United States General Accounting Office

# GAO Testimony

For Release
on Delivery
Expected at
10:00 a.m. EST
Tuesday
March 3, 1987

## Department of the Army's Chemical Munitions Disposal Program

Statement of
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Before the
Subcommittee on Military Construction
Committee On Appropriations
United States Senate

Mr. Chairman and Members of the Subcommittee:

I am pleased to appear before the Subcommittee to discuss the Army's chemical munitions stockpile disposal program.

Public Law 99-145 directs the Secretary of Defense to carry out the destruction of the United States stockpile of lethal chemical agents and munitions by September 30, 1994. The law specifically directs that a plan be developed defining the safest and most effective means of disposing of the stockpile. The Army provided such a report to the Congress in March 1986 which spelled out implemenation plans for the following three possible alternatives: (1) on-site disposal at each of the eight existing continental U.S. storage locations; (2) transportation to two regional disposal centers; and (3) transportation to a national disposal center in the continental U.S. (Because the National Environmental Policy Act requires that agencies consider no action as an alternative, the Army added continued storage as a fourth alternative.)

The National Environmental Policy Act also requires agencies to develop an environmental impact statement when making major program decisions. The statement must discuss significant environmental impacts and inform decisionmakers and the public of reasonable alternatives to avoid or minimize adverse impacts. The Army's draft impact statement, issued in July 1986, analyzed the four alternatives. The statement also presented the Army's preferred alternative for disposal which was to build disposal centers at the eight storage locations.

The Army plans to issue a final environmental impact statement in December 1987 and will, at least 30 days subsequent to the final statement, decide its method of disposal.

At the request of the Chairman, Subcommittee on Investigations, House Committee on Armed Services, we reviewed issues related to the draft environmental statement. Specifically, we were asked to determine: (1) whether the supporting documentation fully addressed all aspects of risk assessment; (2) whether the cost data were fully supportable and reasonable; (3) whether the current incineration technology has full-scale production capabilities; (4) whether the Army is seriously considering other destruction technologies; and (5) whether the Army will be able to meet the mandated 1994 destruction deadline.

RISK ASSESSMENT

The Army's draft statement describes the overall disposal program, the munitions in general, the four alternatives and their associated risks. To determine the risks and potential effects of each alternative, the Army created generic or common communities and environmental settings and used these to assess the potential impacts of normal operations and accidental agent releases on humans, the environment, and local economic and social conditions. The assessment of accidental agent releases included both worst case and most likely accident scenarios. The Army also compared the common communities and environments to the eight storage sites and noted any variances. The Army plans to do additional site-specific studies after deciding on a final disposal option.

In assessing the risk, the Army relied on various hazard and risk analyses which had been conducted for disposing of M55 rockets containing nerve agents GB and VX. An Army contractor integrated these analyses of accidents and their probabilities along with qualitative estimates of risk for other chemical munitions in the stockpile. To define accident consequences, Army contractors provided preliminary estimates of the amount of agent released and, using atmospheric modeling techniques, the distance downwind released agents would travel. Finally, the Army used this information to estimate potential human health and environmental effects for the alternatives.

Using input from Army staff, contractors, other agency experts, public comments, and congressional hearings, we identified areas in the draft statement where: (1) the Army's analysis was incomplete; (2) uncertainties affected the impact analysis; and (3) limitations in the supporting data bases and available research restricted determination of program effects.

Incomplete Analysis

We identified four areas of the draft statement where risk assessment was incomplete. These areas were also identified by the Army and plans are underway for improvements in the final environmental statement. First, we found that hazard and risk analyses included calculated accident probabilities for M55 rockets only. The Army did not have similar analyses for other types of stored munitions and relied on a qualitative assessment of the risk probabilities. In conducting a more detailed risk analysis

subsequent to those in the draft statement, Army contractors have analyzed more than 460 additional accidents.

Second, because the rail transportation plans were not fully defined, analysts said some potential accident scenarios for the regional and national disposal options were not identified. As a result, the risk and potential impacts associated with transportation were not included in the comparison of disposal alternatives. Some of the public comments received by the Army on the draft also noted that alternative methods of transporting munitions were not adequately assessed. Army contractors are now developing rail, air, and barge transportation plans and are convening a panel of experts to evaluate the plans.

Third, emergency response was defined as a socioeconomic issue but its impact was not fully assessed. The Army has recognized that emergency response could significantly impact local resources. An Army contractor and agency officials suggested that the magnitude of emergency response activities could affect the selection of the disposal alternative. For example, emergency response under the regional or national alternative could be very costly if all communities along the transportation route have to have a response plan. A contractor is now developing an emergency response concept plan for the Army.

Fourth, the Army's air monitoring technology and its limitations were not described in the draft environmental statement. The Army is exploring other technologies to improve response time. The Army has also requested that the National

Institute for Occupational Safety and Health evaluate the current monitoring technologies and alternative methods for the program, and plans to expand the monitoring section of the final statement.

Uncertainties Limit The Analyses

The draft statement contains analytical uncertainties which affect the accuracy of fatality estimates and the determination of health and environmental impacts. The Army relied on an atmospheric dispersion model, D2PC, to estimate how far chemical agents might accidentally travel and reach the public and environment. Thus, the model results are a major component of the risk assessment. In describing the model's assumptions and logic, analysts acknowledged its limitations and uncertainties in predicting the downwind distance of an agent cloud released during an accident. Others knowledgeable in the field also noted these shortcomings but generally agreed that the D2PC model was the most appropriate dispersion model for this program. Nevertheless, because analysts used these travel distances to quantify expected fatalities in the statement, we believe the shortcomings of the model and its limitations on determining program effects should be highlighted in the final environmental impact statement.

Data Limitations

Limited available data affected risk assessment results. Analysts had limited actual and research data to determine either the lethal or long-term effects of accidental releases on humans. Actual human toxicity data was based on primarily World War II exposures of young, healthy adult males and may not reflect effects

on other segments of the general population. Researchers also had to infer potential human health effects from data on the effects to animals. Analysts said because of limited data, they could not determine various long-term effects, such as cancer or reproductive problems, or quantify non-lethal effects.

Researchers said they could describe but not quantify potential environmental effects on animal, plant, and marine life and surface waters. For example, in their attempt to determine impacts on wildlife, analysts extrapolated data from domestic animal exposures. Also, little data exists to determine effects on plant life, or how mustard agent behaves in water.

A third area where researchers said they could describe but not quantify the effects of the disposal program was the socioeconomic impacts on communities. Analysts said limited research from similar programs, such as nuclear power plants, did not show a causal link between programs and changes in communities' economy, but did indicate potential effects on their quality of life.

Finally, while the draft environmental statement acknowledged sabotage and terrorism as program risks, Army and contractor staff stated no data base exists to calculate legally defensible probabilities of such events. Thus, the Army's risk assessment does not include the risk of sabotage or terrorism.

COST ESTIMATES

The Army has estimated the total costs for the chemical munitions disposal program at about $2 billion regardless of whether the on-site, regional, or national alternative is selected. Although the estimates are close in total, specific cost elements such as those for construction, equipment, and transportation--vary among the alternatives. For example, while the on-site alternative requires more buildings and more equipment than the regional and national alternatives, the regional and national alternatives require transportation of the chemical munitions inventories to the disposal sites which is not necessary for the on-site alternative.

Our analysis indicated that the cost estimates were generally supportable and reasonable except in the following areas.

The transportation cost estimates are understated because the estimates do not include some substantial considerations such as (1) emergency response for communities along the rail transportation routes, and (2) upgrade or repair of railroad lines as necessary.

The other area where we identified a potential variance from the Army's cost estimates is for procuring and installing equipment. To estimate the costs, the Army used design data from Johnston Atoll where a disposal center is currently under construction and engineering estimates with adjustments for sites in the U.S. The Army has recently used actual costs collected from the Johnston Atoll project to update their estimates. They have found that their original estimates were lower than actual costs

for equipment by $11.7 million and equipment installation by $3.9 million. They plan to continue updating all estimates as actual data become available.

DISPOSAL TECHNOLOGIES

At present the Army is primarily considering two disposal technologies. The most fully developed and tested is what is commonly referred to as the baseline technology. The second technology, cryofracture, is being explored by an Army contractor and has not been operationally tested.

The baseline technology was developed at the Chemical Agent Munitions Disposal System or CAMDS facility, located at Tooele Army Depot, Utah. Since 1979, Tooele has destroyed 19,000 projectiles without explosives and nearly 18,000 M55 rockets, both containing GB nerve agent. The CAMDS facility was designed for developing and testing disposal technology and equipment.

At CAMDS, explosive and agent are removed from the projectile and mortar rounds by disassembling the parts and draining the agent from projectiles without explosives. The M55 rockets are dismantled using a rocket shear machine which first drains the agent and then cuts the rockets to expose the explosive. After removal, CAMDS disposes of the explosive and the agent and decontaminates the munitions bodies by using four specialized furnaces.

The CAMDS process, equipment and furnaces were the bases for the Johnston Atoll Chemical Agent Disposal System design. The Johnston facility is currently under construction and will be the

first to go into operation. The CAMDS facility has only served as a test facility and has not operated on a full-scale production basis. CAMDS has been used to simulate production at Johnston to determine whether or not planned production rates can be achieved. Although the CAMDS simulation has not duplicated the Johnston facility, the Army has concluded that the planned production rates of the equipment can be achieved.

Cryofracture Technique

While the Johnston Atoll facility design was being developed the Army continued to search for improved technologies that would reduce the cost and/or increase the safety of the disposal program. After considerable research the Army awarded a contract to test the scientific and engineering feasibility of a technology called cryofracture. This technology generally involves freezing the thick walled projectiles in a nitrogen bath to the point of zero ductility, after which the projectiles are crushed in a large hydraulic press. The frozen particles, including explosive, agent and metal parts are incinerated in a single furnace. The furnace selected for the thermal aspects of the cryofracture process was a rotary kiln.

As of November 1986, the mechanical process of the cryofracture technology had been tested quite extensively on projectiles and mortar rounds without explosive or agent. While some preliminary testing on rockets and mines had been carried out, the equipment had not yet been adapted to these munitions nor to bulk items.

Some testing of the thermal aspects of cryofracture has been conducted using a kiln installed at CAMDS. Items fed into the kiln were not randomly crushed as would result from the press, but were hand prepared mixtures simulating the contents of various munitions.

The present contract for cryofracture includes the design of a production scale cryofracture system known as MOD 1, which may be constructed at Tooele Army Depot. The design of MOD 1 is due to be completed in early 1988. Engineering experts we contacted generally expressed the opinion that given time for development, the cryofracture technology could be applied. Several experts pointed out, however, that it is a new technology and has more knowledge-gaps than the technology which will be applied at Johnston Atoll.

We were informed by contractor personnel that the primary benefits of cryofracture are most readily achieved when processing projectiles. In fact, one engineer stated that the cryofracture process offers little or no advantages when used on other munitions and it would not be practical for use at locations with all bulk agent.

The Army plans to have an independent committee of experts develop the evaluation criteria for selecting the technology for use in destruction of the continental U.S. stockpile. The committee will review all technical data and will first make a recommendation on whether the MOD 1 facility should be constructed. If MOD 1 is built, the committee will develop or approve a test

program for MOD 1 and for the Johnston Atoll Chemical Agent Disposal System and will monitor the testing. Upon completion of the testing the committee will evaluate the test results and will recommend a technology for use in destruction of the stockpile.

Currently, cryofracture has not proven to be a less expensive or safer technology than the baseline technique. Cost estimates show that cryofracture would be significantly more expensive and, more importantly, no risk assessments have been completed to quantitatively compare the safety of the two methods.

IS 1994 ACHIEVABLE?

The Army is currently facing some obstacles to achieving the September 1994 deadline for disposal of the chemical munitions stockpile. According to Army staff, efforts are underway to obtain the environmental permits necessary for construction of the facilities. The Army has applied for permits in each of the states where the munitions are stored and has asked that the normal 18 to 24 month approval process be expedited to 16 months. Applications were submitted to all eight states even though the Army has not decided whether disposal facilities will be built at all eight locations, two locations or one.

In late January 1987, Army staff informed us that they could meet the environmental permitting process and begin construction in fiscal year 1988. However, one of the eight states has responded by stating it cannot expedite the permitting process and the normal permitting time of 18 to 24 months will prevail. Two other states, Maryland and Kentucky, have said they prefer waiting for the Army's

site-specific environmental assessments before taking final action on permitting. The Army does not plan to do site-specific assessments until after filing its final decision in January 1988. If these two states do not act on the Army's permit application until 1988, it is questionable whether construction can start on schedule.

The Army's schedule for issuing the final environmental impact statement originally called for it to be issued in December 1986. That date has slipped one year to December 1987. In addition, according to Army staff, the improvements being made in the environmental impact statement could significantly change the impacts analysis and program alternatives could vary from the draft statement. If this occurs, the Army may have to prepare another draft and allow another 45 day public comment period. This would extend issuing the final statement another three months. The decision regarding the need for a second draft statement will, according to the Army, be made in consultation with the President's Council on Environmental Quality.

Continued Storage

If the 1994 deadline for disposal of the chemical munitions stockpile is extended the stockpile would remain in storage. According to Army staff, in 1985, the Army's Armament, Munitions, and Chemical Command undertook a test of the M55 rocket propellant. The rockets are thought to be the most volatile aspect of the storage program. Every rocket lot was sampled to determine the loss of propellant stabilizer. Originally the rocket propellant

included 2 percent stabilizer. The Army's criterion for an unacceptable stabilizer level is .2 percent. Results of the 1985 study showed the worst test case had a 1.31 percent and the Army concluded the rockets had another 25 years of expected life and posed no known storage hazard.

Some Army staff were concerned that the Army had only one test program to assess the stabilizer's degradation. Consequently, the Army has tasked its armament command with testing the propellant every two years. The Army is currently conducting its second test of the propellant stabilizer. Army staff predict the samples will all be taken by June 1987 and analyses will be completed by July.

Mr. Chairman, the Army obviously is facing a very difficult task. A great deal of study has gone into the safest way to dispose of these munitions. In preparing its environmental impact statement the Army used information which was limited in applicability due to incomplete data sources or modeling constraints. We have discussed some of those weaknesses here. Additional studies and analyses will probably not eliminate all these shortcomings. For example, a hazard and risk analysis will have uncertainties regardless of its completeness. The Department of Health and Human Services, Center for Environmental Health, complemented the Army's health effects analysis and suggested that the Army should not postpone disposal in order to fill the existing gaps in its analyses.

We believe that in preparing the Draft Environmental Impact Statement, the Army could have more explicitly pointed out the data

and methodology weaknesses and their impact when comparing alternatives. According to the Army, the final environmental statement currently being prepared will correct some of the analytical weaknesses and should more explicitly address those areas where weaknesses cannot be corrected.

Mr. Chairman this concludes my statement. We will be glad to respond to your questions.