 of those charges from NL stocks have been fired without safety related incidents.

4. The NL and US use identical firing tables (FT 8-J-4).

5. The US fuze M557 and the NL fuzes M557C1 and M557 (Italian fabrication) have been found to be essentially the same in design, performance, and safety. NL has field fired approximately 250,000 M557 and M557C1 without a single safety related incident. The US has fired approximately 70 million M557 fuzes with no close in or inbore prematures and approximately 20 down range prematures attributed to the fuze.

6. The NL primers M82 and MK2A4 are of US manufacture. The NL MK2C1 and M82C1 primers are of NL manufacture against essentially the same technical data packages used for the MK2A4 and the M82 in the US.

The NL charges are packed with both the MK2C1/MK2A4 and the M82/M82C1 primers. In the exchange firings, the US troops will use only the M82/M82C1 primer. The NL troops will use the US-supplied M82 primer if the self-propelled weapon is employed. If the NL troops use the towed howitzer, they will provide their own MK2C1/MK2A4 primer to fit the firing lock with which the weapon is equipped.

The NL has field fired approximately 300,000 primers with no safety related incidents. The US has fired approximately 15 million M82 primers with no safety related incident.

7. The US M110 (M2A2 CANNON) and the NL M110 (M2A2 CANNON) weapons are identical and therefore present no problems for interoperability. The US will also use the M110A1 (M201 CANNON) which is also no problem for interoperability.

CONCLUSIONS

8. Based on the foregoing analysis, it is concluded that current NL and US field stocks of 8-inch high explosive complete rounds, as identified herein, are interoperable and safe to fire from howitzers M110 and M110A1 with the following operational provision:

The US troops must use the M82 or M82C1 primer.

The NL troops must use the M82/M82C1 primer in the SP weapon and the MK2C1/MK2A4 in the towed weapon.

9. A configuration advisory procedure will be established for exchange of technical data package revisions to assure continued interoperability. Reporting procedured will also established for reporting field incident and ammunition/weapon failure information.

28-11-75

For NL _____

Ammunition Interoperability Team Col RNLA J.van Veen

For US _____

Ammunition Interoperability Team Victor Lindner

Nov 28, 1975

BILATERAL AGREEMENT

ON

INTEROPERABILITY OF NL AND US

155MM HE AMMUNITION/WEAPON SYSTEMS

INTRODUCTION

1. The NL and US ammo Interoperability Teams have completed a review of the 155mm HE Ammunition/Weapon System Interoperability. Interoperability was evaluated on a complete round (projectile, propelling charge, fuze, primer) basis. System components evaluated are as follows:

	US	NL
Projectile	M107	M107, M107B2, M107C1
Propelling Charge	M3A1, M4A2	M3C1, M4C3, M4A1
Fuze	M557	M557 , M557C1
Primer	M82	M82C1
Weapon	M109, M109A1, M109A2, M109A3	M109, M109A1

The team evaluations are based on review of the following data:

a. Safety related firings of system components.

b. Technical Data Packages (TDP's).

c. Acceptance testing.

d. Field performance history.

FINDINGS

2. US projectile M107 and NL projectile M107 are of US manufacture. The NL projectile M107B2 is a US-manufactured M101 projectile modified (band cut down) to the M107 configuration and are equivalent. The NL projectile M107C1 is fabricated to essentially the same technical data package as the M107 by the NL. The NL has only loaded with TNT and loading is done under equivalent requirements and specification. The NL has fired approximately 250,000 M107, M107B2, and M107C1 projectiles with no projectile safety related incidents. The US has loaded both Composition B and TNT and has fired approximately 22 million TNT-loaded projectiles with a critical failure rate of approximately one in two million.

3. The US M4A2 and M3A1 charges and the NL M3C1 and M4C3 charges are fabricated to essentially equivalent technical data packages. The M4A1 is of US manufacture and provides the same ballistics as the M4A2 charge. Approximately 280,000 NL charges have been fired without safety related incidents.

4. The NL primers M82 and MK2A4 are of US manufacture. The NL MK2C1 and M82C1 primers are of NL manufacture against essentially the same technical data packages used for the MK2A4 and the M82 in the US.

The NL charges are packed with both the MK2C1/MK2A4 and the M82/M82C1 primers. In the exchange firings, the US troops will use only the M82/M82C1 primers. The NL troops will use the US-supplied M82 primer if the self-propelled

weapon is employed. If the NL troops use the towed howitzer, they will provide their own MK2C1/MK2A4 primers to fit the firing lock with which the weapon is equipped.

The NL has field fired approximately 300,000 primers with no safety related incidents. The US has fired approximately 15 million M82 primers with no safety related incidents.

5. The US fuze M557 and the NL fuzes M557C1 and M557 (ITALIAN fabrication) have been found to be essentially the same in design, performance, and safety. The NL has field fired approximately 250,000 M557 and M557C1 without a single safety related incident. The US has fired approximately 70 million M557 fuzes with no close in or inbore prematures and approximately 20 down range prematures attributed to the fuze.

6. The US M109 (M126A1 cannon) and the M109A1 (M185 cannon) and the NL M109 and M109A1 weapons are identical and therefore present no problems and are interoperable.

CONCLUSIONS

7. Based on the foregoing analysis, it is concluded that current NL and US field stocks of 155mm high explosive complete rounds, as identified herein, are interoperable and safe to fire from howitzers M109, M109A1, A2, and A3 with the following operational provisions:

a. Since the NL has only TNT-loaded projectiles, interchange firings will be with TNT-loaded projectiles only.

b. The US troops must use the M82 or M82C1 primer.

c. The NL troops must use the M82/M82C1 primers in the SP weapon and the MK2C1/MK2A4 in the towed weapon.

8. A configuration advisory procedure will be established for exchange of technical data package revisions to assure continued interoperability. Reporting procedures will also be established for reporting field incident and ammunition/ weapon failure information.

29-11-78

For NL

Ammunition Interoperability Team _____

Col. RNLA ir. J. van Veen

For US

Ammunition Interoperability Team _____

V. Lindner

Nov 29, 1978

BILATERAL AGREEMENT
ON
INTEROPERABILITY OF NL AND US
4.2 INCH HE AMMUNITION /WEAPON SYSTEMS

INTRODUCTION

1. The NL and US Ammunition Interoperability Teams have completed a review of the 4.2 Inch HE Ammunition/Weapon System Interoperability. Interoperability was evaluated on a complete round (projectile, propelling charge, fuze, primer) basis. System components evaluated are as follows:

	US	NL
Projectile/Fuze	M329A1 HE/M557	M329A1/M557 or M557C1
		M329C1/M557 or M557C1
Propelling Charge	M36A1	M36A1 (with M329A1 and M329C1)
Primer	M2A2	M2A2
Weapon	M30	M30

The team evaluations are based on review of the following data:

a. Safety related firings of system components;

b. Technical Data Packages (TDP's);

c. Acceptance Testing; and

d. Field Performance History.

FINDINGS

2. US projectile M329A1 and NL projectile M329A1 were fabricated in the US and are indentical. The NL projectile M329C1 is the US projectile M329 modified by NL to the M329A1 including modifioation of the charge M36 to M36A1.

The NL has field fired approximately 35,000 M329C1 projectiles with no critical malfunctions.

3. The US fuze M557 and the NL fuzes M557 and M557C1 (Italian fabrication) have been found to be essentially the same in design performance, and safety. NL has field fired approximately 250,000 M557 and M557C1 without a single safety related incident.
The US has fired approximately 70 Million M557 fuzes with no close in or inbore prematures.

4. The sustained rates of fire for 4.2 inch HE Ammunition is 3 rounds per minute.

5. The NL primer M2A2 is of US manufacture.
The M30 weapon is of US manufacture and therefore present no problems for interoperability.

CONCLUSIONS

6. Based on the foregoing analysis, it is concluded that current NL and US field stocks of 4.2 Inch High Explosive complete rounds and weapons as identified herein are interoperable and safe to fire in partnership firings.

7. For NL/US interoperability firings, the maximum rate of fire shall be at the herein specified sustained rate of fire.

8. A configuration advisory procedure will be established for exchange of Technical Data Package (TDP) revisions to assure continued interoperability. Reporting procedures will also be established for reporting fiels incident and ammunition/weapon failure information.

29-11-78

For NL
Ammunition Interoperability Team

Col RNLA J.van Veen

For US
Ammunition Interoperability Team

Victor Lindner
29/11/78

BILATERAL AGREEMENT

ON

INTEROPERABILITY OF NL AND US
4.2 INCH ILLUMINATING AMMUNITION/WEAPON SYSTEMS

INTRODUCTION

1. The NL and US Ammunition Interoperability Teams have completed a review of the Illuminating Ammunition/Weapon System Interoperability. Interoperability was evaluated on a complete round (projectile, propelling charge, fuze, primer) basis. System components evaluated are as follows:

	US	NL
Projectile/Fuze	M335A2/M565	M335C1/NR151
Propelling Charge	M36A1	M36A1
Primer	M2A2	M2A2
Weapon	M30	M30

The team evaluations are based on review of the following data:

a. Safety related firings of system components;

b. Technical Data Packages (TDP's);

c. Acceptance testing; and

d. Field performance history.

FINDINGS

2. The US projectile M335A2 and NL projectile M335C1 were fabricated to essentially equivalent technical data packages. The NL M335C1 is the US M335 modified by the NL to the M335A1 including modification of the charge M36 to M36A1. The NL has field fired approximately 10,000 M335C1 projectiles with no critical malfunctions.

3. The NL fuze NR151 is essentially the same as the US M501A1 accept that NL has removed the PD element and replaced it with a dummy head (only MT function remains). It should be noted that the NR151 has a maximum setting time of 75 seconds and the M565 has a maximum setting time of 100 seconds.

4. The NL primer M2A2 is of US manufacture. The M30 weapon is of US manufacture and therefore presents no problems for interoperability.

5. The sustained rates of fire for 4.2 inch Illuminating Ammunition is 3 rounds per minute.

CONCLUSIONS

6. Based on the foregoing analysis it is concluded that current NL and US field stocks of 4.2 Inch Illuminating Ammunition as identified herein are interoperable and safe to fire in partnership firings.

7. For NL/US interoperability firings, the maximum rate of fire shall be at the herein specified sustained rate of fire.

8. A configuration advisory procedure will be established for exchange of Technical Data Package (TDP) revisions to assure continued interoperability. Reporting procedures will also be established for reporting field incident and ammunition/weapon failure information.

23-11-78

For NL _____

Ammunition Interoperability Team Col RNLA J.van Veen

For US _____

Ammunition Interoperability Team Victor Lindner

NOV 29 1978

BILATERAL AGREEMENT

ON

INTEROPERABILITY OF BELGIUM AND UNITED STATES

8"/203MM AMMO/WEAPON SYSTEMS

INTRODUCTION

1. Belgium and US Ammunition Interoperability teams have completed a review of the 8 inch/203MM ammunition/weapon system interoperability. Interoperability was evaluated on a complete round (projectile, prop charge, fuze, primer) basis. System components evaluated are as follows:

	BE	US
Projectile	M106	M106
Fuze	M557, M564	M557, M564
Prop Charge	M1, M2	M1, M2
Primer	M82	M82
Weapon (Cannon)	M110 (M2A2)	M110 (M2A2) M110A1 (M201)

The team evaluations are based on review of the following data:

a. Safety related firings of system components

b. Technical Data Packages (TDP's)

c. Acceptance testing

d. Field performance history

FINDINGS

2. US projectile M 106 and BE projectile M 106 are of US manufacture made to the same TDP. High explosive loading was performed in the U.S. and is only TNT. Belgium has field fired approximately 27.000 M 106 projectiles with no projectile safety related incidents. The US has field fired approximately 5 million with five malfunctions - two low order inbores caused by human error (firing without a fuze), two projectile breakups caused by firing metal parts with low mechanical properties, and one close in premature, caused by firing a cracked shell. None of these malfunctions caused any fatalities.

3. The US fuzes M 557 and M 564 and the BE fuzes M 557 and M 564 are of US fabrication and purchased through the US Army. BE has field fired approximately 207.500 M 557 and M 564 fuzes wthout a single safety related incident. The US has fired approximately 70 million M 557 fuzes with no close in or inbore prematures and approximately 20 down range prematures attributed to the fuze. The US has fired in excess of one million M 564 fuzes with no close in or inbore prematures.

4. The US M1 and M2 charges and the BE M1 and M2 charges are of US fabrication made to the same TDP and so are interoperable. BE has fired approximately 27.000 charges, and US approximately 5 million charges, without safety related incident.

5. BE primers M 82 and US primers M 82 are of US manufacture made to the same TDP.

   BE has field fired approximately 105.000 M 82 primers with no safety related incidents. The US has fired approximately 15 million M 82 primers with no safety related incidents.

6. The US M110 (M2A2 Cannon) and the BE M110 (M2A2 Cannon) weapons are identical and therefore present no problems for interoperability. The US will also use the M110A1 (M201 Cannon) weapon which, although different, fires standard rounds and uses standard firing tables and therefore is safe for exchange firing.

CONCLUSIONS

7. Based on the foregoing analysis, it is concluded that current BE and US field stocks of 8 inch (203MM) ammunition, as identified herein, are interoperable and safe to fire in peacetime partnership firings from M110 and M110A1 weapons.

8. A configuration advisory procedure will be established for exchange of technical data package revisions to assure continued interoperability.

9. Reporting procedures will also be established for reporting field incidents and ammunition/weapon failure information.

For BE

Ammunition Interoperability Team

M. GYSEMBERG
Général
Adjoint au Chef d'EM
de la Force Terrestre

Feb 15, 1979

For US

Ammunition Interoperability Team

V. LINDNER

Feb 14, 1979

BILATERAL AGREEMENT

ON

INTEROPERABILITY OF BELGIUM AND UNITED STATES

155MM HE AMMUNITION/WEAPON SYSTEMS

INTRODUCTION

1. The BE and US Ammo Interoperability teams have completed a review of the 155MM HE Ammunition/Weapon System interoperability. Interoperability was evaluated on a complete round (projectile, prop. charge, fuze, primer) basis. System components evaluated are as follows:

	BE	US
Projectile	M107	M107
Fuze	M557, M564	M557, M564
Prop Charge	M3, M4A1	M3A1, M4A2
Primer	M82	M82
Weapon (Cannon)	M109 (M 126 E 1)	M109 (M126A1) M109A1, A2, A3 (M185)

The team evaluations are based on review of the following data:

a. Safety related firings of system components

b. Technical Data Packages (TDP's)

c. Acceptance testing

d. Field performance history

FINDINGS

2. The US projectile M107 and a quantity of BE projectiles M107 are of US manufacture (purchased through U.S. Army). BE has purchased a small quantity of M107 projectiles in Belgium, manufactured to the US technical data package. BE has only loaded with TNT and loading is done under equivalent US TDP requirements and specifications. BE has fired approximately 85,000 M107 projectiles with no projectile safety related incidents.. The US has loaded both Composition B and TNT and has fired approximately 22 million TNT loaded projectiles with a critical failure rate of approximately one in two million.

3. The US fuzes M557 and M564 and the BE fuzes M557 and M564 are of US fabrication and purchased through U.S. Army. BE has field fired approximately 207,500 M557 and M564 fuzes without a single safety related incident. The US has fired approximately 70 million M557 fuzes with no close in or inbore prematures and approximately 20 down range prematures attributed to the fuze. The US has fired in excess of 1 million M564 fuzes with no close in or inbore prematures.

4. The US M3A1 charge and the BE M3 charge are fabricated to essentially equivalent technical data packages except the BE charge uses 3.0 ounces of black powder in the igniter pad instead of CBI.
The US M4A2 charge and the BE M4A1 charge are similar except the BE charge uses 3.0 ounces of black powder instead of CBI and the charge does not include a flash reducer. Flash reducer M2 may be used with BE charge but is separate item of issue. The M3A1, M4A2 and the M3 and M4A1 provide the same ballistics respectively.(*) Approximately 85,000 BE charges have been fired without safety related incidents.

(*) The applicable firing tables for the respective charges should be used.

5. BE primers M82 and U.S. primers M82 are of US manufacture to the same TDP.

BE has field fired approximately 105,000 M82 primers with no safety related incidents. The USA has fired approximately 15 million M82 primers with no safety related incidents.

6. The US M109 (M126A1 Cannon) and the BE M109 (M126 E1) are identical and present no problems and are interoperable. (The M126E1 was the development nomenclature for the cannon which was changed to M126 A1 at Type classification

CONCLUSIONS

7. Based on the foregoing analysis, it is concluded the current BE and US field stocks of 155MM ammunition, as identified herein are interoperable and safe to fire in peacetime partnership firings from M109, A1, A2 and A3 with the following operational provisions:

a. Since BE has only TNT-loaded projectiles, interchange firings will be with TNT-loaded projectiles only.

b. Only U.S. manufactured M107 projectiles will be exchanged.

8. A configuration advisory procedure will be established for exchange of technical data package revisions to assure continued interoperability.

9. Reporting procedures will also be established for reporting field incidents and ammunition/weapon failure information.

For BE

Ammunition Interoperability Team _____

Feb 15, 1979

Adjoint au Chef d'EM de la Force Terrestre

For US

Ammunition Interoperability Team _____

V. Lindner

Feb 4 1979

BILATERAL AGREEMENT

ON

INTEROPERABILITY OF BELGIUM AND UNITED STATES

105MM HEAT-T TANK AMMUNITION/WEAPON SYSTEM

INTRODUCTION

1. The BE and US Interoperability teams have completed a review of the 105MM HEAT-T Tank Ammunition/Weapon System. Interoperability was evaluated for the following :

	BE	US
Cartridge	M456A1	M456A1
Tube	L7A2 L7A3	M68

The team evaluations are based on review of the following data :

a. Safety related field incidents

b. Technical Data Packages (TDP's)

c. Field performance history

d. Acceptance testing

FINDINGS

2. The US Cartridge M456A1 (fabricated in the US) and BE Cartridge M456A1 (fabricated in EUROPE) are fabricated to the US Technical Data Package and the evaluation has determined that they are interoperable. (For the purpose of this agreement the M456A1 refers to the "one-piece" body design only) BE has field fired approximately 6000 M456A1 rounds with no safety related incidents. The US has a premature rate of none in 232.000 firings.

3. The US Gun Tube, M68 and BE Gun Tubes L7A2 and L7A3 are interoperable.

CONCLUSIONS

5. Based on the foregoing analysis, it is concluded that current BE and US field stocks of 105mm HEAT-T Tank Ammunition, as identified herein, are interoperable and safe to fire in peacetime partnership firings from L7A2, L7A3 and M68 Tubes.

6. A configuration advisory procedure will be established for exchange of technical data package revisions to assure continued interoperability.

7. Reporting procedures will also be established for reporting field incidents and ammunition/weapon failure information

For BE

Ammunition Interoperability Team _____

Feb 15 1979

M. GYSEMBERG
Colonel breveté
Adjoint au Chef d'EM
de la Force Terrestre

For US

Ammunition Interoperability Team _____

V. LINDNER

Feb 14 1979

BILATERAL AGREEMENT

ON

INTEROPERABILITY OF BELGIUM AND UNITED STATES

4.2 INCH ILLUMINATING AMMUNITION/WEAPON SYSTEMS

INTRODUCTION

1. The BE and US Ammunition Interoperability teams have completed a review of the 4.2 Illuminating Ammunition/Weapon System Interoperability. Interoperability was evaluated on a complete round (projectile, propelling charge, fuze, ignition cartridge) basis. System components evaluated are as follows :

	BE	US
Projectile/Fuze	M335A2/M565	M335A2/M565
Propelling Charge	M36A1	M36A1
Ignition cartridge	M2A2	M2A2
Weapon	M30	M30

The team evaluations are based on review of the following data:

a. Safety related firings of system components

b. Technical Data Packages (TDP's)

c. Acceptance testing

d. Field performance history

FINDINGS

2. US projectile M335A2 and BE projectile M335A2 are of US fabrication made to the same TDP and are identical and therefore interoperable.

3. The US fuze M565 and BE fuze M565 were fabricated in the US to the same TDP and are identical and are therefore interoperable.

4. The US propelling charge M36A1 and BE propelling charge M36A1 were fabricated in the US to the same TDP and are identical and are therefore interoperable.

5. The BE ignition cartridge assy M2A2 and US ignition cartridge assy M2A2 were fabricated in the US to the same TDP and are identical.

6. The M30 weapon is of US manufacture and therefore presents no problems for interoperability.

7. The sustained rates of fire for 4.2 inch Illuminating ammunition is 3 rounds per minute. Both BE and US use the same firing tables. The US has fired approximately 2 million M335A2 complete rounds with no safety related incidents.

CONCLUSIONS

9. Based on the foregoing analysis, it is concluded that current BE and US field stocks of 4.2 inch Illuminating complete rounds as identified herein are interoperable and safe to fire in peacetime partnership from the M30 weapon with the following operational provision :

a. For BE/US interoperability firings, the maximum rate of fire shall be at the herein specified sustained rate of fire (paragraph 7).

10. A configuration advisory procedure will be established for exchange of technical data package revisions to assure continued interoperability.

11. Reporting procedures will also be established for reporting field incident and ammunition/weapon failure information.

For BE

Ammunition Interoperability Team _____

Feb, 15 1979

[illegible] GYSEMBERG
Général-Major
Adjoint au Chef [illegible]
de la Force Terrestre

For US

Ammunition Interoperability Team _____

V. LINDNER

Feb 14 1979

BILATERAL AGREEMENT
ON
INTEROPERABILITY OF FR AND US
155 MM HE AMMUNITION/WEAPON SYSTEMS

==========

INTRODUCTION

1.- The FR and US Ammunition Interoperability Teams have completed a review of the 155 mm HE Ammunition/Weapon Systems Interoperability. Interoperability was evaluated on a complete round (projectile, prop charge, fuze, primer) basis. System components evaluated are as follows :

	FR	US
Projectile	M107	M107
Fuze	M557	M557
Prop Charge	M3, M4A1	M3A1, M4A2
Primer	MK2A4	M82
Weapon (Cannon)	F3 Am (1025-14-276-3459)	M109 (M126A1), M109A1, A2, A3 (M185)

The team evaluations are based on review of the following data :

a)- Safety related firings of system components.
b)- Technical Data Packages (TDP's).
c)- Acceptance testing.
d)- Field performance history.

FINDINGS

2.- The US Projectile M107 and FR Projectiles M107 are made essentially to the same US TDP's. For training purposes, FR only used rounds loaded with TNT. The US and France both have deep cavity M107's with supplementary charge and shallow cavity M107's. Since 1966, for training purposes, FR fired approximately 575.000 M107 Projectiles with no safety related incidents. The US has loaded both Composition B and TNT and has fired approximately 22 million TNT loaded projectiles with a critical failure rate of approximately one in two million.

3.- The US Fuze M557 and the FR Fuze M557 are made essentially to the same US TDP's. Since 1966, for training purposes, FR has field fired approximately 515.000 M557 Fuzes with no close in or inbore prematures and one down range premature attributed to the fuze. The US has fired approximately 70 million M557 Fuzes with no close in or inbore prematures and approximately 20 down range prematures attributed to the fuze.

4.- The US M3A1 Charge and the FR M3 Charge are fabricated to essentially equivalent US technical data packages except the FR charge uses 3.0 ounces of black powder in the igniter pad instead of CBI. The US M4A2 Charge and the FR M4A1 Charge are similar except the FR charge uses 3.0 ounces of black powder instead of CBI and the charge does not include a flash reducer. The M3A1, M4A2 and the M3 and M4A1 provide the same ballistics with each country's respective weapon. The applicable firing tables for the respective charges and weapons should be used. Since 1966, for training purposes, approximately 285.000 FR charges have been fired with no safety related incidents. The M4A1 and M4A2 charges will be used only in zones 5, 6 and 7.

5.- FR Primer MK2A4 and US Primer M82 are manufactured in their respective countries according to the applicable US TDP's. Since 1966, for training purposes, FR has fired approximately 800.000 MK2A4 Primers with no safety related incidents. The US has fired approximately 15 million M82 Primers with no safety related incidents.

6.- The FR F3 Am weapon and the US M109 series weapon provide comparable projectile performance characteristics.

CONCLUSIONS

7.- Based on the foregoing analysis, it is concluded that 155 mm Ammunition, as identified herein, are interoperable and safe to fire in peacetime partnership firings from US M109, A1, A2 and A3 and FR F3 Am with the following operational provisions :

a)- Each country will use its own firing tables ;

b)- Interchange firings will be with TNT loaded projectiles only.

c)- US troops will use only the M82 Primer in the M109 Series weapons and French troops will use only the MK2A4 Primer in the F3 Am weapon.

8.- A configuration advisory procedure to be specified between the signatories will be established for exchange of technical data package revisions to assure continued interoperability.

9.- Procedures will be similary established for reporting safety related incidents regarding the 155 mm ammunition/weapon systems, as identified in the present agreement.

For FR

Ammunition Interoperability Team : IPA Guerin

For US

Ammunition Interoperability Team : V. Lindner

May 10, 1979

APPENDIX D

FORMS RELATED TO INTEROPERABILITY

GE/US BILATERAL AGREEMENT TDP AMENDMENT

Country of Origin_____

DATE:_____

ITEM:_____

GE/US AGREEMENT NO:_____AMEND:_____DATE:_____

DWG NO:_____REV:_____DATE:_____

SPEC NO:_____REV:_____DATE:_____

TDP CHANGE:_____

_____

AFFECTS INTEROPERABILITY YES:_____NO:_____

IF YES - HOW:

- DATE OF IMPLEMENTATION:

- LOT NO. OF IMPLEMENTATION:

_____

FOR COUNTRY OF ORIGIN

COMMENTS OF RECIPIENT COUNTRY:

RETURN TO:

Figure D-1. Typical form to amend agreement.

PRELIMINARY MALFUNCTION REPORT CALL FROM:

MIF NO.

USING UNIT

CALIBER AND MODEL OF WEAPON

MODEL NO. LOT NO.(S)

COMPL. RD.

FUZE

PROP

DESCRIPTION OF MALFUNCTION

PERSONNEL INJURIES PROPERTY DAMAGE

SUSPENSION ACTION TAKEN

NO. OF RDS OF SUSPECT LOT FIRED NO. OF RDS REMAINING ON HAND

DATE, TIME MALF OCCURRED

WEATHER CONDITIONS

AVAILABILITY OF FRAGMENTS

OTHER INFORMATION CONSIDERED PERTINENT

RECEIVED BY: DATE:

Figure D-2. Form to report field incident.

APPENDIX E

EXAMPLE OF TECHNICAL BULLETIN

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

IDENTIFICATION OF, AND SPECIAL PRECAUTIONS PERTAINING TO 8-INCH FOREIGN AMMUNITION (NATO) (GE)

Headquarters, Department of the Army, Washington, DC
27 October 1978

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS
You can help improve this bulletin. If you find any mistake or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this bulletin direct to: Commander, US Army Armament Materiel Readiness Command, ATTN: DRSAR-MAS-MA, Dover, New Jersey 07801. A reply will be furnished to you.

1. Introduction. As a result of recent agreements between the United States and a number of its NATO allies it is intended to establish the interoperability of many weapon systems and ammunition of the various countries. The goal is to enable the safe and effective firing of major types of ammunition of the same size from the same compatible size and type weapon of the NATO armies (e.g., fire a German 8-inch projectile from a US 8-inch cannon). Interoperability criteria are now required for many weapons and ammunition items in current development. Determinations are now being made to establish which ammunition is compatible with which weapons. As these are completed, ammunition items will be authorized for use in US weapons by changes to the applicable ammunition and weapons manuals. NATO countries will provide similar authorization in their manuals. Only authorized NATO ammunition will be used. Those items covered in this technical bulletin have been authorized. If a round or component has not been authorized it is because (1) it has not yet been determined to be safe to fire from a US weapon system or (2) it has been determined that the round or component cannot be safely fired from the US weapon system.

2. Scope. This bulletin covers only authorized GE 8-inch (203-mm) components at this time. Authorized 8-inch (203-mm) components from other NATO countries will be added as tests are completed.

3. General. This bulletin contains data that will be incorporated into the following ammunition and weapons technical manuals:

a. TM 9-1300-251-20.

b. TM 9-2300-216-10.

c. TM 43-0001-28.

4. Data To Be Incorporated Into TM 9-1300-251-20.

a. The following GE munitions are authorized for use in US M110 Howitzer Weapons system:

Projectile--------	203mm (8-inch) HE, DM11
Charge, Propelling -----	Green bag, DM12 Zones 1 — 5
Charge, Propelling -----	White bag, DM22 Zones 5 — 7
Fuze ------------	Point detonating, DM241
Flash Reducer----	DM1

Primer -------	Use only US M82 Primer. Do not use GE primers in M110 Weapons system.

b. The following US munitions are authorized for use in GE M110 Howitzer Weapon system:

Projectile-----	8-inch (203-mm), HE, M106
Charge, Propelling --	Green bag, M1 Zones 1 — 5
Charge, Propelling --	White bag, M2 Zones 5 — 7
Flash Reducer-	M3
Fuze ---------	Point detonating, M572
Primer-------	Do not issue M82 Primer for use in GE M110 Weapons system

NOTE: Do not mix US and GE components — use all US or all authorized GE components (i.e., projectile, propelling charge, flash reducer and fuze).

5. Data To Be Incorporated Into TM 9-2300-216-10. Add the following paragraph (4-1.1) to the ammunition chapter (chapter 4) for 8-Inch M110 Howitzer:

4-1.1. NATO Ammunition. As a result of recent agreements between the United States and a number of its NATO allies it is intended to establish the interoperability of many weapon systems and ammunition of the various countries. The goal is to enable the safe and effective firing of major types of ammunition of the same size from the same compatible size and type weapon of the NATO armies (e.g., fire a German 8-inch projectile from a US 8-inch cannon). Interoperability criteria are now required for many weapons and ammunition items in current development. Determinations are now being made to establish which ammunition is compatible with which weapons. As these are completed, ammunition items will be authorized for use in US weapons by changes to the applicable ammunition and weapons manuals. NATO countries will provide similar authorization in their manuals. Only authorized NATO ammunition will be used. Those items covered in this change have been authorized. If a round or component has not yet been authorized it is because (1) it has not yet been determined to be safe to fire from a US weapon system or (2) it has been determined that the round or component cannot be safely fired from the US weapon system.

a. The following GE munitions are authorized for use in US M110 Howitzer Weapons system:

Projectile--------	203-mm (8-inch) HE, DM11
Charge, Propelling -----	Green bag, DM12* Zones 1 — 5
Charge, Propelling -----	White bag, DM22** Zones 5 — 7
Flash Reducer----	DM1
Fuze ------------	Point detonating, DM241
Primer ----------	Use only US M82 Primer. Do not use GE primers in M110 Weapons system.

* When Charges DM12 and DM22 are removed from the container the igniter protector cap must be removed prior to loading charge into howitzer chamber.

** When firing white bag charge DM22, use DM1 Flash Reducer.

NOTE: Except as noted above, preparations for firing GE munitions in US Weapons systems (misfire procedures, precautions during firing, etc.) are as contained in chapter 4 of this technical manual.

b. The following US munitions are authorized for use in GE M110 Howitzer Weapons system:

Projectile -------	8-inch (203-mm), HE, M106
Charge, Propelling -----	Green bag, M1 Zones 1 — 5
Charge, Propelling -----	White bag, M2 Zones 5 — 7
Flash Reducer----	M3
Fuze ------------	Point detonating, M572
Primer ----------	Do not issue M82 Primer for use in GE M110 Weapons system

NOTE: Except as noted above, preparations for firing US munitions in GE Weapons systems (misfire procedures, precautions during firing, etc.) are as contained in appropriate GE weapons technical manuals.

NOTE: Do not mix US and GE components — use all US or all authorized GE components (i.e., projectile, propelling charge, flash reducer and fuze). US Firing Tables can be used when firing GE munitions. GE Firing Tables can be used when firing US munitions.

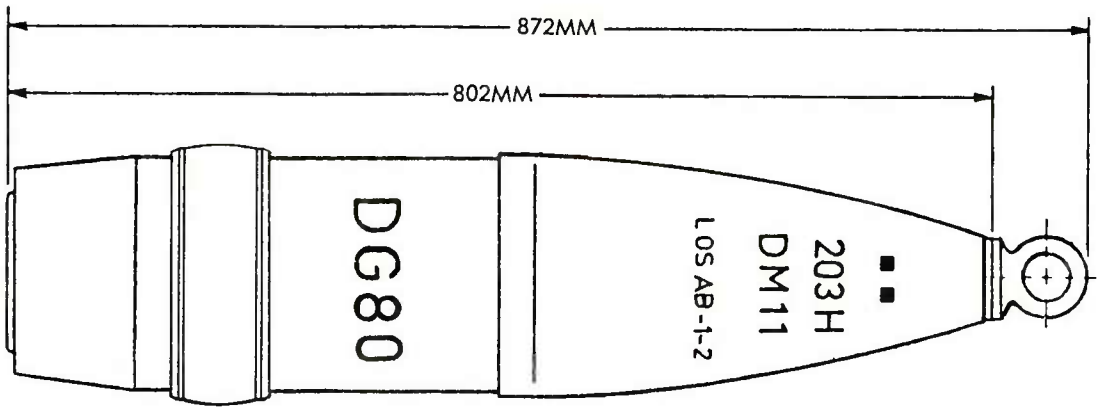
NOTE: Illustrations, use, description, functioning,

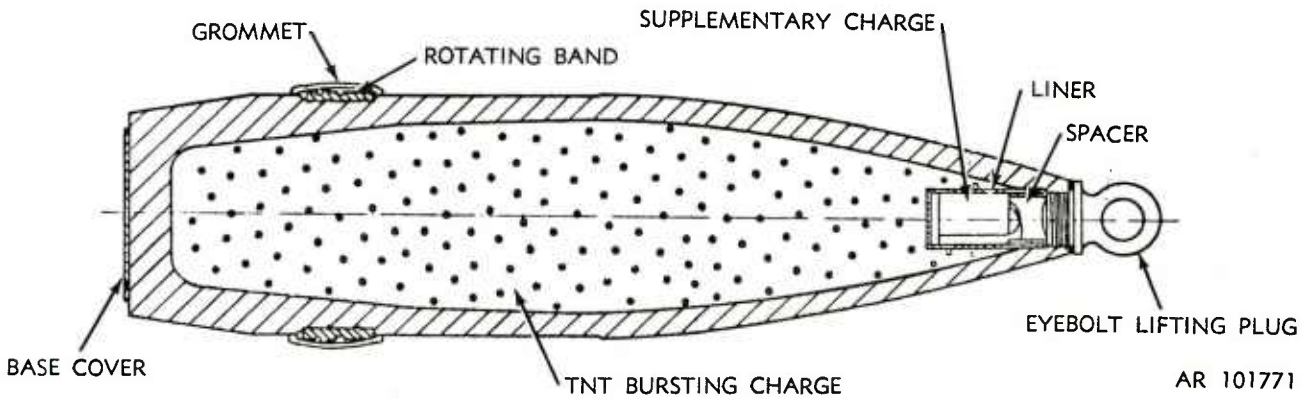
limitations, etc., for the above GE ammunition are contained in the following data sheets.

6. Data To Be Incorporated Into TM 43-0001-28. The data contained on the following pages will be incorporated into this manual as a change.

THIS PAGE INTENTIONALLY LEFT BLANK

PROJECTILE, 203-MM, (8-INCH) DM11





Use:

This projectile is used against personnel and materiel, producing blast and fragmentation at the target.

Description:

The projectile consists of a hollow steel forging with a boattailed base, a streamlined ogive, and a gilding metal rotating band. A base cover is welded to the base of the projectile for added protection against the entrance of hot gases from the propelling charge during firing. The nose of the projectile is fitted with a threaded eyebolt-lifting plug to facilitate handling and provide a closure for the fuze cavity. The projectile is made with either a shallow or deep fuze cavity and is loaded with TNT. Deep cavity projectiles contain a supplementary charge in the fuze cavity. A cardboard spacer is placed in the fuze cavity between the supplementary charge and the lifting plug to limit movement of the supplementary charge during shipping and handling. The rotating band is protected by a removable grommet. The loaded projectile is zoned into one of five weight zones ranging from 86.8 to 91.6 kilograms. The weight zone of the projectile is indicated by the number of squares and prick punch marks on the ogive of the projectile.

Functioning:

The grommet and lifting plug are removed

from the projectile and the projectile is fitted with the authorized fuze and rammed into the weapon chamber. Fuze arming occurs after firing, during projectile flight downrange. The fuze functions detonating the projectile on impact, either superquick (SQ) or with 0.05 second delay.

Tabulated Data:

Projectile:

Type ---------- HE

Weight Zone Information

Zone	Loaded Projectile w/o Fuze Kilograms Over	Up to & Incl	Without Lifting Plug Marking Yellow Squares
2	86.8	88.1	⊡ ⊡
3	87.9	89.3	⊡ ⊡ ⊡
4	89.1	90.4	⊡ ⊡ ⊡ ⊡
5	90.2	91.6	⊡ ⊡ ⊡ ⊡ ⊡
6	91.4	92.7	⊡ ⊡ ⊡ ⊡ ⊡ ⊡

Length:

W/o lifting plug ---- 802-mm (31.6 in.)

W/lifting plug ------ 872-mm (34.35 in. max)

Diameter:

Rotating band ------ 210-mm (8.28 in. max)

Bourrelet ---------- 203-mm (7.998 in. max)

Body material ------ Steel

Color ---------- Olive drab w/yellow markings

Filler and weight --- TNT 16.5 kg (36 lbs)

Supplementary charge ---------- TNT 0.14 kg (0.3 lbs)

Grommet ---------- 3 types, metal w/ wire ties, fiberglass or plastic w/metal lever

Weapon System Information:

	Model M110SP
Cannon tube ----------	M2A2 (M2A1E1), M201
Propelling Charge -----	DM12, DM22
*Primer ----------	M82
Fuze, PD ----------	DM241

Temperature Limits:

Firing:

Upper limit -------- 52°C (+125°F)

Storage:

Upper limit -------- 63°C (+145° F)

Packing ---------- 6 projectiles on pallet

Pallet:

Weight ---------- 635 kg (1400 lb)

Dimensions -------- 720 x 480 x 972-mm

Cube ---------- 0.336 m^3

Shipping and Storage Data:

Quantity-distance class --- (18) 1.2

Storage compatibility group ---------- D-2

DOT shipping class ------ A

DOT designation --------- EXPLOSIVE PROJECTILE

DODAC ---------- DG80

Drawing number ---------

Firing Tables (US):

FT 8-0-4 ---------- M110, Cannon M2A2 (M2A1E1)

FT 8-Q-1 ---------- M110A1, Cannon M201

*NOTE:

The M82 US Primer is not interchangeable with the GE M191A1 Primer because of variations in the breech mechanism. GE weapons must use DM191A1 Primers and US weapons must use M82 Primers.

References:

FUZE, POINT DETONATING: DM241

AR 101778

Use:

Point Detonating Fuze DM241 is intended for use only with 175-mm and 203-mm HE projectiles at all charges, and is designed to withstand structurally the acceleration forces involved.

Description:

Fuze DM241 consists essentially of Fuze DM211 modified with an epoxy filler in the ogive cavity for reinforcement. A superquick (SQ) element in the head consists of a firing pin, firing pin support and detonator. The body of the fuze is epoxy filled within the thin-walled ogive. The fuze body contains a delay plunger assembly and a selective setting device for superquick or delay action. The delay plunger assembly includes a firing pin and delay element, consisting of a primer, black powder delay charge and a relay. The DM42 booster consists of a brass booster body having external threads to fit projectiles having 2-inch diameter, 12 threads per inch cavities, and internal threads to receive fuzes having 1.7-inch diameter, 14 threads per inch. An aluminum booster cup containing a tetryl booster pellet is threaded to the booster body. The DM42 booster internal configuration is that of an eccentric rotor containing a detonator held in an unarmed (out of line) position by centrifugal detents and a gear train mechanism which provided for delayed arming of the booster assembly until the projectile is approximately 66 meters from the muzzle, depending upon the weapon and charge being fired.

Functioning:

No action occurs until after the projectile has left the muzzle of the gun, when centrifugal force releases the flash tube interrupter, thus opening the flash tube. At the same time, the delay plunger is armed in preparation for impact by withdrawal of the plunger pins, also by centrifugal force. The delay mechanism of the booster provides an arming distance of 66meters. Upon impact, the superquick firing pin is driven against a detonator, exploding the projectile. Should the superquick element fail, the delay train will still function, thus avoiding a dud. When the fuze has been preset for delay, the superquick element will still function but will have no effect because the interrupter blocks the flash tube. Projectile detonation will occur through the delay element.

Tabulated Data:

Type	PD
Weight	1.03 kg (2.3 lbs)
Length:	
Visible	100mm (3.72 in.)
Overall	160mm (5.93 in.)

Temperature Limits:

Firing:	
Upper limit	52°C (+125°F)
Storage:	
Upper limit	63°C (+145°F)
Packing	
Packing Box:	
Weight	
Dimensions	
Cube	

Shipping and Storage Data:

Quantity-distance class	(04) 1.2
Storage compatibility group	B
DOT shipping class	A
DOT designation	DETONATING FUZES — CLASS A EXPLOSIVES
DODAC	

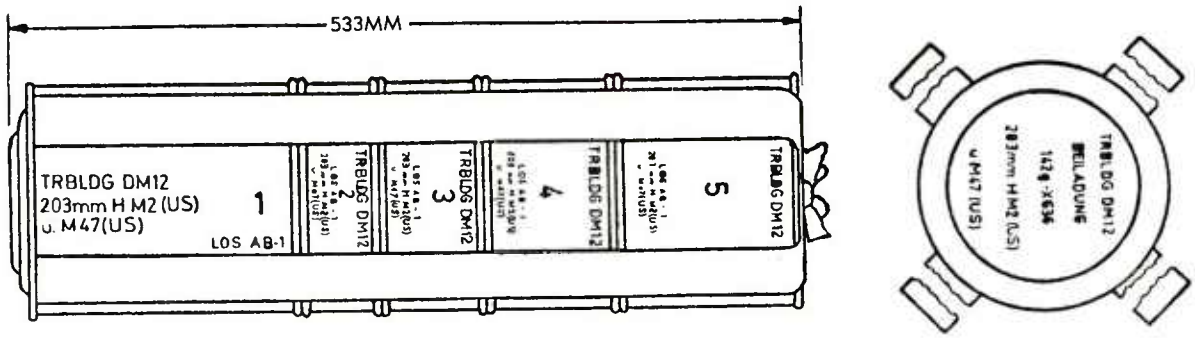
Explosive Components:

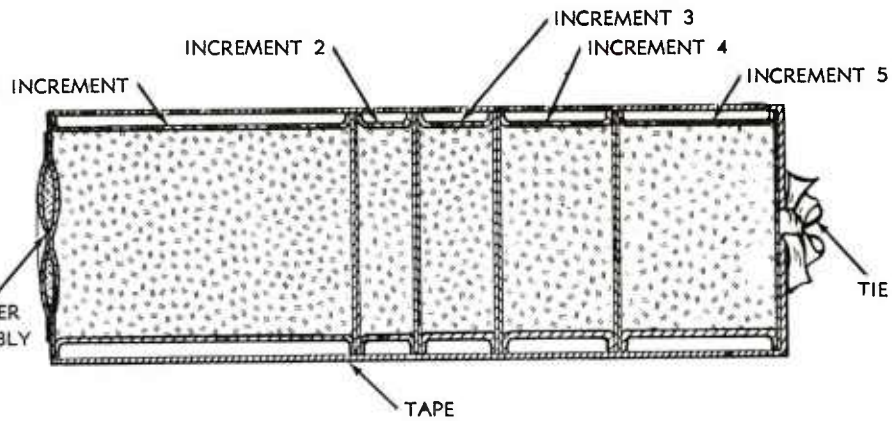
Limitations:

Premature functioning can occur when fuzes are fired in heavy rainfall.

References:

CHARGE, PROPELLING, 203-MM: DM12





AR 101772

Use:

203-MM Green Bag Propelling Charge DM 12 is used for zone firing with Charges 1 to 5 in M110 Howitzer Weapons System.

Description:

The charge consists of a base section (Charge 1) and four unequal increments (2 through 5) of propellant in green cloth bags. The increments are assembled end to end in sequence, and held in place by four tying straps sewn to the base of Increment 1 and tied over the top of Increment 5. A igniter pad containing 142 grams of black powder is sewn to the base of Increment 1. Each increment of the charge and the igniter pad is identified by black stencil markings.

Functioning:

The flash from the primer ignites the black powder igniter pad, which in turn ignites the propellant in the charge. The burning propellant generates gases which force the projectile out of the gun tube at a velocity required to reach the target.

Tabulated Data:

Type	Green Bag, separate loaded propelling charge
Weight	6.1 kg (13.4 lbs)
Length	533-mm (21.0 in. max.)

Diameter ---------- 165-mm (6.50 in.) (max.)
Color ---------- Green w/black marking

Propellant:
Composition ------- M1
Grain Type -------- 1 perforated L/D = 4.6
Weight ---------- 6.2 kg (13.6 lbs.)
Web ---------- .43-mm (0.017 in.)
Primer M82 ------- Used with Cannon Weapon M2A2 (M2A1E1), (M110); M201 (M110A1)

Assembly Dwg. No.--

Temperature Limits:

Firing:
Upper limit-------- 52°C (+125°F)
Storage:
Upper limit-------- 63°C (+145°F)

Packing---------- 1 charge in metal container; 16 containers per pallet
Container --------- M18A2
Weight ---------- 15.4 (34 lbs.)
Dimensions ------- 214-mm x 668-mm
Cube ---------- 0.029 m^3

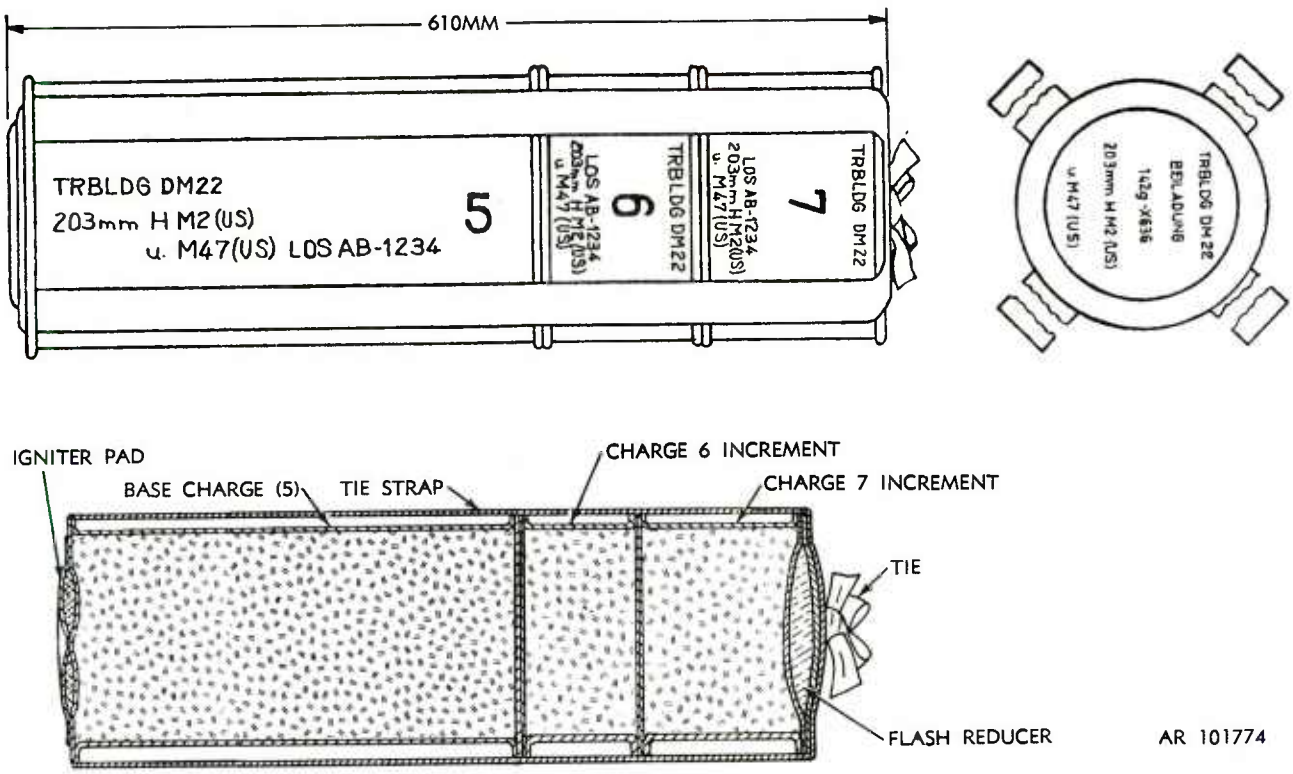
Pallet:
Weight ----------
Dimensions ---------- 667.5-mm x 860-mm x 1011-mm (max) (33.9 x 26.4 x 39.8 in.)
Cube ---------- .58 m^3 (20.3 ft^3)

Shipping and Storage Data:

Quantity-distance class ---- 1.1
Storage compatibility group - C
DOT shipping class -------- B
DOT designation ---------- PROPELLANT EXPLOSIVES SOLID CLASS B
DODAC ---------- DG75

References:

CHARGE, PROPELLING, 203-MM: DM22



Use:

203-MM White Bag Propelling Charge DM22 is used for zone firing with Charges 5 through 7 in M110 Howitzer Weapons System.

Description:

The charge consists of a base section (Charge 5) and two unequal increments (Charges 6 and 7) for zone firing. The increments are assembled end to end in sequence, and held in place by four tying straps sewn to the base of Increment 5 and tied over the top of Increment 7. A red cloth igniter pad containing 142 grams of black powder is sewn to the base of Increment 5. Each increment of the charge and the igniter pad is identified by black stencil markings. In use a DM1 Flash Reducer is inserted under the tie straps at the forward end of the charge. Flash Reducer DM1 is a separate item of issue to be used when firing all zones of the DM22 Propelling Charge. It consists of a square pad of red cloth containing a 1 pound mixture of potassium sulfate and black powder.

Functioning:

The flash from the primer ignites the black powder igniter pad, which in turn ignites the propellant in the charge. The burning propellant generates gases which force the projectile out of the gun tube at a velocity required to reach the target. The flash reducer serves to reduce the amount of blast overpressure at the muzzle. Although the flash reducer increases

the quantity of smoke, it must be used in daylight firing as well as night firing unless it is tactically impossible.

Tabulated Data:

Type	White Bag, separate loading propelling charge
Weight	13.6 kg (30 lbs)
Length	610-mm (24.0 in. max.)
Diameter	196.8-mm (7-3/4 in. max.)
Color	White w/black markings
Propellant:	
Composition	M1
Grain Type	7 perforated cylinder
Weight	12.9 kg (28.5 lbs.)
Web	.109-mm (0.043 in.)
Primer M82	Used with Cannon (Weapon) M2A2 (M2A1E1), (M110); M201 (M110A1)
Assembly Drawing No.	

Temperature Limits:

Firing:	
Upper limit	52°C (+ 125°F)
Storage:	
Upper limit	63°C (145°F)
Packing	1 charge in metal container; 12 metal containers per pallet
Container	M19A2
Weight	23.7 kg (52 lbs)
Dimensions	250-mm x 744-mm
Cube	.049 m^3 (1.4 cu ft)
Pallet:	
Weight	
Dimensions	755-mm x 744 x 1151-mm (max) (29.7 x 29.3 x 45 in.)
Cube	.67 m^3 (23.8 ft^3)

Shipping and Storage Data:

Quantity-distance class	1.1
Storage compatibility group	C
DOT shipping class	B
DOT designation	PROPELLANT EXPLOSIVE SOLID CLASS B
DODAC	DG76
Packing, DM1 Flash Reducer	
Weight	
Dimensions	
Cube	

Shipping and Storage Data:

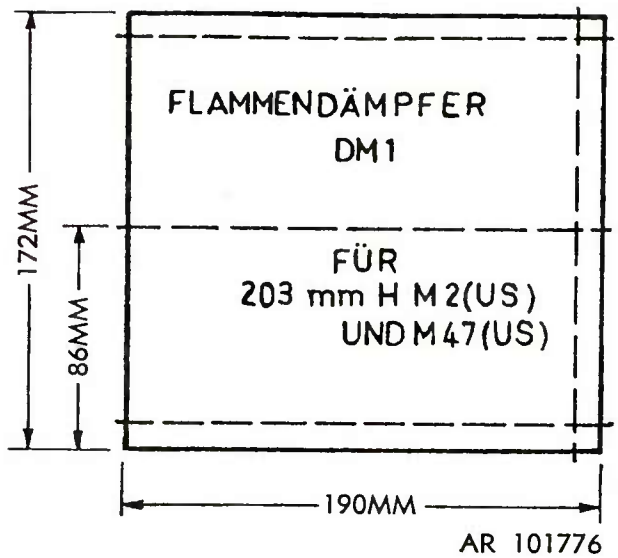
Quantity-distance class	7
Storage compatibility group	O
DOT shipping class	A
DOT designation	BLACK POWDER
DODAC	
Drawing number	

Limitations:

The DM22 propelling charge must be used with a DM1 flash reducer. If flash reducers are not available, occasional blast overpressure and excessive flash may be experienced.

References:

REDUCER, FLASH: DM1



Use:

Flash Reducer DM1 is used when firing 203-mm White Bag Propelling Charge DM22 (all zones). It is not used with Green Bag Propelling Charges DM12 which are flashless. The primary purpose is the reduction in muzzle flash to make accurate weapon location more difficult for the enemy. It is used in both night and daylight firings. A secondary effect is reduction of blast pressure at the muzzle.

Description:

The flash reducer is a square light brown cloth pad containing a 460 gram mixture of black powder and potassium sulphate or potassium nitrate. The assembly is sewn around each edge to prevent leakage of the contents, and through the center to increase tear resistance. Thus, the appearance is of two equal increments. The flash reducer is inserted under the tie/straps at the forward end of the propelling charge at time of firing.

Functioning:

The flash reducer is ignited by the burning propellant. The chemical combination of burning potassium and propellant serves to modify the flashing of gases at the muzzle of the weapon. The result is a reduction in brilliance and of the blast overpressure at the muzzle.

Tabulated Data:

Type	Chemical modifier
Weight	460 g (1 lb)
Dimensions	172-mm x 190-mm (6.4 in. x 7.1 in.)
Color	Light brown w/black markings
Filler	Potassium sulphate and Black powder
Cannon (Weapon) used with	M2A1E1 (M110) M201 (M110A1)
Charges used with	203-mm Charge Propelling: DM22
Assembly Dwg. No.	

Temperature Limits:

Firing:	
Upper limit	52°C (+ 125°F)

Storage:
Upper limit---------- 63°C (+145°F)
Packing----------

Storage compatibility group- D-1
DOT shipping class -------- A
DOT designation---------- BLACK POWDER
DODAC----------

Packing Box:
Weight----------
Dimensions----------

Cube----------

Limitations:

Shipping and Storage Data:

Quantity-distance class------- 1.1

References:

By Order of the Secretary of the Army:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

Official:
J. C. PENNINGTON
Brigadier General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-40, Organizational maintenance requirements for Artillery Ammunition and in accordance with DA Form 12-37 Operator's Maintenance requirements for Gun, 175-mm, M107; Howitzer, 8-Inch, M110.

★U.S. GOVERNMENT PRINTING OFFICE: 1978--665-012/1187

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)
Commander
Stateside Army Depot
ATTN: AMSTA-US
Stateside, N.J. 07703

DATE 10 July 1975

PUBLICATION NUMBER	DATE	TITLE
TB 9-XXXX-XXX-XX	23 Jan 74	Radar Set AN/[illegible]-76

BE EXACT. . .PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.	
2-25	2-28			Recommend that the installation antenna alignment procedure be changed through [illegible] to specify a 2° IFF antenna lag rather than 1°. REASON: Experience has shown that with only a 1° lag, the antenna servo syst[illegible] is too sensitive to wind gusting in excess of [illegible] knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.
3-10	3-3		3-1	Item 5, Func[illegible] column. Change "2 db" to "3db." REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
		F03		Zone C 3. On J1-2, change "+24 VDC to "+5 VDC." REASON: This is the output line of the 5 VDC power supply. + 24 VDC is the input voltage.

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
SSG I. M. DeSpiritof 999-1776

SIGN HERE: SSG I. M. DeSpiritof

DA FORM 1 AUG 74 2028-2

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

HISA 1686-75

TEAR ALONG DOTTED LINE

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?

THEN... JOT DOWN THE DOPE ABOUT IT ON THIS FORM, CUT IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)

DATE

PUBLICATION NUMBER	DATE	
TB 9-2300-303-10		

BE EXACT...PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE:

CUT ALONG DOTTED LINE

DA FORM 1 AUG 74 2028-2

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FINO," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD 314

U.S. MAIL

Commander
US Army Armament Materiel REadiness Command
ATTN: DRSAR-MAS-MA
Dover, NJ 07801

CUT ALONG DOTTED LINE

FOLD BACK

REVERSE OF DA FORM 2028-2 (TEST)

APPENDIX F

TYPICAL AMMUNITION COMPONENTS

Figure F-1. 8-Inch HE M106 projectile.

Figure F-2. 155 mm HE M107 projectile.

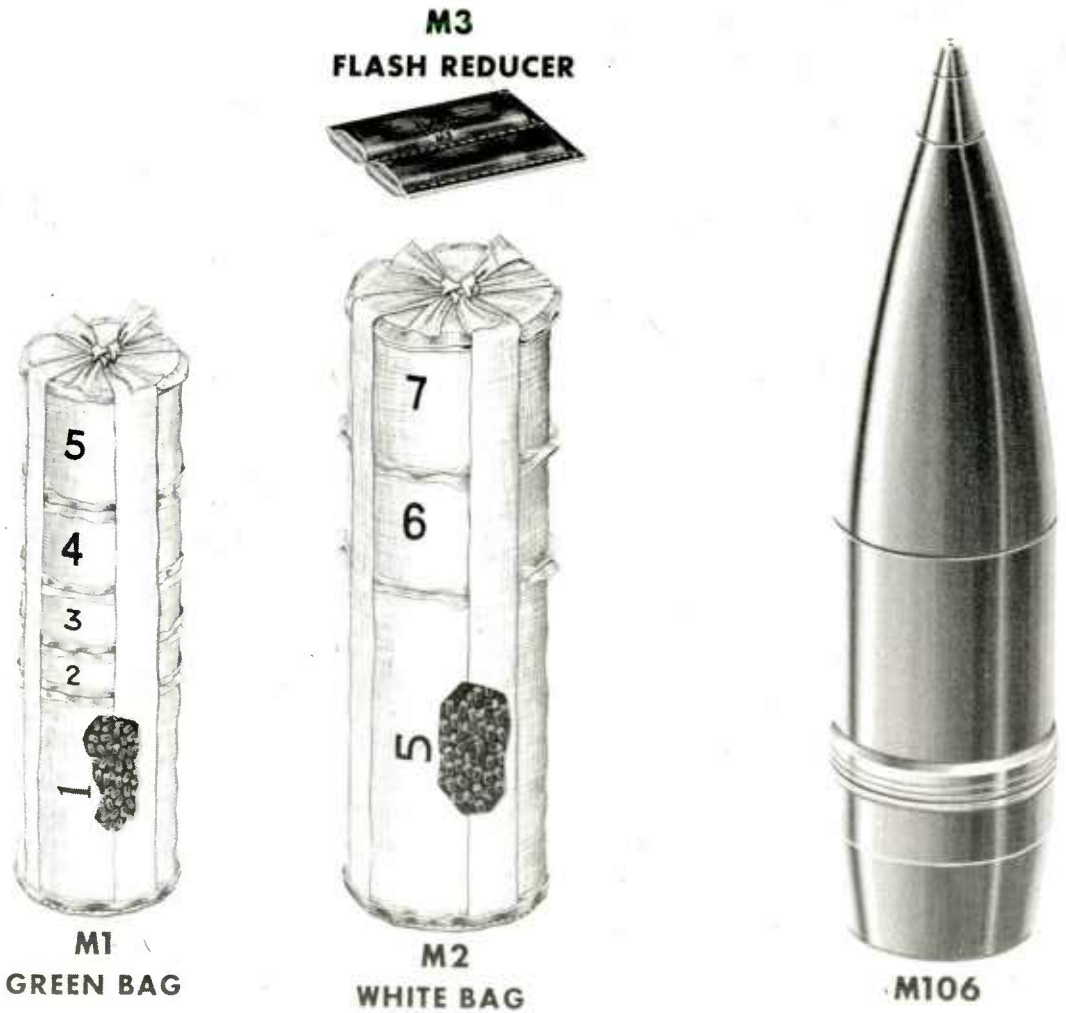
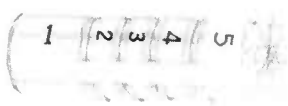
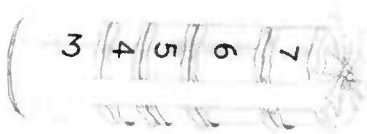


Figure F-3. Propelling charges, flash reducer, and projectile for 8-inch howitzer.



M3



M4A1

M107,HE

M110 WP,GAS

M121,CHEMICAL

M116,SMOKE

Figure F-4. Propelling charges and projectiles for 155 mm howitzer.

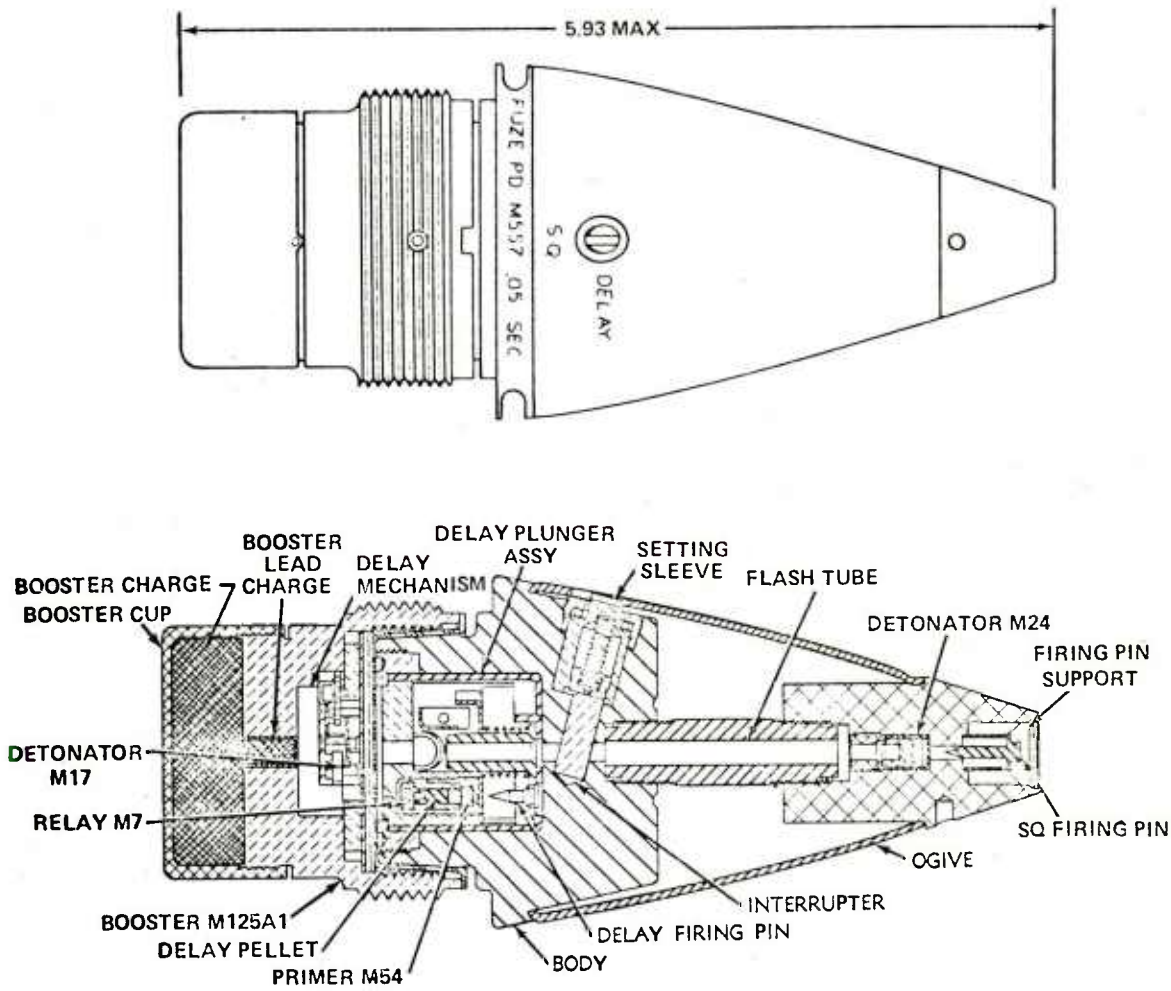


Figure F-5. Point detonating fuze M557.

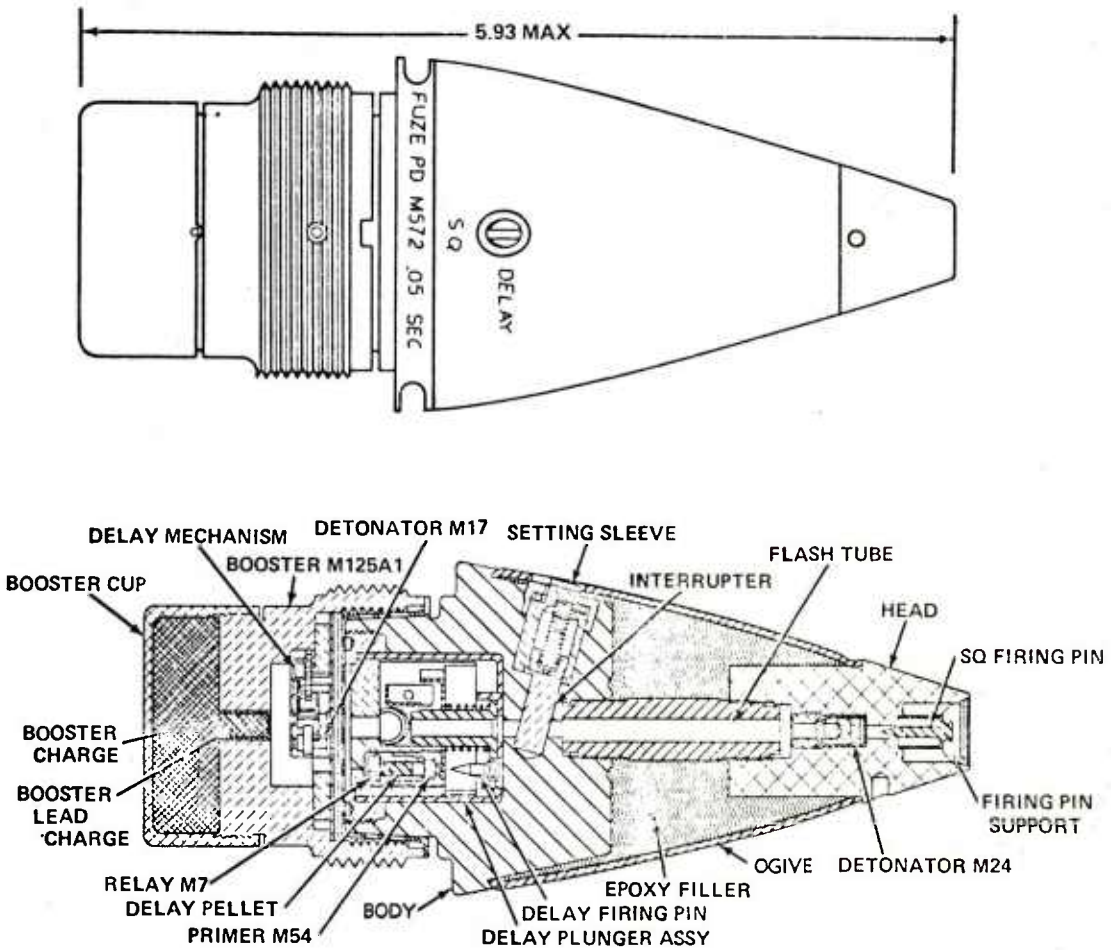


Figure F-6. Point detonating fuze M572.

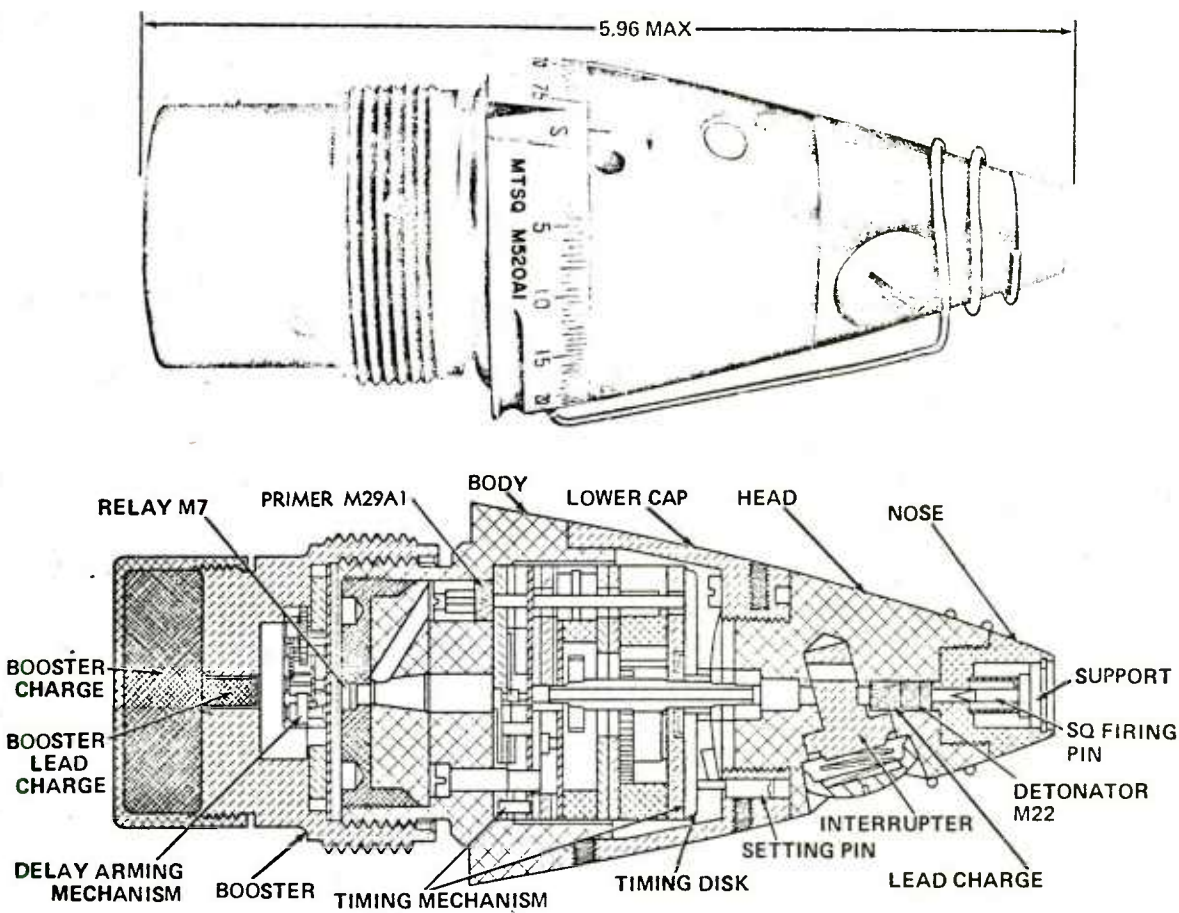


Figure F-7. Mechanical time and superquick fuze M520A1 and M520.

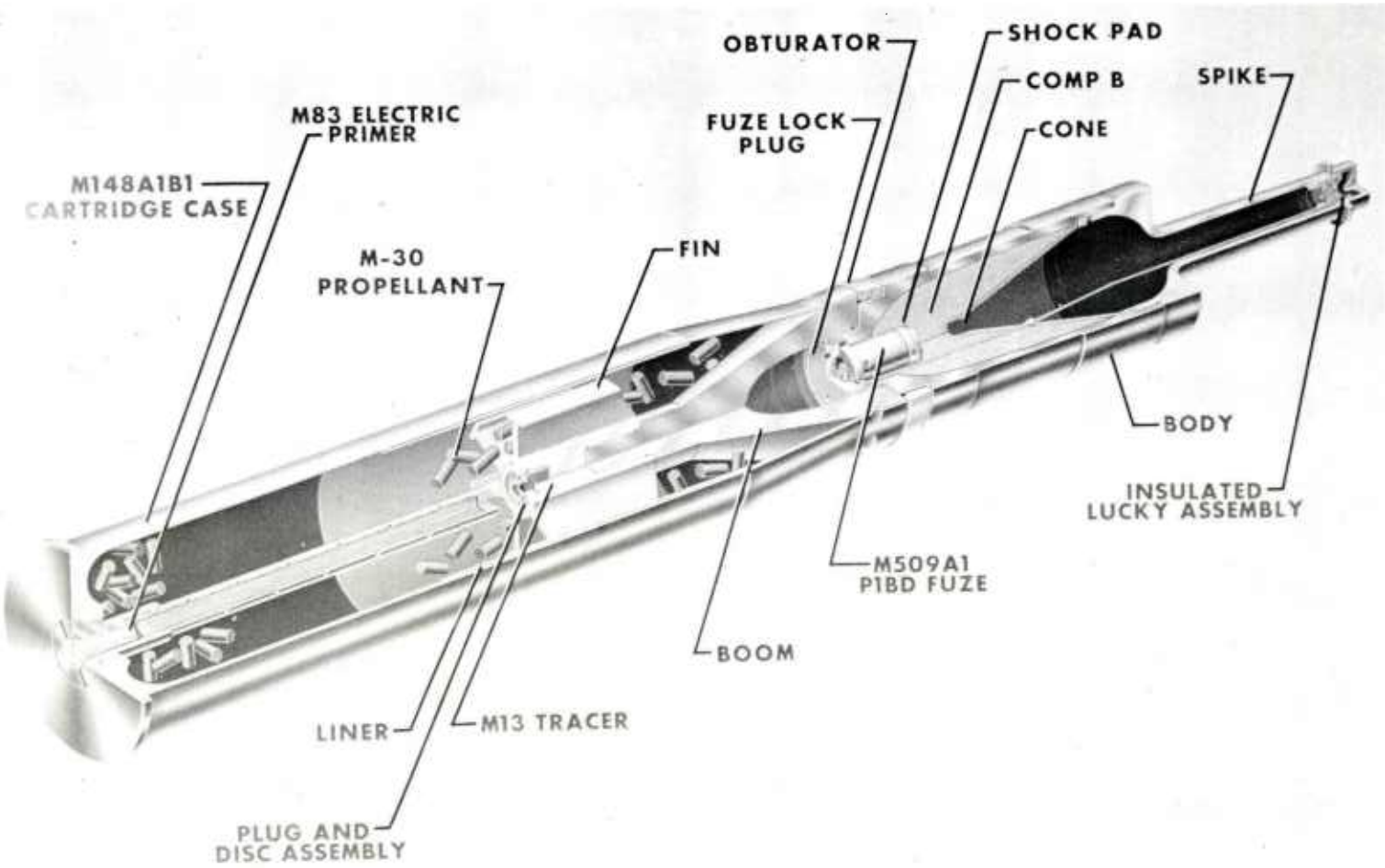


Figure F-8. 105 mm HEAT-T cartridge M456A1.

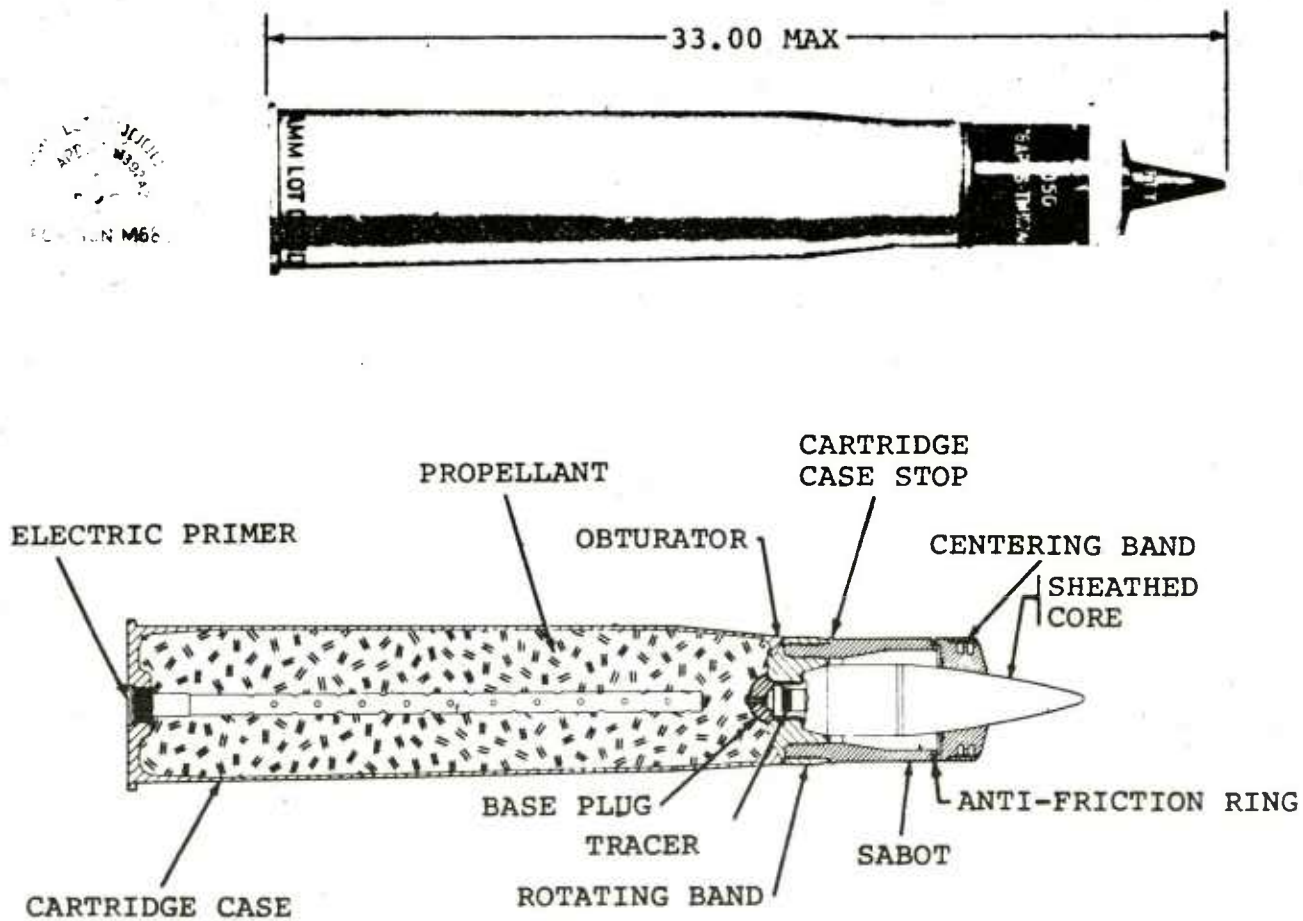


Figure F-9. 105 mm APDS-T cartridge M392A2.

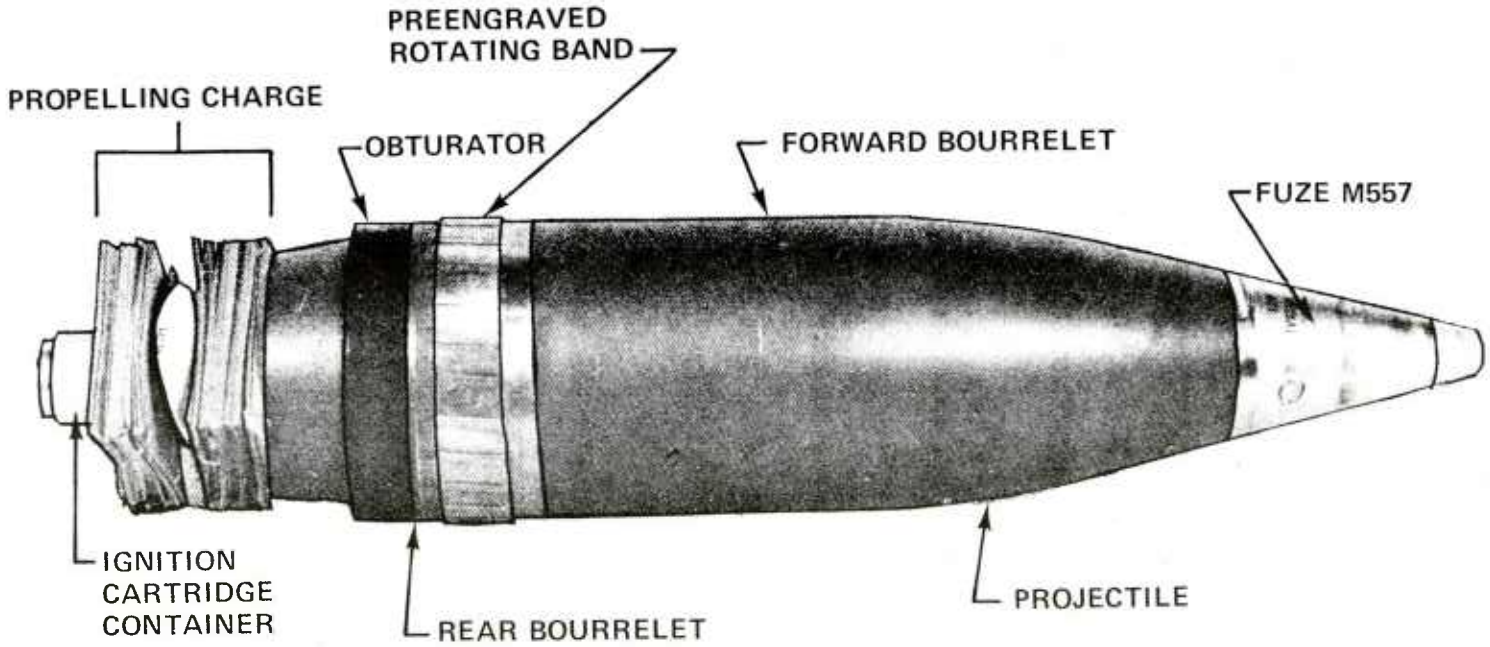


Figure F-10. 4.2-inch HE cartridge M329A2.

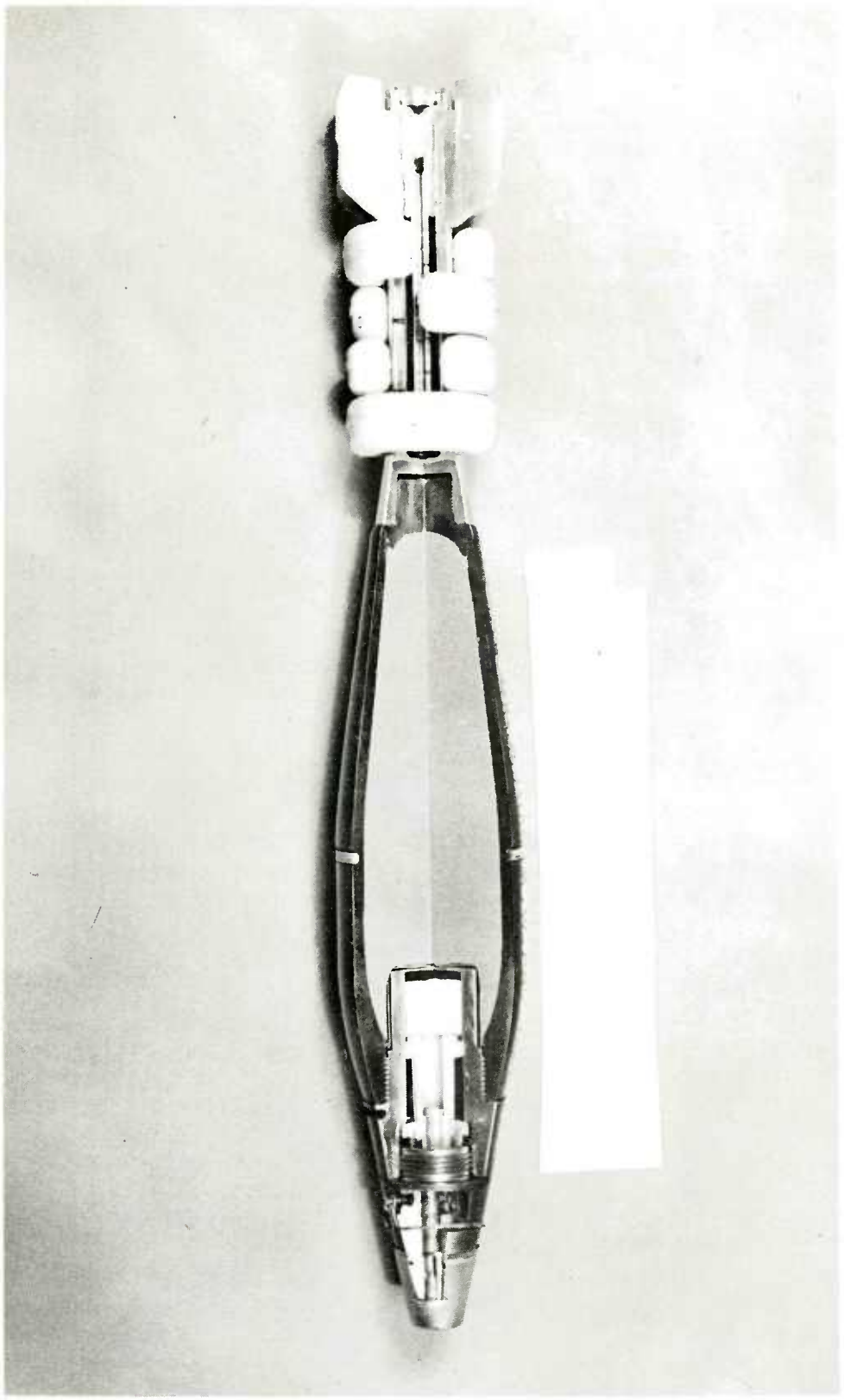


Figure F-11. 81 mm HE cartridge M374A2E1 with M567 fuze and with felted fiber increment.

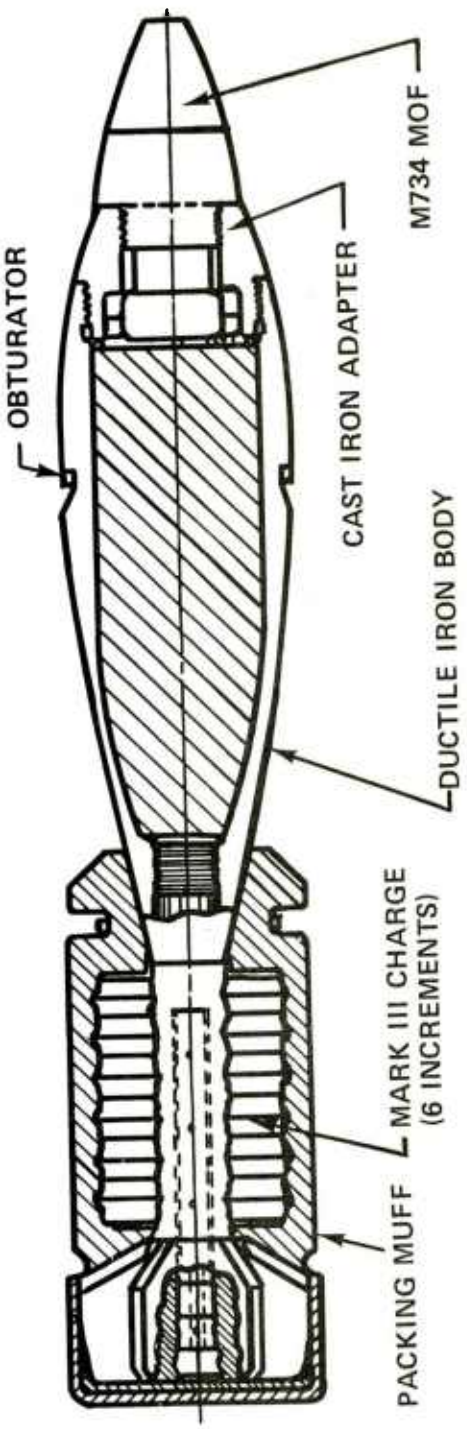


Figure F-12. United Kingdom 81 mm HE mortar bomb L31E2.

APPENDIX G

TYPICAL WEAPONS

Figure G-1. 175 mm gun M107.

Figure G-2. 155 mm howitzer M109A1.

Figure G-3. M60A3 tank (105 mm tube).

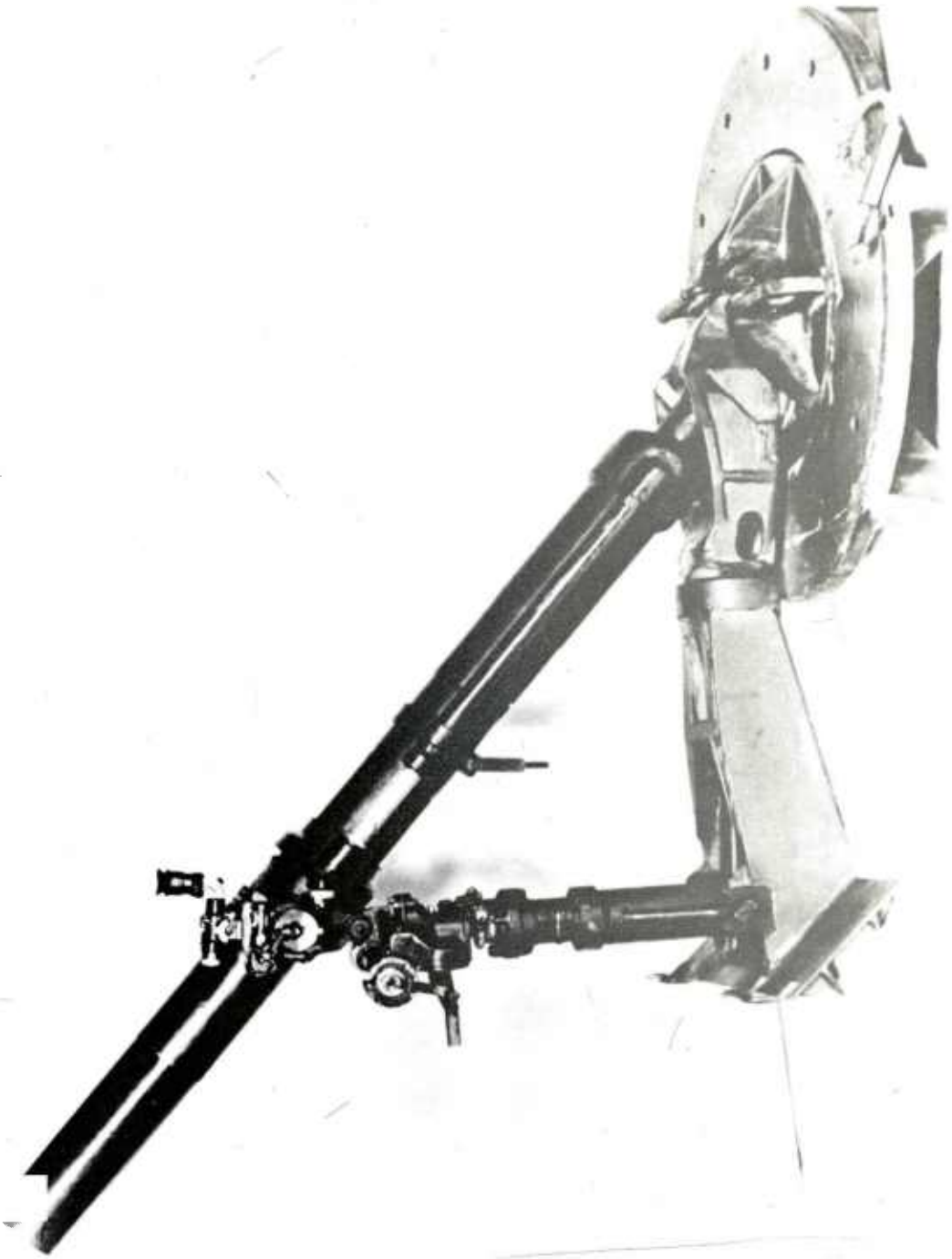


Figure G-4. 4.2-inch mortar M30.

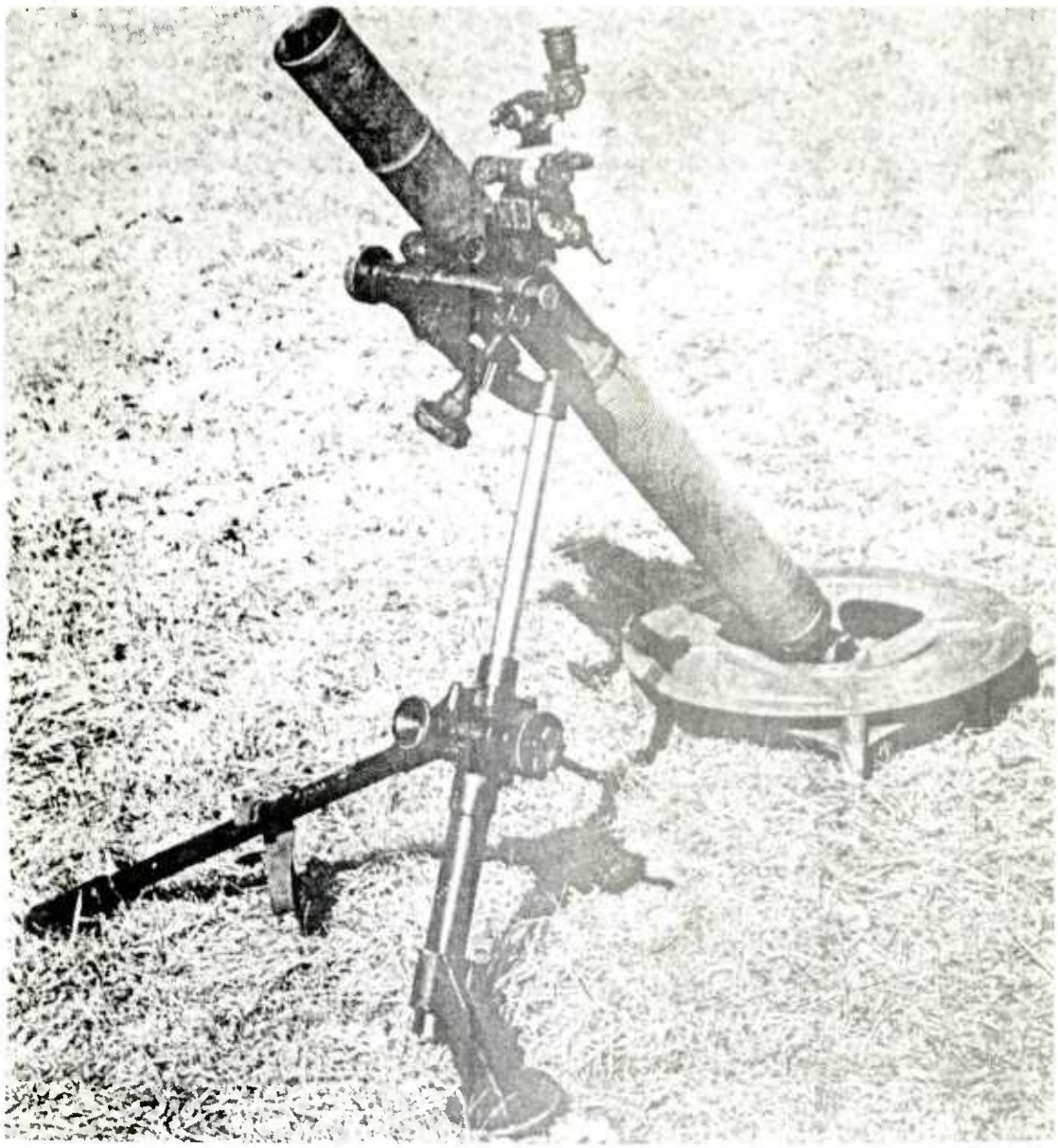


Figure G-5. United Kingdom 81 mm mortar L16A2.

LIST OF ABBREVIATIONS AND ACRONYMS

AAIP	Army Ammunition Interoperability Plan
AMMO	Ammunition
AMSAA	U.S. Army Materiel Systems Analysis Activity
AP	Armor piercing
APDS-T	Armor piercing discarding sabot-tracer
APDS-TP	Armor piercing discarding sabot-target practice
ARRADCOM	U.S. Army Armament Research and Development Command
ARRCOM	U.S. Army Armament Materiel Readiness Command
B.E.	Base ejecting
BWB	Bundesamt Wehrtechnik und Beschaffung (Federal Office for Weapons Technology and Procurement)
CBI	Clean burning igniter
CINCUSAREUR	Commander in Chief, U.S. Army Europe
COMP	Composition
DA	Department of the Army
DARCOM	U.S. Army Materiel Development and Readiness Command
DCGMA	Deputy Commanding General, Materiel Acquisition
DOD	Department of Defense
DS/T	Discarding sabot-tracer
FORCECOM	U.S. Army Forces Command

HE	High explosive
HEAT-T	High explosive antitank-tracer
HESH	High explosive squash head
HQ	Headquarters
JCS	Joint Chiefs of Staff
MAS	Military Agency for Standardization
MK II	Mark II
MOD	Modification
MPTS	Metal parts
MT	Mechanical time
NATO	North Atlantic Treaty Organization
PD	Point detonating
PRB	Poudreries Reunies de Belgique
psi	Pounds per square inch
RSI	Rationalization, standardization, and interoperability
STANAG	Standardization Agreement
TB	Technical bulletin
TDP	Technical data package
TECOM	U.S. Army Test and Evaluation Command
TNT	Trinitrotoluene
TP	Target practice
TRADOC	U.S. Army Training and Doctrine Command

TT	Teletype
USAREUR	U.S. Army Europe
USDDR&E	U.S. Department of Defense, Research and Engineering

DISTRIBUTION LIST

Headquarters
Department of the Army
ATTN: DAMA-CSM (2)
Washington, DC 20310

Commander
U.S. Army Armament Research & Development Command
ATTN: DRDAR-CG
DRDAR-LC (2)
DRDAR-LCS (10)
DRDAR-LCU-CP (20)
DRDAR-TDS (2)
DRDAR-TSS (5)
DRDAR-LCN (2)
DRDAR-LCU-E (2)
DRDAR-QAM (2)
Dover, NJ 07801

Commander
U.S. Army Materiel Development & Readiness Command
ATTN: DRCDMD
DRCRE
DRCIRD
DRCSF
5001 Eisenhower Avenue
Alexandria, VA 22333

Commander
U.S. Army Armament Materiel Readiness Command
ATTN: DRSAR-ASR
DRSAR-LEI
DRSAR-LEM
DRSAR-LEC (RSI) (2)
Rock Island, IL 61299

Commander
U.S. Army Test & Evaluation Command
ATTN: DRSTE-CM-F (2)
Aberdeen Proving Ground, MD 21005

Director
U.S. Army Materiel Systems Analysis Agency
ATTN: DRXSY-RW (2)
Aberdeen Proving Ground, MD 21005

Project Manager
Cannon Artillery Weapons Systems
ATTN: DRCPM-CAWS-AM (2)
DRCPM-CAWS-SI (2)
Dover, NJ 07801

Commander
U.S. Army Armament Materiel Readiness Command
ATTN: DRSAR-MAS-MA (5)
Dover, NJ 07801

Defense Documentation Center (12)
Cameron Station
Alexandria, VA 22314

Weapon System Concept Team/CSL
ATTN: DRDAR-ACW
Aberdeen Proving Ground, MD 21010

Technical Library
ATTN: DRDAR-CLJ-L
Aberdeen Proving Ground, MD 21010

Technical Library
ATTN: DRDAR-TSB-S
Aberdeen Proving Ground, MD 21005

Benet Weapons Laboratory
Technical Library
ATTN: DRDAR-LCB-TL
Watervliet, NY 12189

Commander
U.S. Army Armament Materiel Readiness Command
ATTN: DRSAR-LEP-L
Rock Island, IL 61299

Director
U.S. Army TRADOC Systems Analysis Activity
ATTN: ATAA-SL (Tech Lib)
White Sands Missile Range, NM 88002

Commander
U.S. Army Materiel Systems Analysis Activity
ATTN: DRXSY-MP
Aberdeen Proving Ground, MD 21005