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Report to Congressional Requesters

August 1993

OPERATION DESERT STORM

Casualties Caused by Improper Handling of Unexploded U.S. Submunitions

GAO/NSIAD-93-212

GAO

United States
General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

B-253502

August 6, 1993

The Honorable Christopher Dodd
United States Senate

The Honorable Christopher Shays
House of Representatives

During Operation Desert Storm, at least 25 U.S. military personnel were killed[1] by U.S. submunitions and others were injured. The Army attributes 16 of these deaths, including 2 members of the Connecticut National Guard's 142nd Medical Company, to inappropriate handling of these submunitions. At your request, we reviewed certain aspects of the Army's Desert Storm experience with its M42, M46, and M77 submunitions, which caused some of the deaths and injuries. Specifically, we determined whether

- the dud rate[2] for the M42, M46, and M77 submunitions as calculated during acceptance tests were higher than the Army's requirements or goals;
- U.S. soldiers, in general, and the soldiers of the Connecticut National Guard's 142nd Medical Company, in particular, were adequately warned about the dangers of unexploded submunitions;
- it was reasonable to use submunitions in areas that U.S. soldiers were expected to occupy; and
- the Army's planned improvements can reasonably be expected to reduce friendly casualties in the future.

In addition, we addressed your concerns about alleged defective submunitions from the Mississippi and Riverbank, California, Army ammunition plants. The results of our work on this issue are presented in appendix I. Our scope and methodology are discussed in appendix II.

Background

M42, M46, and M77 submunitions are small, cylindrically shaped explosive devices with a bell-like top. A looped ribbon is attached to each device to provide stabilization. Army weapon systems using these submunitions during Operation Desert Storm were the Multiple Launch Rocket System

[1]We reviewed reports prepared by the U.S. Army Criminal Investigation Division, Ordnance Missile and Munitions Center, and Forces Command to determine the number of submunition-related deaths. These reports may not include all Desert Storm deaths caused by U.S. submunitions.

[2]A dud is defined as a submunition that does not explode upon impact.

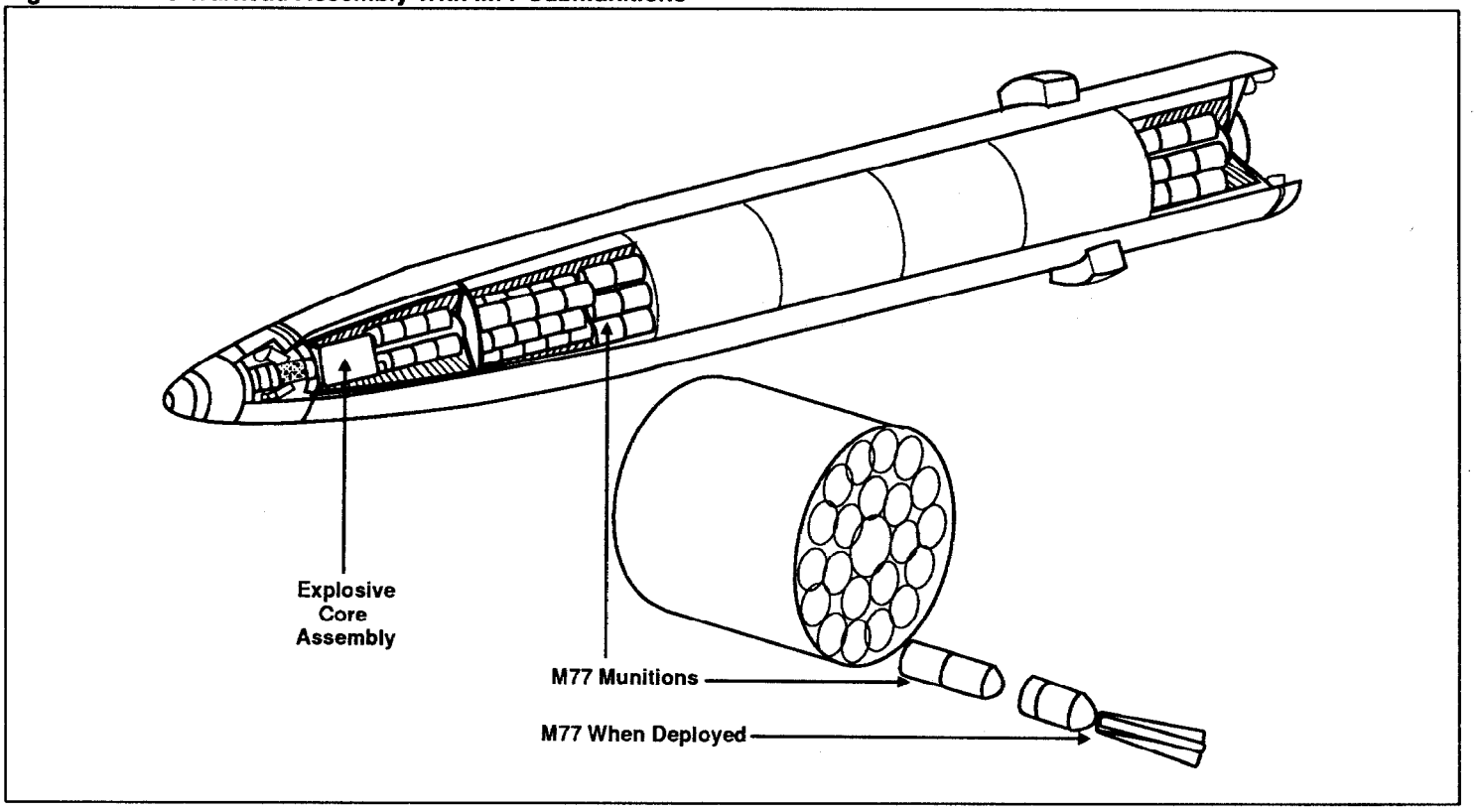
(MLRS), 155-mm howitzer, and 8-inch howitzer. The number and type of submunitions used in these weapon systems are shown in table 1.

Table 1: Army Weapon Systems Using M42, M46, and M77 Submunitions

Weapon system	Ammunition type	Number and type per rocket or projectile
MLRS	Rocket	644 M77 submunitions
155-mm howitzer	M483A1 Artillery projectile	64 M42 submunitions 24 M46 submunitions
8-inch howitzer	M509A1 Artillery projectile	180 M42 submunitions

At a preset time, the artillery round or rocket explodes, expelling the submunitions over a target area. The submunitions are expected to explode upon impact. Figure 1 shows how M77 submunitions are packed into the MLRS warhead assembly.

Figure 1: MLRS Warhead Assembly With M77 Submunitions



Source: Armament, Munitions, and Chemical Command.

Note: The Armament, Munitions, and Chemical Command (AMCCOM) is an Army subordinate command responsible for the management of conventional ammunition.

Rockets and artillery rounds are produced in groups called lots. Artillery round lots vary in size, but the majority of MLRS rocket lots contain about 3,000 rockets, or about 2 million M77 submunitions. All rockets or rounds in each lot are manufactured under the same production conditions and are considered homogeneous. Before the Army accepts a lot of rockets or artillery rounds, a sample is test fired. This test firing, called an acceptance test, provides much information about the lot, including the dud rate of the lot's submunitions. The Army requires the artillery round submunitions (M42 and M46) to have a dud rate of 5 percent or less. It has the same goal for MLRS submunitions (M77), but it has no firm requirement. The artillery rounds are tested at temperatures between 68.5°F and 72.5°F. However,

some MLRS rockets are heated to 140°F or cooled to –25°F before testing to determine how they will perform in adverse weather.

Results in Brief

The Army did not maintain data on the dud rate of submunitions actually used in Operation Desert Storm. However, based on lot acceptance tests,[3] the Army could reasonably assume that U.S. soldiers entering Desert Storm battlefields would encounter larger amounts of unexploded MLRS submunitions than desired. Lot acceptance tests on M42 and M46 artillery round submunitions showed that about 97 percent should have exploded as designed. MLRS' acceptance tests showed that the M77 dud rate ranged from 2 percent to 23 percent,[4] resulting in from 154 to 1,777 unexploded submunitions when firing a full launcher load.[5] The Army attributes the higher dud rates to design and deployment deficiencies. However, until 1989, these deficiencies were given little consideration because MLRS was developed to defend against the Soviet threat, which would not have required U.S. soldiers to occupy submunition-contaminated areas.

Although the Army warned U.S. soldiers about the danger of battlefield debris, most soldiers we spoke with said they were not usually trained to recognize specific types of submunitions. According to Army officials, its use of submunitions in Operation Desert Storm was reasonable because combat deaths may have been minimized.

Except for MLRS rockets already in inventory, the Army's improvement initiatives should reduce the dud rates and improve soldiers' safety. The Army has decided not to use its MLRS rockets with the highest submunition dud rates, but many lots still exceed the goal. The Army also has made design improvements to the MLRS submunition (M77) that should result in better reliability. However, most MLRS rockets will not contain the improved submunitions because the Army considers it too costly to improve existing inventory. The Army is making training changes that should enable soldiers entering a battlefield to recognize the hazards of handling unexploded ordnance. The Army has also taken action to increase the awareness of using submunitions in combat, including plans

[3]Dud rates under actual combat conditions may differ from lot acceptance tests. However, this was the best measure available.

[4]Rockets with the 23-percent dud rate were cooled to –25°F before testing. However, the Army has not retested the rockets to determine the dud rate when fired at temperatures similar to those experienced during Desert Storm.

[5]In a tactical scenario, soldiers generally fire a full launcher load of 12 rockets.

to develop a reporting system to identify areas where duds are known to exist.

Dud Rates Based on Acceptance Testing

Lot acceptance tests showed the artillery round submunitions used in Desert Storm should have been about 97 percent reliable, but MLRS lots exceeded their submunition dud rate goal. The Army did not maintain any data on dud rates during Operation Desert Storm that allowed us to determine (1) rounds of each type of ammunition fired and (2) submunitions that did not explode each time a round was fired. Therefore, we used data collected during lot acceptance tests to project potential dud rates for the artillery rounds and MLRS rockets used during Desert Storm.

Artillery Rounds

Based on lot acceptance test data, the Operation Desert Storm dud rate could have ranged from 2 percent to 2.8 percent for the 155-mm howitzer submunitions (M42 and M46) and from 2.3 percent to 3.3 percent for the 8-inch howitzer submunition (M42). The Army requires 95 percent of the submunitions to explode upon impact.

Artillery rounds that exceed a 5-percent submunition dud rate are generally rejected during acceptance tests. The procuring agent—in this case, AMCCOM—can grant a waiver if the acceptance criteria is not met, but AMCCOM has granted few waivers. Only 4 of the 1,649 lots produced have been accepted on waiver, and none of these lots exceeded the requirement by more than 2 percent. However, none of the artillery round dud rates experienced during lot acceptance tests reflect submunition reliability of the rounds in adverse weather conditions.[6]

MLRS Rockets

The lot acceptance test submunition dud rate of MLRS rockets, available for use during Operation Desert Storm, ranged from 2 percent to 23 percent—leaving from 154 to 1,777 unexploded submunitions from a full launcher load. Highly variable dud rates occur because the Army does not impose a submunition reliability requirement on the rocket. The MLRS Project Office, the developer of the rocket, established a maximum dud rate goal of 5 percent. However, the MLRS Project Manager informed us

[6]According to a supervisory engineer at the Army's Armament Research, Development, and Engineering Center, artillery projectiles are not tested at temperature extremes during lot acceptance tests. However, during development, the Army tests prototype projectiles at hot, cold, and ambient temperatures to ensure that they meet all user requirements, including submunition reliability.

that rockets with high submunition dud rates could not be rejected because the government furnishes submunitions[7] to the rocket contractor.

As of August 1990 when Iraq invaded Kuwait, the Army had 133 MLRS rocket lots in inventory. Based on lot acceptance test results, over half exceeded the Army's 5-percent dud rate goal. A large percentage of the lots exceeding the goal had been heated or cooled before testing, and portions of many of these lots were sent to Southwest Asia. However, in May and November 1990, four MLRS rocket lots that experienced 18-percent to 25-percent dud rates when tested at normal air temperatures were restricted so that they would not be issued. With the suspension of these four lots, the dud rates for lots sent to Southwest Asia and those still remaining in inventory ranged from 2 percent to 23 percent.

Causes of MLRS' High Dud Rates

According to a MLRS production engineer, MLRS submunition duds are usually caused by design and deployment deficiencies. He said submunition arming screws sometime fail to loosen sufficiently to initiate the arming sequence, and a submunition may hit a surface at too great an angle to detonate.

When the M77 submunition is expelled from the rocket, it tumbles erratically for 1 second to 1.5 seconds and then begins to rotate in a counterclockwise direction (the rotational direction of the rocket). If the submunition is to properly arm, its ribbon must vibrate the arming screw loose while it tumbles. Otherwise, the counterclockwise rotation could tighten the arming screw, which is designed to loosen with a clockwise rotation.

According to a Project Office Production Branch official, the vibration of the ribbon is sometimes not sufficient to loosen the screw before the submunition strikes the target. Our analysis of data collected by White Sands Missile Range[8] test personnel confirms the arming screws are often at fault. The data led test personnel to conclude that about half of the unexploded submunitions analyzed failed to explode because the arming screw was not fully loosened.

In addition, about one-fifth of the unexploded submunitions analyzed failed to function due to the angle at which the submunition hit the

[7]Before being shipped to the rocket assembly manufacturer, all submunition lots are tested to ensure they meet the Army's specifications. Those not meeting specifications are rejected.

[8]MLRS acceptance tests are conducted at the White Sands Missile Range in White Sands, New Mexico.

surface. According to a production engineer, a submunition must strike a surface at an angle of approximately 65° to 90° to explode. While Project Office technical management engineers told us they could not always determine why a submunition fails to strike at the required angle, they believe gusts of wind or uneven terrain are two causes.

High Dud Rates Not Addressed Until December 1989

Army Regulation 385-16 requires the project manager to track and analyze field data for indications of hazards inherent in material design and take positive action to correct any safety problems. From 1984 through 1989, half of the rocket lots produced exceeded the 5-percent goal. Despite this problem, an investigation of the high dud rate was not initiated until December 1989. Project office technical management engineers and a Studies Division Branch Chief in the Training and Doctrine Command System Manager's Office told us the battlefield safety of operating in areas where submunitions had been delivered was not considered during the design and early production of the system. They said the Army believed the weapon would most likely be used against the Soviet threat in Europe, where U.S. troops would probably be in a defensive position. Therefore, U.S. soldiers were not expected to occupy submunition-contaminated areas.

Warning of Potential Hazards Appeared Adequate, but Better Training Would Have Been Desirable

According to the former Inspector General of the Connecticut National Guard,[9] the Army's warnings about the potential hazards of battlefield debris should have prevented a well-disciplined soldier under adequate leadership from handling unexploded submunitions. However, he said training during Operation Desert Storm in the recognition and dangers of newer submunitions would have been desirable.

Soldiers Were Warned

Before Operation Desert Storm began, the Commander in Chief, U.S. Central Command, issued a general order to ensure that troops understood the danger of battlefield debris. To ensure soldier safety and comply with federal law,[10] this order prohibited all military and civilian personnel from taking war trophies and possessing souvenir ammunition and explosives. It also directed unit commanders and supervisors to

[9]This individual served as Inspector General of the Connecticut National Guard during Desert Storm and also conducted investigations into the removal of the commander of the 142nd Connecticut National Guard Medical Company.

[10]18 U.S.C. 842 (a)(3)(A). "It shall be unlawful for any person other than a licensee or permittee knowingly to transport, ship, cause to be transmitted, or receive in interstate or foreign commerce any explosive material . . . ."

ensure that all personnel understood these prohibitions. Members of the 142nd Medical Company and other units with whom we talked said they were repeatedly warned and understood the dangers of picking up unknown or dangerous debris from the battlefield, but most said they were not trained to recognize unexploded submunitions.

In addition, based on his investigation, the former Inspector General of the Connecticut National Guard told us that he believed members of the 142nd Medical Company had adequate warning about the dangers of objects on the battlefield. He believed that a lack of self-discipline and inadequate leadership caused at least 11 members of the 142nd Medical Company to collect unexploded submunitions as souvenirs, even though they were repeatedly warned not to touch anything. He said one officer not only collected the submunitions, but also told other members of the unit that they were harmless and would make good souvenirs. Eventually, some of these submunitions exploded—killing two members of the unit and injuring seven others.

Better Training Desirable

No Army-wide submunition recognition training was provided to soldiers prior to Operation Desert Storm. According to an action officer at the Army's Training and Doctrine Command, the Army recognizes that warnings about battlefield debris may not always prevent soldiers from handling unexploded ordnance. She said a soldier should be trained to (1) avoid all objects encountered on the battlefield and (2) recognize unexploded submunitions. Also, according to the former Inspector General of the Connecticut National Guard, warnings need to be reinforced and strengthened through formalized training that teaches soldiers to recognize specific submunitions and report their presence on the battlefield.

The Army Believes Its Use of Submunitions Was Reasonable

The Army believes that it used submunition-bearing weapon systems in a reasonable manner during Operation Desert Storm. The Training and Doctrine Command System Manager for Cannon said these systems quickly destroyed enemy targets, minimizing the number of combat deaths. However, he also acknowledged that the failure to consider the effects of unexploded submunitions increased the potential of friendly deaths.

The System Manager said that submunition-bearing weapon systems, such as MLRS, are considered to have saved many lives during Operation Desert

Storm. These weapon systems were extremely effective against a variety of targets, and they delivered large volumes of accurate fire in day or night and in all types of weather. Enemy soldiers reportedly were terrified of the submunitions and even referred to the MLRS submunitions as "steel rain."

However, Army guidance for conducting combat operations did not require commanders to consider how submunition-bearing weapon systems might affect U.S. troops. The policies primarily directed commanders to base weapon system selection on (1) the system's effectiveness against the proposed target and (2) the effects of the target-area terrain on the lethality of the system.[11] But, according to an Operation Desert Storm After Action Report, this practice caused some problems with U.S. troop movement during operations. For example, in some instances, ground movement came to a halt because units were afraid of encountering unexploded ordnance. Also, the unexploded ordnance caused friendly casualties.

The Army Has Developed Initiatives to Correct Problems

The Army has started initiatives to reduce the MLRS submunition dud rate, increase soldier awareness of submunition dangers, and use submunitions in the safest possible way. The Army has implemented some actions; other actions are still being developed. The solutions appear reasonable to correct or mitigate submunition safety issues. However, improvements to MLRS submunitions (M77) will not be incorporated into the majority of rockets in inventory. In addition, the Connecticut National Guard has taken action to improve the leadership in the 142nd Medical Company.

Actions to Reduce MLRS Dud Rate

Army initiatives to reduce dud rates include making changes to manufacturing specifications and suspending some high dud rate lots. However, because the Army considers the cost to be prohibitive, the specification changes are not expected to be incorporated into lots already manufactured. Therefore, many high dud rate lots will remain in inventory.

Manufacturer's Specifications Changed

In 1990, the MLRS Project Office began changing the M77 manufacturing specifications to reduce the submunition's dud rate. These changes required the manufacturer to reduce the amount of force, or torque, needed to loosen the submunition arming screw; lubricate all arming screws; and change the loosening direction of the screw. The Army estimates that changing the direction of the arming screw should lower the

[11]Prior to Desert Storm, field commanders were warned that submunitions should not be used in snow, swamps, or forested areas because their lethality would be decreased.

dud rate an average of 2.5 percentage points, but it has not estimated the reduction resulting from the other specification changes.

According to a Project Office production engineer, submunitions with the counterclockwise rotational screw will not be available until June 1993, when production of the basic MLRS rocket will be almost completed. Therefore, only about 3,600, or less than 1 percent of all MLRS rockets, will contain the improved arming screw.

Project Manager Directed Suspensions of Some Lots

As of November 1992, the Project Office suspended 10 of 168 lots of MLRS rockets with an estimated purchase cost of $133.7 million.[12] As previously discussed, the Project Manager suspended four lots before Operation Desert Storm, and he also suspended six other lots with high dud rates in March 1992. These six lots were suspended when the MLRS Project Manager directed that rocket lots be suspended if, based on acceptance tests, they were less than 90 percent reliable at ambient temperatures; 88 percent reliable when heated to 140°F before testing; or 86 percent reliable when cooled to –25°F before testing. According to the Deputy Project Manager, reliability rates lower than these levels would indicate a problem in the submunition production process.

After suspension of these 10 lots, nearly half of the lots remaining in inventory—with an estimated cost of $1.5 billion[13] exceed the 5-percent dud rate goal. According to a Project Office production engineer, because of the high cost involved, there are no current plans to suspend any remaining lots.

Army-wide Unexploded Ordnance Training Developed

The U.S. Army Training and Doctrine Command recognized unexploded ordnance training and safety awareness as Operation Desert Storm battlefield deficiencies. To correct these deficiencies, the Ordnance Missiles and Munitions School developed new Army-wide unexploded ordnance training. This training, which began in fiscal year 1993, is required for enlisted soldiers at all skill levels and for officers who attend the Command and General Staff College. Most soldiers will be alerted to the dangers of unexploded submunitions as well as other battlefield hazards. Only noncommissioned officers will be taught to recognize specific submunitions.

[12]This cost assumes that none of the rockets included in these lots were fired or destroyed as a result of Desert Storm.

[13]This cost is based upon the number of rockets originally produced as part of each lot and the current price per six rockets of $40,956.

The Army has produced a 12-minute film that will be shown to soldiers during basic training and, probably, during each unit's annual safety training. The unexploded ordnance project officer said that this film should provide all soldiers with a basic awareness of unexploded ordnance hazards and that soldiers in leadership roles will receive more in-depth instruction.

Actions to Increase the Awareness of Using Submunitions

The Army revised its policies and classroom instruction to make field commanders more aware of the risks involved in using submunition-bearing weapon systems. In addition, the Army plans to develop a new battlefield reporting system that will indicate battlefield areas contaminated with submunitions.

According to the Director of Fort Sill's Fire Support Division, the Field Artillery School has already added information on the hazards of unexploded ordnance. He said the school is teaching artillery officers the methods for selecting appropriate munitions, the potential dud rates of various munitions, and the impact of various munitions on the overall fire plan and maneuvering scheme.

Connecticut National Guard Initiatives

As a result of the deaths and injuries suffered by members of the 142nd Medical Company during Operation Desert Storm, the Connecticut Adjutant General directed unit command changes. According to the Director for Plans, Operations, Training, and Military Support, a complete change in the 142nd's leadership has been made and new enlistees added. The Director said the unit, as it is now configured, is better prepared for combat than it was for Operation Desert Storm.

Agency Comments

The Department of Defense (DOD) provided its formal written comments on a draft of this report and did not challenge any of the findings. DOD stated that since the report presents no conclusions or recommendations, it makes note of the draft report and has no further comment. DOD comments are contained in appendix III.

We are sending copies of this report to the rest of the Connecticut congressional delegation, the Secretary of Defense, the Secretary of the Army, and the Director of the Office of Management and Budget.

Please contact me at (202) 512-5140 if you or your staffs have any questions concerning this report. Major contributors to this report are listed in appendix IV.

Mark E. Gebicke
Director, Military Operations
and Capabilities Issues

Contents

Abbreviations

AMCCOM	Armament, Munitions, and Chemical Command
DOD	Department of Defense
MLRS	Multiple Launch Rocket System

Mississippi and California-Produced Submunitions

Army ammunition plants across the United States manufacture component parts and/or assemble M42, M46, and M77 submunitions. There has been concern regarding the quality of the metal parts and/or submunitions produced at two of these plants—the Mississippi Army Ammunition Plant and the Riverbank, California, Army Ammunition Plant. For example, in 1992, the Army confirmed that the Armament, Munitions, and Chemical Command (AMCCOM) had directed the Mississippi Army Ammunition Plant, an M42 and M46 component and assembly facility, to destroy 2.2 million unusable submunitions. Also, a former quality control inspector at the Riverbank Army Ammunition Plant, which produced metal bodies for the M42, M46, and M77 submunitions, alleged that many of the submunition bodies were defective.

Army records did not permit us to determine how many submunitions or components of submunitions used in Desert Storm were produced at the Mississippi and California plants. However, defective submunitions that may have been produced at these plants could not have increased the Desert Storm dud rate or caused any deaths or injuries because

- only one of the suspected defects, an arming malfunction, would have caused submunitions to dud and
- submunitions with this defect were not sent to Southwest Asia.

Mississippi Plant

In 1992, AMCCOM confirmed that the Mississippi plant was destroying defective M42 and M46 submunitions. The Mississippi plant identified about 4 million defective units, but AMCCOM determined that 1.8 million could be used, and directed that 2.2 million should be destroyed.

The defective submunitions were identified during routine lot sampling. During the production process, a sample of submunitions from each lot is tested to determine if the lot meets requirements. If the sampled submunitions fail, the Army assumes that other submunitions within the lot are defective and removes the entire lot from the production process.

Sample test data showed that the 4 million units had two primary defects: various submunitions (1) might not be able to penetrate the required thickness of metal or (2) failed to arm when expelled from test equipment. In addition, many of the submunitions could not be identified as part of a tested lot, therefore, inspection officials did not know if they met specifications. According to an AMCCOM quality control engineer, the

arming failure is the only identified defect that could cause a submunition to dud.

After being retested, some submunitions identified as having the arming defect were used in artillery rounds. The engineer said that additional samples were taken from lots suspended for submunition arming malfunctions and test fired from howitzers. Submunition lots that passed this more reliable test were loaded into projectiles. However, according to Army records, none of the projectiles containing these retested submunitions were sent to Operation Desert Storm.

Riverbank Plant

A former quality control inspector alleged that the Riverbank Army Ammunition Plant produced deficient submunition bodies that may have caused the deaths and injuries of U.S. soldiers during Operation Desert Storm. According to the former inspector, cracked, rusted, and deformed M42, M46, and M77 submunition bodies were produced at the Riverbank plant from November 1988 until March 1989.

However, our discussions with several ammunition and explosive specialists[1] indicate that these alleged defects would not have prevented submunitions from exploding upon impact. According to these specialists, the alleged defects could result in improper fragmentation of the body or an ineffective shaped charge. They added that if the body did not fragment as designed, it might not be as effective against personnel targets, or if the shaped charge was ineffective, the submunition might not penetrate some metal targets. However, they said the submunitions would still have exploded upon impact.

In addition, duds examined during artillery round and rocket lot acceptance tests show that duds did not result from cracked, rusted, or deformed bodies. All of the analyses indicate that the duds were caused by an arming failure or the submunition's impact angle.

[1]These specialists include the Army's senior explosive ordnance disposal officer, other personnel who had received training as explosive ordnance disposal officers or technicians, and a quality assurance specialist. These specialists are in three different Army organizations, and one is a civilian supporting a fourth Army organization.

Scope and Methodology

To determine the number of Desert Storm submunition-caused deaths, we held discussions at the U.S. Army Criminal Investigation Division, Falls Church, Virginia; U.S. Army Forces Command, Fort McPherson, Georgia; and the U.S. Army Ordnance Missile and Munitions Center, Redstone Arsenal, Alabama. We reviewed reports they compiled, but we did not independently verify the data contained in these reports.

We collected information on the performance and shortfalls of the M42, M46, and M77 submunitions by holding discussions and examining records at the U.S. Army's Multiple Launch Rocket System Project Office, Redstone Arsenal, Alabama; the U.S. Army Armament, Munitions, and Chemical Command, Rock Island, Illinois; and the U.S. Army Armament Research, Development, and Engineering Center, Picatinny Arsenal, New Jersey. We examined the dud rates for all Multiple Launch Rocket System acceptance tests and statistically sampled ballistic firing reports that provided dud rate information on the artillery rounds that contain M42 and M46 submunitions.

We originally randomly selected 120 artillery round firing reports for sampling. However, some of these reports represented rejected lots and were excluded from the sample, and other reports were missing. We adjusted the populations and sample size to reflect these factors, which reduced our sample size to 87 reports. From this reduced sample, we predicted an average dud rate, at the 95-percent confidence level, for the M42 and M46 submunitions. This estimated average dud rate is based upon tests conducted under controlled conditions and may not represent the actual rates under diverse combat conditions.

We talked to a former Riverbank Army Ammunition Plant quality assurance inspector who alleged that Operation Desert Storm deaths and injuries were caused by submunition duds resulting from poor manufacturing quality control. We also examined documents and discussed the Mississippi plant's quality control problems with production and quality control personnel at the Armament, Munitions, and Chemical Command.

We reviewed documents from and discussed training and weapon system use with officials at the U.S. Army Training and Doctrine Command, Fort Monroe, Virginia; the U.S. Army Artillery School, Fort Sill, Oklahoma; the Office of the Inspector General of the Connecticut National Guard, Hartford, Connecticut; the 142nd Medical Company, New Haven, Connecticut; and the U.S. Army Safety Center, Fort Rucker, Alabama. We

conducted our work from October 1992 through April 1993 in accordance with generally accepted government auditing standards.

Comments From the Department of Defense

OFFICE OF THE UNDER SECRETARY OF DEFENSE

WASHINGTON, DC 20301-3000

ACQUISITION

08 JUL 1993

Mr. Frank Conahan
Assistant Comptroller General
National Security and International
Affairs Division
U.S. General Accounting Office
Washington, D.c. 20584

Dear Mr. Conahan:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "OPERATION DESERT STORM:Casualties Caused By Improper Handling of Unexploded U.S. Submunitions," dated June 22, 1993 (GO Code 393491/OSD Case 9445).

As stated in the Draft, the Army has started initiatives to reduce the Multiple Launch Rocket System submunition dud rate, increase soldier awareness of submunition dangers, and use submunitons in the safest way possible. The Army has implemented some actions and other actions are being developed. As the report presents no conclusions or recommendations, the DoD makes note of the draft report and has no further comment. The DoD appreciates the opportunity to review the report in draft form.

Sincerely,

for Spencer Abraham

Frank Kendall
Director
Tactical Systems

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