

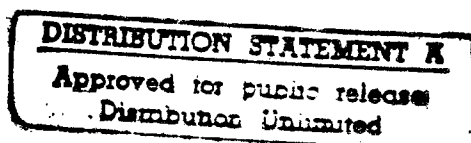
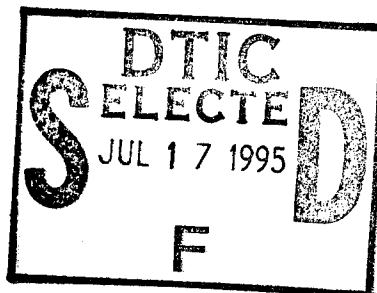
GAO

Report to the Chairman, Subcommittee
on Environment, Energy and Natural
Resources, Committee on Government
Operations, House of Representatives

November 1994

POLLUTION PREVENTION

Status of DOD's Efforts



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National Security and
International Affairs Division

B-258433

November 9, 1994

The Honorable Mike Synar
Chairman, Subcommittee on Environment, Energy
and Natural Resources
Committee on Government Operations
House of Representatives

Dear Mr. Chairman:

You requested that we provide information on the status of the Department of Defense's (DOD) pollution prevention efforts. Specifically, you asked us to determine

- the extent to which DOD has collected and reported information on its inventories and releases of toxic chemicals;
- what progress DOD has made in reducing the use of toxic chemicals;
- the challenges DOD faces in achieving reductions in the use of toxic chemicals, including the progress DOD has made in reviewing and revising military specifications; and
- the extent to which DOD has incorporated pollution prevention goals in its procurement and inventory processes.

On October 5, 1994, we briefed your staff on observations emerging from our work. This report presents the information that we provided during the briefing.

Background

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Pollution is caused by the release of wastes into the environment. Hazardous wastes result from the use of toxic materials found in a variety of products, such as chemicals used in thinning paint, while nonhazardous wastes, such as scrap paper, do not contain toxic materials. A glossary of terms is at the end of this report.

In August 1993, the President signed Executive Order 12856, which specifically requires federal agencies to take actions to reduce pollution, including implementing the Pollution Prevention Act of 1990 and the Emergency Planning and Community Right-to-Know Act of 1986. The Pollution Prevention Act of 1990 established a national policy for reducing pollution at its source as the method of choice in preventing pollution. Other methods include recycling waste materials, treating wastes, and disposing of wastes. The Emergency Planning and Community

Right-to-Know Act of 1986 establishes a requirement to, among other things, inventory toxic chemicals and to measure and report certain releases of hazardous wastes into the environment from certain public and private facilities. This act had initially excluded most government facilities.

Executive Order 12856 specifically requires federal agencies to place a high priority on funding to reduce pollution by identifying and eliminating or reducing requirements for toxic chemicals in military specifications and by incorporating pollution prevention objectives into purchasing decisions. Agencies are also required to monitor compliance with the order and submit annual reports to the Environmental Protection Agency (EPA) beginning on October 1, 1995. EPA is responsible for convening a high-level interagency task force to assist agencies in implementing the order, providing technical advice to agencies when requested, and providing guidance and monitoring agency compliance with certain aspects of the order related to reporting and emergency planning.

Results in Brief

DOD is in the process of gathering information on toxic chemical inventories and releases and anticipates it will have this information by July 1, 1995, the reporting date required by Executive Order 12856. To help DOD collect this information, a DOD-wide system is being developed but it may not be ready in time to meet the reporting requirement. EPA has provided draft guidance to federal agencies on collecting and reporting information on toxic chemicals. DOD and EPA are negotiating several of the proposed provisions in EPA's draft guidance to reduce implementation costs. EPA could not be certain when final guidance would be issued. (See app. I.)

The extent that DOD has reduced the use of toxic chemicals cannot be measured because that information is not now available. DOD's past efforts have focused on treating and controlling pollution generated from processes rather than eliminating the use of toxic chemicals. DOD has reported progress in reducing the amount of hazardous waste disposal and the use of toxic chemicals. Much of the reported reductions have been achieved through reducing the volume, but not the toxicity of hazardous waste. For example, while removing water from hazardous waste reduces overall waste volume, it does not reduce the amount of toxic substances in the waste. (See app. II.)

DOD believes that significant reductions in the use of toxic chemicals will be difficult. Making reductions in the use of toxic chemicals will require more research, development, testing, and evaluation to identify potential substitute processes and materials. The services believe their current estimates of about \$2 billion during fiscal years 1994 through 1999 for pollution prevention efforts exclude potentially significant costs, such as the costs to implement all the projects that are likely to be required to achieve reductions, related changes in processes, and to identify and test potential substitutes for toxic chemicals. (See app. III.)

As required by Executive Order 12856, DOD is reviewing military specifications and standards that call for the use of toxic chemicals in repairing and maintaining weapon systems and facilities. DOD needs to identify requirements for toxic chemicals as the first step in revising these requirements to allow the use of proven substitute materials and processes. DOD will not likely meet the Executive Order requirements to review and revise all military specifications and related technical documents by the deadline. This is because each specification must be analyzed separately to determine whether the requirements for toxic chemicals are necessary and whether a suitable less toxic substitute is available or should be developed. This process also includes testing potential known substitutes, conducting research and development to identify substitutes, the administrative process of making the revisions, and modifying weapon system hardware and maintenance facilities and equipment. DOD is emphasizing the use of commercial practices and performance-based specifications to minimize the use of military specifications and standards. Such an emphasis could reduce the review and revision effort because fewer military specifications and standards would need to be reviewed. (See app. IV.)

The services have not comprehensively incorporated environmental concerns in the design, development, and production of weapon systems, but are beginning to take steps to do so. DOD has not, on a systematic basis, revised its procurement and acquisition regulations to address environmental pollution concerns. Also, DOD's supply system is not designed to systematically provide visibility and control over hazardous materials purchases, and acquisition regulations do not provide guidance for addressing environmental concerns in day-to-day purchasing decisions. DOD is developing approaches to provide better visibility and control over hazardous materials inventories to help reduce the generation of hazardous wastes. (See app. V.)

Scope and Methodology

We collected data from DOD, the Air Force, the Army, the Navy, and the Defense Logistics Agency to answer our objectives. We also discussed pollution prevention issues with representatives of 7 major commands and 12 installations (see app. VI) and EPA.

We conducted our review from November 1993 to September 1994 in accordance with generally accepted government auditing standards. As requested, we did not obtain written agency comments on this report. However, we discussed the results of our work with DOD officials and incorporated their comments as appropriate.

Unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after its issue date. At that time, we will send copies to interested congressional committees and Members of Congress; the Secretaries of Defense, the Army, the Navy, and the Air Force; the Administrator, EPA; and the Director, Office of Management and Budget. We will also make copies available to others on request.

Please contact me at (202) 512-8412 if you or your staff have any questions concerning this report. Major contributors to this report are listed in appendix VII.

Sincerely yours,



Donna M. Heivilin, Director
Defense Management and NASA Issues

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Abbreviations

DOD	Department of Defense
EPA	Environmental Protection Agency
DECIM	Defense Environmental Corporate Information Management

Inventory and Uses of Toxic Chemicals

DOD Is in the Early Stages of Gathering Information on Its Inventories and Releases of Toxic Chemicals

The Department of Defense (DOD) anticipates that it will have complete information on toxic chemical inventories and releases by July 1, 1995, the reporting date required by Executive Order 12856. Some DOD facilities are already reporting inventories and releases of toxic chemicals. These facilities include government-owned, contractor-operated facilities originally covered under the Emergency Planning and Community Right-to-Know Act of 1986 and other industrial-type facilities that had anticipated the requirement. For example, Tinker Air Force Base, Oklahoma, and Portsmouth Naval Shipyard, Maine, reported inventories and releases for calendar year 1992.

DOD issued initial implementing guidance on the Executive Order to the services on February 15, 1994. The Environmental Protection Agency (EPA), which is responsible for implementation guidance on the collection of this information, issued interim guidance to federal agencies dated February 28, 1994. As of September 1994, however, EPA had not issued final guidance to federal agencies.

DOD Is Developing a System for Reporting Toxic Chemical Inventories and Releases, but It May Not Be Ready in Time to Meet the Reporting Requirement

The Defense Environmental Corporate Information Management (DECIM) office has been developing an automated hazardous materials management system to be implemented DOD-wide.¹ The DECIM office expects to have an interim system available early in 1995 and a final system sometime later. Both systems are expected to contain a wide array of environmental information, including information on inventories and releases of toxic chemicals, as required by Executive Order 12856. The systems are intended to eliminate about 53 redundant hazardous materials management information systems.

According to DOD officials, several systems are being considered for the standard system. The officials told us that a decision has not been made as to which or how many of these systems will ultimately be deployed. They said if a system is not deployed by late October 1994, the services will need to consider deploying their own systems in order to meet reporting requirements of the Executive Order. For example, the Air Force has decided to modify the Joint Logistics System Center's system, already installed at some DOD depots, for use at its installations.

¹The DECIM program office is staffed by defense personnel temporarily detailed to the office. The office is attached to the Army Environmental Center and reports to the Deputy Under Secretary of Defense for Environmental Security through a panel of high-level service representatives. DECIM received \$13.5 million in funding for fiscal year 1994. It also has authority to request the services to provide field staff for specific projects.

EPA Is Considering DOD Concerns in Its Draft Guidance for Implementing the Executive Order

DOD and EPA are negotiating several of the proposed provisions in EPA's draft guidance. The discussions centered around ways to reduce implementation costs. For example, DOD has taken exception to reporting emissions of toxic chemicals from mobile sources, such as motor vehicles and aircraft, as a costly requirement that is outside the scope of the 1986 act. EPA has encouraged federal agencies to report on mobile source emissions, but DOD will not be doing so. According to EPA officials, other agencies have indicated an interest in conducting pilot tests for reporting emissions from mobile sources. EPA officials told us that they could not be certain when final guidance would be issued.

Also, on January 19, 1994, DOD advised EPA that expending limited resources to develop pollution prevention plans and report releases of toxic chemicals for installations to be closed in the near term is unnecessary. DOD proposed that installations closing by December 31, 1997, should not prepare plans or report releases. DOD and EPA are negotiating a separate agreement to resolve this issue.

DOD Guidance for Implementing the Executive Order Does Not Address Toxicity

According to the Executive Order, establishing priorities for eliminating or reducing the unnecessary acquisition and use of toxic chemicals should be developed by each federal agency in coordination with EPA. EPA is developing guidance to assist federal agencies in developing prevention priorities. According to draft EPA guidance for implementing the Executive Order, federal agencies should establish their own priorities for the elimination or reduction of toxic chemicals based on factors such as toxicity of the chemicals being used.² DOD's February 1994 implementing guidance does not address toxicity. Some service officials told us that unless prevention priorities included toxicity in addition to quantities, funding priorities could be misplaced. According to these officials, funding emphasis would likely be placed on reducing uses of reported chemicals, whereas more highly toxic chemicals not meeting reporting thresholds but presenting a greater risk to the environment may not be addressed. In September 1994, DOD officials told us that they recently developed a proposal to conduct a study in fiscal year 1995 on tools addressing the toxicity of hazardous materials, which would assist systems acquisition and maintenance officials in prioritizing their efforts.

²Executive Order 12856 imposes the reporting thresholds of section 313 of the Emergency Planning and Community Right-to-Know Act, which requires federal facilities with 10 or more full-time employees that manufacture, import, or process 25,000 pounds or otherwise use 10,000 pounds of a listed toxic chemical to report annually (reporting is required even if no release or transfer occurs). DOD stated that facilities will generally meet the use reporting threshold requirement.

DOD Reporting Meets Basic Requirements

Executive Order 12856 requires agencies to report releases of the 370 toxic chemicals and compounds subject to section 313 of the Emergency Planning and Community Right-to-Know Act as of December 1993. The purpose of reporting is to ensure that federal agencies collect and make information available to the public about the use, processing, manufacture, disposal, and release of toxic chemicals.

In January 1994, EPA proposed adding 313 toxic chemicals to the required list for toxic release inventory reporting by public and private facilities. According to EPA, these chemicals were proposed for addition based on their acute human health and environmental effects. EPA believes that the addition of these chemicals will provide citizens with more comprehensive information to better assess potential risks to health and the environment in their communities. However, the 1994 baseline reporting will not include these chemicals. Agencies have the option, under the Executive Order, to report on other toxic chemicals, such as hazardous air pollutants covered by the Clean Air Act Amendments of 1990. As of September 1994, DOD has decided to report on the required list of toxic chemicals.

Reductions in Use of Toxic Chemicals

Information Is Not Now Available to Measure DOD's Progress in Reducing the Use of Toxic Chemicals

Because DOD is in the process of gathering information on its inventories and releases of toxic chemicals, we could not precisely measure DOD's progress in reducing its use of toxic chemicals. Prior laws (Resource Conservation and Recovery Act of 1976 as amended by the Hazardous and Solid Waste Amendments of 1984) did not require reporting of toxic chemical releases and inventories. However, DOD did report on its efforts to reduce the amounts of hazardous waste disposal.

DOD's past reporting on hazardous waste disposal does not measure how much of the reductions in these disposals are due to reductions in the use of toxic chemicals or other factors such as defense downsizing. Much of the hazardous waste generated in DOD is industrial waste associated with the production, operation, and maintenance of DOD weapon systems. Defense downsizing has impacted these activities. For example, between 1985 and 1992, the Army ammunition budget has declined by 40 percent, and depot labor hours have declined by 27 percent. Also, we recently reported significant reductions in the Air Force's depot maintenance workload from 1987 through 1992, including an 11.3-percent reduction in the number of aircraft with maintenance work completed, a 29.9-percent reduction in the number of engines repaired, and a 46-percent reduction in the number of weapon system subsystems and components repaired.¹ Although the relationship between funding or labor hours and the amount of hazardous waste disposal may not be one-to-one, decreased industrial activity could account for a significant portion of the reported reductions. The services plan to compare future releases to measures of industrial activities, such as depot maintenance operations, as required by EPA.

Reported reductions in hazardous waste disposal also include reductions in waste volume achieved through techniques, such as dehydration of the waste. While this process does reduce the volume of hazardous waste that must be disposed of, it does not reduce the amount of toxic chemicals in the waste.² For example, about 155,000 tons, or about 86 percent, of the Navy's reported reductions between 1988 and 1992 resulted from the dehydration of bilge wastes from ships. The Army and the Air Force have also used dehydration to reduce the volume of hazardous wastes. According to the services, these projects have been beneficial in reducing waste volume and disposal costs. The services are not required and do not

¹Air Logistics Center Indicators (GAO/NSIAD-93-146R, Feb. 25, 1993).

²According to the Pollution Prevention Act of 1990, source reduction does not include altering the physical, chemical, or biological characteristics or volume of a hazardous substance, pollutant, or contaminant through a process that is not integral to or necessary for producing a product or providing a service.

plan to separately identify and report reductions due to dehydration and other volume-reducing techniques.

Services Have Reported Reductions in Hazardous Waste Disposal and Use of Toxic Chemicals

In establishing their hazardous waste minimization programs, the services set a goal to reduce the amount of hazardous waste disposed of by 50 percent by 1992. Each of the services reported that it has met this goal with the following reductions:

- the Air Force reported a 56-percent reduction in its disposal of hazardous waste (from 50,678 tons in 1987 to 22,236 tons in 1992),
- the Army reported a 62-percent reduction (from 72,728 tons in 1985 to 27,726 tons in 1992), and
- the Navy reported a 63-percent reduction (from 288,232 tons in 1988 to 107,704 tons in 1992).

The services told us that they had recently implemented many successful projects to reduce their use of toxic chemicals, but do not have a complete list of these projects because management reports and budgets do not segregate them from other environmental projects by purpose.³ The services' past efforts to minimize hazardous waste focused on treating and controlling pollution generated from processes rather than eliminating the use of toxic chemicals that generated hazardous waste. The following are examples of each service's projects that focus on eliminating the use of toxic chemicals:

- Elmendorf Air Force Base, Alaska, has substituted the toxic chemicals used in deicing runways with more benign chemicals and reduced the use of the benign chemicals by placing sensors below runways to better detect when deicing is needed. Tinker Air Force Base, Oklahoma, has eliminated cadmium, a highly toxic metal, from its electroplating process used in the maintenance and repair of aircraft parts and substituted a less hazardous material. In addition, Tinker reported over a 50-percent reduction in the use of methylene chloride, a toxic chemical used to remove paint from aircraft and rubber from aircraft engine parts, by substituting benzyl alcohol and high-pressure water spray.

³The Pollution Prevention Act of 1990 defines source reduction as reducing the amount of hazardous wastes entering the environment, including fugitive emissions, prior to recycling, treatment, or disposal and reducing the hazards to the public health and the environment. In practice, ambiguity exists in classifying and reporting the purpose of various types of environmental projects. For example, a project to reduce toxic chemicals in paint could be classified as either compliance with the Clean Air Act to reduce emissions of hazardous materials into the air or prevention.

- The Lake City Army Ammunition Plant, Missouri, has replaced methyl chloroform and other hazardous materials used in cleaning machine parts and tooling with parts washing machines that use soap and water. As a result, the plant has reduced the generation of hazardous waste by 6,000 gallons and is saving \$12,000 annually. The Anniston Army Depot, Alabama, reduced its use of the highly toxic metal, cadmium, by substituting a nontoxic aluminum ion vapor deposition process for electroplating a variety of parts for weapon systems. The depot estimated that this process would reduce waste treatment and disposal costs by \$178,000 per year.
- Several Navy installations have replaced chemicals with water-based processes for cleaning non-flight-critical aircraft components. In addition, the Charleston Naval Shipyard, South Carolina, has replaced ozone-depleting chemicals with sodium bicarbonate for paint removal and certain cleaning operations.

Reporting Releases of Toxic Chemicals Into the Air Has Not Been Required in the Past

Hazardous waste minimization goals and reporting have excluded releases into the air because DOD's hazardous waste minimization program did not require reporting these releases. Since Executive Order 12856 now requires the reporting of releases into the air, this information will begin to be collected by defense installations. Data from Tinker Air Force Base indicates that air releases could be significant: it reported that about 1.6 million pounds, or 99.9 percent, of its toxic chemical releases, was released into the air during calendar year 1992.

Services Expect to Make Additional Progress

DOD Believes Significant Reductions in Use of Toxic Chemicals Will Be Difficult

The Executive Order requires DOD to reduce its releases and disposal of toxic chemicals by 50 percent by December 31, 1999. Moreover, the order requires that these reductions be achieved through source reductions to the maximum extent practicable. The services told us that taking further significant steps to reduce hazardous waste would be difficult. For example, 78 percent of the Air Force's reported reduction in hazardous waste disposal between 1987 and 1992 occurred in 1988, and reported disposal actually increased by 13 percent from 1991 to 1992.¹

According to the services, making additional reductions in their use of toxic chemicals will require more research, development, test, and evaluation to identify potential substitute processes and materials and capital investment for new equipment that the new processes are likely to require. For example, replacing cleaning processes that use ozone-depleting chemicals with less hazardous materials often requires additional processing steps and related new equipment. In another example, Tinker Air Force Base expects to spend about \$21 million to replace a process using a hazardous material for stripping paint from aircraft with a robotics system using high-pressure water.

Funding Priority for Pollution Prevention Efforts Competes With Other Budget Priorities

Service officials told us they are committed to giving priority to pollution prevention efforts and they believe funding has generally been adequate. However, they also told us that funding these efforts in the future would be a challenge in the current environment of defense downsizing and declining budgets. For example, pollution prevention projects must compete with environmental cleanup and compliance projects that are also required by environmental laws and regulations and must be funded to avoid large fines and potential criminal penalties. DOD's fiscal year 1995 budget request included \$5.7 billion for environmental programs, of which \$4.4 billion was for environmental cleanup and compliance and \$392 million for pollution prevention. Some pollution prevention activities are included in other funding accounts, but the amount specifically spent on these activities is not tracked. For example, as previously mentioned, portions of some projects funded with compliance money could be for pollution prevention.

¹Much of the reduction in 1988 may have resulted from decreased workload. For example, over one-half of the 20.7-percent reduction in direct production hours at Air Force depots from 1987 through 1992 occurred between 1987 and 1988. According to the Air Force, the increase in 1992 was due to a one-time cleanup of sludge ponds at numerous waste water treatment plants.

Estimated Future Costs to Prevent Pollution Exclude Some Potentially Substantial Costs

DOD's future costs to address pollution prevention under the Executive Order will likely be higher than current estimates. The services' cost estimates for fiscal years 1994 through 1999 are shown in table III.1.

**Table III.1: Services' Cost Estimates
for Pollution Prevention Activities,
Fiscal Years 1994-99**

Dollars in millions

Service	Fiscal year						Total
	1994	1995	1996	1997	1998	1999	
Air Force	\$157	\$164	\$108	\$97	\$89	\$85	\$700
Army	37	80	110	128	125	104	584
Navy	129	155	142	137	105	104	772
Total	\$323	\$399	\$360	\$362	\$319	\$292^a	\$2,056^a

^aDoes not add due to rounding.

The services developed these estimates in response to a December 1993 request from the Under Secretary of Defense for Acquisition to develop a financial strategy for implementing the Executive Order. These cost estimates generally include known costs of meeting these requirements, such as reporting releases of toxic chemicals and preparing pollution prevention plans. The services also reported that their cost estimates exclude the following potentially significant costs:

- The Air Force expects additional requirements of at least \$10 million per year to achieve the goal of 50 percent reduction in toxic releases, revise military specifications, and meet reporting requirements.
- The Army believes the \$583.6 million cost estimate through fiscal year 1999 may be understated because it will not know its total requirements until its installations' pollution prevention plans are submitted in December 1995 and the Army evaluates these plans. Therefore, according to the Army, its cost estimate does not include the cost to implement all the projects that are likely to be required to achieve reductions in the use of toxic chemicals and related changes in processes.
- The Navy's pollution prevention cost estimates do not include the costs to review and change military specifications, standards, and standardization

**Appendix III
Services Expect to Make Additional
Progress**

documents, and to test less toxic materials as replacements for the current, more toxic materials.

Military Specifications and Standards

Review of Military Specifications and Standards That Contribute to Pollution Is Underway

DOD is beginning to review the 31,700 military specifications and standards to determine which ones require use of toxic chemicals. Military specifications describe the essential technical requirements for a product and define the criteria for ensuring that these requirements are met. Military standards describe the product design criteria and the engineering and management processes for making and testing the product. DOD uses military specifications and standards to maintain safety, reliability, and performance in weapon systems and DOD operations.

DOD will not know how many specifications and standards require the use of toxic chemicals until it completes its review, but it realizes the number could be substantial. For example, as of April 1994, DOD had identified about 540 specifications and standards that could require the use of ozone-depleting toxic chemicals, scheduled to be banned from production by the end of 1995, for which substitutes must be found.

DOD's Review of Standardized Documents Will Not Likely Meet the Executive Order Deadline

DOD will not likely meet the requirement to review all of the standardized documents¹ to identify opportunities to eliminate or reduce the use of toxic chemicals by August 3, 1995, as required by the Executive Order. While DOD stated it is possible to complete the review of specifications and standards on time, the review does not include about 1 million related technical documents. These technical documents describe the requirements for operating, maintaining, repairing, and disposing of specific equipment, parts, and materials. DOD does not believe the Executive Order requires the review of technical documents. However, EPA's February 28, 1994, draft implementing guidance defines standardized documents to include technical documents. The status of the specification and technical document review is as follows:

- The Air Force expects to complete its review of specifications and standards by the deadline by computer matching a digitized version of these documents to a digitized list of toxic chemicals. However, the Air Force is not scheduled to complete its review of the 158,000 related technical documents until December 2000. The Air Force has programmed about \$100 million over the next 5 years to digitize its technical documents for computer matching to the digitized list of toxic chemicals.
- The Army plans to complete its review of specifications and standards by the deadline if funding is available by using several techniques, including using the results of the Air Force's computer matching described above. It

¹DOD's planned review of standardized documents includes those in the DOD Index of Specifications and Standards.

also plans to require system program managers to perform the reviews. The Army does not expect to complete the review of related technical documents until 1999. The Army is not planning to digitize technical documents due to lack of funding.

- The Navy plans to complete its review of specifications and standards by the deadline if funding is available. The Navy is identifying known hazardous materials from a list of authorized materials being used and then identifying the applicable specification or standard requiring use of the materials. The Navy also plans to use the results of the Air Force's computer matching of specifications and standards. According to Navy officials, review of other technical documentation by the review deadline will be limited since the Navy believes it cannot afford to digitize technical documents.

DOD Revisions to Standardized Documents Will Not Likely Meet the Executive Order Deadline

DOD will also not likely meet the Executive Order requirement to revise the standardized documents by 1999. The revisions are to eliminate or reduce the use of toxic chemicals wherever it is consistent with the safety and reliability requirements of DOD's mission. The targets for making revisions by the services are as follows:

- The Air Force's current goal is to revise 50 percent of the standardized documents that require the use of 17 toxic chemicals targeted by EPA by December 31, 2000, but has not set goals for the other 353 toxic chemicals and compounds targeted in the Executive Order.
- The Army reported that it may not meet the 1999 deadline due to funding and the need for extensive research and development to find suitable substitutes for some toxic chemicals.
- The Navy reported that it believes it will make the 1999 deadline. However, Navy officials told us that meeting the deadline will be a challenge due to the large number of documents that must be reviewed and the lack of resources for automating the review of technical documents.

Changing and Implementing New Military Specifications May Be Costly

DOD has not estimated the total cost of making and implementing revisions to standardized documents. However, these costs could be substantial. For example, in responding to the December 1993 request from the Under Secretary of Defense for Acquisition to develop a financial investment strategy for implementing Executive Order 12856, the Army estimated about \$450 million would be required from fiscal years 1995 through 1999 to review and revise military specifications and standards and to implement projects at installations. However, as discussed previously,

these estimates do not include all the costs to implement projects that are likely to be required to achieve reductions in the use of toxic chemicals and related changes in processes because installations will not complete their pollution prevention plans until 1995.

More reliable cost estimates will not be available until the services complete their reviews of standardized documents. Costs will include testing potential known substitutes, conducting research and development on substitutes, and modifying system hardware and maintenance facilities and equipment, as well as, the administrative cost of making the revisions. DOD officials told us that budgetary constraints will require consideration of economic trade-offs in implementing revisions.

The cost of testing and implementing potential substitutes and the research and development related to substitutes are inherently difficult to estimate because of the uncertainties that are involved. According to service officials, testing potential substitutes must be specific as to how the toxic chemical is used, so eliminating the use of one toxic chemical could involve the testing for many individual applications. For example, the Air Force built a facility at Kelly Air Force Base, Texas, that uses plastic beads instead of a toxic chemical to remove paint from aircraft, but this technology is not suitable for removing paint from the more sensitive surfaces of aircraft radomes that protect electronic equipment in the nose of the aircraft.

Several toxic chemicals have no known substitutes for certain specific uses. For example, halon, an ozone-depleting chemical, has no known suitable substitute for providing fire protection inside engine compartments of military aircraft and crew compartments of Army armored vehicles. The services are currently conducting tests to identify potential substitutes. According to preliminary Army estimates, the cost to replace halon in armored vehicles could be at least \$400 million.

Researching, Developing, and Implementing the Use of Substitutes Could Take 3 or More Years

Research and development to identify potential substitutes for toxic chemicals and testing the suitability of substitutes for specific applications may be a time-consuming process, involving up to 3 years or more. For example, the Army does not expect to find and install a suitable substitute for fire suppressants containing halon used in the crew compartments of armored vehicles until after 2005 due to the long lead time required for testing potential substitutes. Therefore, substitutes not identified or tested

now may not be available by the 1999 target date for revising standardized documents unless test schedules are compressed.

According to service officials, compressing test schedules could jeopardize worker safety and the reliability of weapon system performance. For example, the Air Force has experienced problems in implementing substitutes for ozone-depleting chemicals used to clean liquid oxygen systems. Several accidents have occurred in cleaning liquid oxygen systems that investigators believe were caused by using unproven substitute materials and processes.

Using Performance-Based Specifications Could Reduce the Time and Cost of Reviewing Military Specifications

DOD is attempting to improve its ability to stay abreast of commercial practices, products, and processes by making military standardized documents less prescriptive. Even though some prescriptive standards will be necessary to meet unique military requirements, other prescriptive standards may not. In April 1994, a DOD Process Action Team recommended that DOD replace the current prescriptive military specifications and standards with more flexible performance-based specifications, commercial item descriptions, and nongovernment standards. While military specifications and standards tell a contractor how to make a product to meet a requirement, more flexible standards, such as performance-based standards, specify the requirement and allow the contractor to determine how best to achieve it. On June 29, 1994, the Secretary of Defense approved the team's recommendations and directed the Under Secretary of Defense for Acquisition and Technology to implement them. If successfully implemented, these recommendations should help to expedite DOD efforts to eliminate or reduce the requirements for toxic chemicals.

Some of the most critical changes to the current policy discussed in the Secretary's memorandum follow:

- Performance-based specifications shall be used when practicable in purchasing new systems, major modifications, upgrades to current systems, and nondevelopmental and commercial items. If use of these or nongovernment standards is not practicable, waivers for use of military specifications and standards may be approved.
- The Defense Federal Acquisition Regulation Supplement will be revised to encourage contractors to propose nongovernment standards and industry-wide practices. Forming partnerships with industry associations is encouraged for developing nongovernment standards.

- A procedure will be developed for identifying and removing obsolete military specifications and standards for new development efforts.
- Program managers and acquisition decisionmakers are directed to challenge acquisition requirements that create unique military specifications.

DOD officials told us that it is too early to determine the impact of this policy on DOD's review and revision of military specifications to prevent pollution. However, they believe that the costs and time required to review and revise specifications should be reduced to the extent that obsolete specifications are eliminated and nongovernment standards can be applied with less test and evaluation for specific applications.

Acquisition, Procurement, and Inventory Processes

DOD Is Beginning to Incorporate Into Its Acquisition Process Provisions to Eliminate or Reduce the Use of Toxic Chemicals

The services recently began incorporating environmental concerns in weapon systems. This is an important step because, according to a DOD Inspector General report,¹ over 80 percent of the hazardous waste generated in DOD is industrial waste associated with the production, operation, and maintenance of DOD weapon systems.

DOD policy will incorporate National Aerospace Standard 411, a commercial hazardous materials management program, that will provide guidance to military contractors in eliminating or reducing use of hazardous materials during the design, development, and production of weapon systems. Actions taken by the services follow.

- The Air Force issued a policy in December 1993 requiring weapon system program managers to evaluate requirements for hazardous materials, including life-cycle cost analyses and chemical toxicity assessments, during the design, development, and production of new weapon systems. For existing systems, the Air Force has established committees to coordinate the identification and testing of suitable substitutes for hazardous materials for specific product areas, such as air vehicles, munitions, and life support systems.
- The Army and the Navy are beginning to incorporate pollution prevention into some of their major acquisition programs. For example, the Army has initiated a life-cycle environmental analysis for the Advanced Field Artillery System under development and is performing several pollution prevention studies on this system, such as a study of its liquid propellant for the presence of toxic metals. The Navy is also developing guidance to assist program managers in incorporating pollution prevention into major acquisitions and the Army recognizes guidance is needed.

DOD Procurement Processes Do Not Systematically Address Environmental Concerns

DOD has acknowledged that its systems and procedures, including the federal stock system, Federal Acquisition Regulation, and the Defense Acquisition Regulation Supplement, do not ensure the reduction of hazardous materials in products purchased. Also, the federal stock system does not routinely provide information on the type and quantity of hazardous materials contained in products purchased. This is because products are generally ordered by a stock number, not by specific product. A single stock number may contain products representing dozens of manufacturers and formulations, some of which may or may not contain hazardous materials. Moreover, manufacturers are not required to report

¹Hazardous Waste Minimization, DOD Inspector General Inspection Report, No. 93-INS-06, Dec. 28, 1992.

all hazardous materials in their products, in part because the reporting mechanism was designed to protect worker safety rather than meet the requirements of the Emergency Planning and Community Right-to-Know Act.²

Procurement regulations do not systematically address environmental concerns. For example, according to Defense Logistics Agency officials, DOD has not issued guidance for performing life-cycle costs analyses for comparing the costs of toxic chemicals with less toxic chemicals. As a result, purchasing decisions are not always environmentally sound or cost-effective because they are generally based on the initial price of the material. Life-cycle costs associated with environmental considerations, such as the cost to dispose of hazardous waste, are not considered and can total more than the purchase price. Also, procurement officials told us that, even though products can be purchased noncompetitively for certain purposes, such as meeting a time-critical need, buying environmentally friendly materials is not a justification for buying noncompetitively.

DOD Is Taking Steps to Improve Hazardous Material Inventory Practices

DOD is implementing the recommendations in our prior report on hazardous material inventory practices.³ Specifically, DOD expects to complete revisions to regulations by the end of 1994 to improve the management of hazardous materials with limited shelf life by allowing DOD facilities to order more materials directly from vendors. This revision should reduce the amount of materials whose shelf life expires while being stored in government warehouses. Materials with expired shelf life are often disposed of as hazardous waste.

Totally eliminating materials with expired shelf life may not be possible. For example, from January 1990 to June 1991, the Portsmouth Naval Shipyard, Maine, disposed of 82 tons of material with expired shelf life as hazardous waste. As a result, the Navy proposed that DOD establish critical-use application dates for hazardous materials. These dates would dictate how long material could be used for critical uses, such as special paint used to protect submarine hulls, but would allow non-critical uses, such as for painting interior doors and walls, after the critical-use date. DOD is still considering this proposal.

²The Emergency Planning and Community Right-to-Know Act of 1986 requires owners or operators of certain facilities to submit material safety data sheets to state and local emergency planning and response organizations. These data sheets report information about hazardous chemicals covered under the Occupational Safety and Health Act of 1970.

³Hazardous Waste: Attention to DOD Inventories of Hazardous Materials Needed (GAO/NSIAD-90-11, Nov. 6, 1989).

The Air Force and the Navy are also implementing a medical pharmacy-like approach to managing and controlling hazardous material inventories that the Navy initiated in 1989. Under this approach, hazardous materials are to be tightly controlled, much like the medical field controls the dispensing of certain drugs through prescriptions approved by a physician. Likewise, the services expect to achieve more control and accountability of hazardous materials under this approach by allowing only approved personnel and organizations to order hazardous materials in prescribed quantities for prescribed uses. The services told us that this program has already achieved results. According to the Air Force, Hill Air Force Base, Utah, has reduced hazardous material purchases by 50 percent. The Navy has reported that the program resulted in savings of over \$3 million at shore facilities and on eight ships. The Navy issued implementing guidance for this program in January 1994. The Army has no plans to implement a similar approach because officials believe it is too labor-intensive and duplicates portions of the Army's existing supply system.

Major Commands and Installations Visited or Contacted

Air Force

Air Mobility Command, Illinois
Air Force Materiel Command, Ohio
Oklahoma City Air Logistics Center, Oklahoma
San Antonio Air Logistics Center, Texas
Warner-Robins Air Logistics Center, Georgia

Army

Army Materiel Command, Virginia
Armament, Munitions and Chemical Command, Illinois
Depot System Command, Pennsylvania
Test and Evaluation Command, Maryland
Armaments Research, Development, and Engineering Center,
New Jersey
Production Base Modernization Activity, New Jersey
Army Environmental Center, Maryland
Rock Island Arsenal, Illinois
Picatinny Army Arsenal, New Jersey
Letterkenny Army Depot, Pennsylvania
Aberdeen Proving Ground, Maryland
Lake City Army Ammunition Plant, Missouri
Tank and Automotive Command, Michigan

Navy

Portsmouth Naval Shipyard, Maine

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Glossary

Contaminant	Includes, but not limited to, any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly through the food chain, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformations, in such organisms or their offspring.
Environment	Includes water, air, and land and the interrelationship that exists among and between water, air, and land and all living things.
Facility	All buildings, equipment, structures, and other stationary items that are located on a single site or on contiguous or adjacent sites and which are owned or operated by the same person (or by any person that controls, is controlled by, or under common control with, such person). In certain cases, facility also includes motor vehicles, rolling stock, and aircraft.
Hazardous material	A substance or material, including a hazardous substance, which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property.
Hazardous substance	Any substance designated pursuant to the Federal Water Pollution Control Act; any element, compound, mixture, solution, or substance designated pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980; any hazardous waste having characteristics identified by the Solid Waste Disposal Act; any hazardous air pollutant listed under the Clean Air Act; and those pursuant to the Toxic Substances Control Act.
Hazardous waste	A solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (1) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness or (2) pose a substantial present and potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

Pollution prevention	Source reduction, as defined in the Pollution Prevention Act, and other practices that reduce or eliminate the creation of pollutants through (1) increased efficiency in the use of raw materials, energy, water, or other resources or (2) protection of natural resources by conservation.
Release	Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment.
Source reduction	Any practice that (1) reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment prior to recycling, treatment, or disposal; and (2) reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants. The term includes equipment or technology modifications, process or procedures modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control.
Toxic chemicals	Any substance subject to section 313(c) of the Emergency Planning and Community Right-to-Know Act of 1986.
Toxicity	The amount of poisonous compounds or poisons in a substance.
