

September 1990

**CHEMICAL
WEAPONS**

**Status of the Army's
M687 Binary Program**





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

National Security and
International Affairs Division

B-238454

September 28, 1990

The Honorable Sam Nunn
Chairman, Committee on Armed Services
United States Senate

The Honorable Daniel K. Inouye
Chairman, Subcommittee on Defense
Committee on Appropriations
United States Senate

The Honorable Les Aspin
Chairman, Committee on Armed Services
House of Representatives

The Honorable John P. Murtha
Chairman, Subcommittee on Defense
Committee on Appropriations
House of Representatives

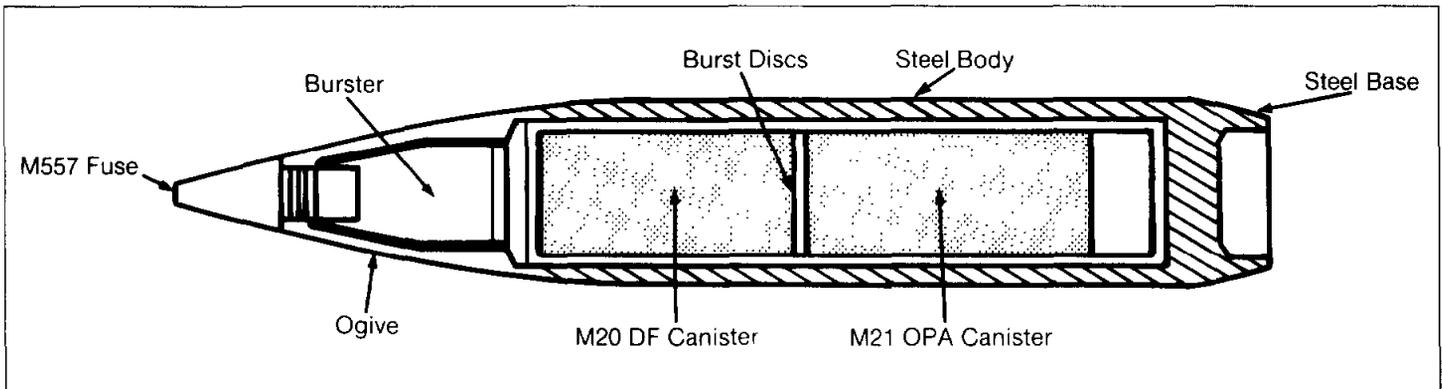
In an October 1989 report, we recommended that the House and Senate Committees on Appropriations deny the Army's \$47 million fiscal year 1990 request for 155-millimeter (mm) M687 binary chemical projectiles because the canister supplier had been unable to meet delivery schedules and a new chemical production facility needed to produce the projectiles had not been completed.¹

Although the requested funds were appropriated, the National Defense Authorization Act for Fiscal Years 1990 and 1991 (P.L. 101-189) requires the Secretary of the Army to certify that certain conditions have been met before fiscal year 1990 appropriations can be obligated to produce 155-mm M687 binary chemical munitions. The act also requires us to (1) provide monthly status reports on the contractor's progress in eliminating the backlog of M-20 and M-21 canister components to be produced in the programs for fiscal years 1986, 1987, and 1988 and (2) provide a final report, within 2 weeks after the Army issues its certification, containing our assessment of the canister supplier's ability to eliminate the backlog of M20 and M21 component deliveries by October 1, 1990. As required by the act, we have been providing you with monthly status reports since February 1, 1990.

¹Defense Budget: Potential Reductions to DOD's Fiscal Year 1990 Ammunition Budget (GAO/NSIAD-90-23, Oct. 23, 1989)

M557 point detonating fuze. The metal casings, produced at the Louisiana Army Ammunition Plant, are comprised of three parts: a steel projectile body, an ogive (i.e., a nose cone) with a burster (explosive), and a steel base. The two steel canisters, each fitted with a polymer liner, are hermetically sealed. One canister, installed in the front of the projectile, is filled with methylphosphonic difluoride (DF). The other, in the rear, contains isopropylamine and isopropyl alcohol (OPA). Each polymer-lined canister has a thin polymer plate and a very thin steel burst disc on one end. When the canisters are installed in the projectile, the burst discs face each other. Upon firing, these canister ends and discs are designed to rupture. The chemicals mix and react during flight to produce a lethal, nonpersistent nerve agent called "GB." Figure 1 depicts the M687 projectile and its components.

Figure 1: M687 Binary Chemical Projectile



The Marquardt Company is the Army's contractor for canister components. Marquardt produces M20 plastic, M20 steel, and M21 components of the M687 projectiles for the Army. The M20 canister components are shipped to the Pine Bluff Arsenal in Arkansas, and the arsenal fills them with the chemical DF. The M21 canisters are filled with OPA by Marquardt and shipped to the Louisiana Army Ammunition Plant, near Shreveport, Louisiana, where M687 projectiles are loaded, assembled, and packed with only M21 OPA canisters installed. The M20 DF canisters are packaged, shipped, and stored at a location remote from the projectile. This separation of the components ensures protection against terrorist activities and against a possible mixing of chemicals during manufacture, transportation, or storage. To prepare the projectile for firing entails removing the M21 OPA canister from the projectile, reassembling the canisters in the proper order, and installing the fuze.

In April 1990, Marquardt completed deliveries of all M-20 plastic, M-20 steel, and M-21 components to be produced in the programs for fiscal years 1986 and 1987. However, it has not yet completed deliveries of those components for the fiscal year 1988 program. Our review disclosed that the delivered components conform to original contract specifications.

Marquardt has experienced problems in meeting the original and subsequently revised contract delivery schedules even though, according to an Army official, the canister supplier had been operating multiple shifts. Table 2 shows the status of the deliveries for the fiscal year 1988 program, as of August 31, 1990.

Table 2: Percentage of Canister Components Delivered for the Fiscal Year 1988 Program

Component	Percent delivered
M-20 plastic	64.5
M-20 steel	40.5
M-21	78.0

Although Marquardt has completed deliveries of the contract quantities for the programs for fiscal years 1986 and 1987 and has delivered a portion of the fiscal year 1988 program, it was generally late in completing the deliveries, as shown in table 3.

In addition, the Army might not be able to use the new facility after it is completed because of difficulties in obtaining a sufficient supply of one of the ingredients, the chemical thionyl chloride, which is needed during the chemical production process. If the chemical cannot be obtained, the Army will not be able to use the new plant.

Chemical Weapons Production Is Scheduled to Stop

In implementing the June 1, 1990, agreement between the United States and the Soviet Union to halt the production of chemical weapons, the Secretary of Defense has decided to stop producing M687 projectiles either at the end of the fiscal year 1989 contract or when the agreement goes into effect, whichever comes first. The Department of Defense estimates that the agreement will go into effect in February or March 1991.

Also, the Secretary of Defense has determined that the Army's fiscal year 1991 budget request of \$74.3 million for M687 projectiles is no longer required. The Department of Defense would like to reprogram the \$47 million fiscal year 1990 appropriation for other purposes. For example, it would like to use a portion of the funds to place the binary munitions production lines on a standby status for possible future use.

Scope and Methodology

To make our assessment, we interviewed program and other officials at the U.S. Army Armament Munitions and Chemical Command, Rock Island, Illinois; the Aberdeen Proving Ground, Maryland; the Corps of Engineers at Pine Bluff Arsenal, Arkansas; and the Marquardt Company in Van Nuys, California. We observed the production lines at the Marquardt Company, analyzed its production capacities, and toured and determined the status of the new chemical production facility at Pine Bluff Arsenal. We obtained and analyzed data and verified it to source documents on scheduled and actual deliveries of M20 plastic, M20 steel, and M21 components and obtained program cost data. We also obtained and reviewed documents to determine whether the delivered components conformed to contract specifications. We conducted our review from December 1989 to August 1990 in accordance with generally accepted government auditing standards.

As requested, we did not obtain agency comments on this report. However, we discussed the results of our work with Office of the Secretary of Defense and Army officials and have included their comments where appropriate.

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We are sending copies of the report to the Secretaries of Defense and the Army; the Director, Office of Management and Budget; and other interested parties. Copies will also be made available to others on request.

Please contact me at (202) 275-4141 if you or your staff have any questions concerning this report. Other GAO staff members who made major contributions to this report are Henry L. Hinton, Associate Director, Army Issues; Raymond Dunham, Assistant Director, Army Issues; and Antanas Sabaliauskas, Evaluator-in-Charge, Chicago Regional Office.

A handwritten signature in black ink that reads "Richard Davis". The signature is written in a cursive style with a large, prominent "R" and "D".

Richard Davis
Director, Army Issues

Table 3: Contract Schedules and Actual Deliveries of Projectile Components as of August 31, 1990

Fiscal year	Contract schedules ^a		Actual deliveries	
	Start deliveries	Complete deliveries	Start deliveries	Complete deliveries
M20 plastic				
1986	Mar. 1988	Apr. 1989	July 1988	May 1989
1987	Apr. 1989	Nov. 1989	May 1989	Dec. 1989
1988	Nov. 1989	July 1990	Dec. 1989	^b
M20 steel				
1986	Mar. 1988	Apr. 1989	Oct. 1988	May 1989
1987	Apr. 1989	Nov. 1989	May 1989	Mar. 1990
1988	Nov. 1989	July 1990	Mar. 1990	^b
M21				
1986	Apr. 1988	May 1989	Feb. 1989	Oct. 1989
1987	May 1989	Dec. 1989	Oct. 1989	Apr. 1990
1988	Dec. 1989	Aug. 1990	Apr. 1990	^b

^aThe original October 1987 contract schedules were revised in December 1988. The schedule dates shown in the table are the revised schedules except for the start dates for the fiscal year 1986 program, which reflect original contract schedules.

^bMarquardt has not yet completed deliveries.

According to an Army official, Marquardt expects to complete deliveries of the components to be produced in the fiscal year 1988 program by the end of November 1990. On the basis of deliveries through August 31, 1990, and considering Marquardt's current production rates and production capacity, we believe that Marquardt will not be able to complete the fiscal year 1988 program before January 1991.

The New Chemical Production Plant Has Not Been Proven Out

The Army's production schedule for filling M20 DF canisters at the Pine Bluff Arsenal requires completing and operating a new facility for producing a chemical called "methylphosphonic dichloride" (DC), which is used to produce DF. In January 1988, the Army awarded a contract for a new DC production facility at the Pine Bluff Arsenal. According to the Army, \$45.1 million has been appropriated for the design, construction, and prove-out of this facility.

The Army originally anticipated that the DC production facility would be completed in October 1989 and that full-scale production would start in January 1990. However, completion slipped to the end of August 1990, and prove-out and acceptance of the new chemical plant are now scheduled for the end of October 1990.

The Congress has appropriated a total of \$224.2 million for procuring a classified quantity of 155-mm M687 binary projectiles. Table 1 shows the amounts that have been appropriated for fiscal years 1986 through 1990 and what portion of each appropriation had been obligated and disbursed as of July 31, 1990.

Table 1: Funds Appropriated, Obligated, and Disbursed for 155-mm M687 Binary Projectiles

Dollars in millions			
Fiscal year	Appropriated ^a	Obligated	Disbursed
1986	\$20.1	\$20.1	\$20.1
1987	52.3	52.3	45.1
1988	59.3	58.5	41.6
1989	45.5	44.7 ^b	16.6
1990	47.0	0	0
Total	\$224.2	\$175.6	\$123.4

^aThe appropriated amounts shown do not include the amounts provided for chemical munitions production facilities.

^bThe Louisiana Army Ammunition Plant has produced metal casings, and Marquardt is under contract to produce M20 and M21 components.

Section 171 of the National Defense Authorization Act for Fiscal Years 1990 and 1991 restricts the obligation of fiscal year 1990 funds for 155-mm binary chemical munitions until 2 weeks after the Secretary of the Army certifies that the following conditions have been met:

- Marquardt has demonstrated monthly delivery rates of M20 plastic, M20 steel, and M21 components sufficient to eliminate the production backlog of those components for fiscal year 1986, 1987, and 1988 programs before October 1, 1990.
- The delivered components conform to original contract specifications.
- Marquardt has sustained those monthly delivery rates for the components for at least 3 consecutive months.
- The new chemical production lines at the Pine Bluff Arsenal have been proven out and formally accepted by the Army.

Production Backlog Has Not Been Eliminated

The Army recognized, at the end of June 1990, that Marquardt could not complete deliveries by October 1, 1990, of the undelivered M20 and M21 canister components to be produced for the fiscal year 1988 program. We agree with the Army's assessment, because Marquardt does not have the capacity to deliver the components at the required rates.

We are sending you our final report because the Army recognizes that the canister supplier cannot eliminate the backlog of deliveries by October 1, 1990, and therefore cannot issue the required certification. In addition, the certification process is a moot issue because the Secretary of Defense has decided that the fiscal year 1990 appropriations will not be used to procure M687 binary chemical projectiles.

Results in Brief

Although the canister supplier—the Marquardt Company, Van Nuys, California—has completed deliveries of the canister components to be produced in the binary chemical munitions programs for fiscal years 1986 and 1987, it has not met the scheduled delivery of components for the fiscal year 1988 program. Marquardt cannot eliminate the fiscal year 1988 program backlog by October 1, 1990, because it does not have the production capacity to do so. According to an Army official, Marquardt expects to complete the fiscal year 1988 program by the end of November 1990; however, on the basis of the contractor's current production rates, we estimate that it will not be completed before January 1991.

Also, the Army originally anticipated that a new chemical production facility needed to produce chemicals for M687 projectiles would be completed in October 1989 and that full-scale production would start in January 1990. However, completion slipped to the end of August 1990, and prove-out and acceptance of the new chemical production facility are now scheduled for the end of October 1990.² Nevertheless, the Army might not be able to use the new facility after it is completed because of difficulties in obtaining a sufficient supply of a chemical needed during the chemical production process.

In any case, the fiscal year 1989 program is expected to be the Army's last procurement program for M687 projectiles because on June 1, 1990, the United States and the Soviet Union agreed to halt the production of chemical weapons.

Background

The 155-mm M687 binary projectile was developed to be used with the Army's most common fire support system, the 155-mm howitzer. The projectile consists of metal casings, M20 and M21 canisters, and the

²"Prove-out" is an Army term used to describe the process of demonstrating a plant's production capability.

