United States General Accounting Office

GAO

The Subcommittee on Energy and Water Development, Committee on Appropriations, House of Representatives

December 2000

NUCLEAR WEAPONS

Improved Management Needed to Implement Stockpile Stewardship Program Effectively

GAO

Accountability * Integrity * Reliability

GAO-01-48

Contents

Letter 5

Executive Summary 6

Chapter 1 Background on DOE's Office of Defense Programs Mission and Structure 16

DOE's Historical Mission in Designing and Maintaining the Nuclear Weapons Stockpile 16
The Mission and Structure of DOE's Nuclear Weapons Complex Has Changed 21
The Reconfigured Weapons Complex Faces Challenges and Constraints 29

Chapter 2 Further Improvements Are Needed in the Office of Defense Programs' Planning Process 34

The Office of Defense Programs Has Developed a New Planning Process to Fit Its Changing Mission 34
The Stockpile Stewardship Program's Plans Are Incomplete and Are Not Linked With Management Controls 37
Conclusions 43
Recommendations for Executive Action 43
Agency Comments and Our Evaluation 44

Chapter 3 Revised Budget Information Needed to Improve Management of the Stockpile Stewardship Program 46

The Office of Defense Programs Has Developed a New Budget Structure for the Weapons Activities Account That Is Intended to Improve Program Management 46
The New Structure Was Not Implemented Consistently 48
DOE Amended the Fiscal Year 2001 Budget Submission to Improve Consistency, but the Revisions Miss the Opportunity to Improve Program Management 52
Conclusions 52
Recommendation for Executive Action 53
Agency Comments and Our Evaluation 53

Chapter 4 Fundamental Organizational and Leadership Changes Needed for Successful Implementation of the Program's New Mission

55
DOE Has Reorganized the Office of Defense Programs to Meet Its Changing Mission 55
DOE's Attempts to Reorganize Have Not Addressed All of the Organizational and Leadership Issues 63
Conclusions 72
Recommendations for Executive Action 73
Agency Comments and Our Evaluation 73

Chapter 5 Management Improvements Needed for the Office of Defense Programs to Conduct Successful Stockpile Life Extensions

75
The Office of Defense Programs Has Begun a Major Program to Extend the Life of Nuclear Weapons in the Stockpile 75
The Only Life Extension Conducted to Date Experienced Significant Design and Production Problems Due to Management Weaknesses 77
Improved Management Processes Have Been Developed for Future Life Extensions, but More Needs to Be Done 83
Conclusions 84
Recommendations for Executive Action 85
Agency Comments and Our Evaluation 85

Appendixes

Appendix I: Explanation of How Modern Nuclear Weapons Work 86
Appendix II: Scope and Methodology 88
Appendix III: Comments From the Department of Energy's National Nuclear Security Administration 91

Tables

Table 1: Roles of the Production Sites in the Nuclear Weapons Complex, 1988 20
Table 2: Weapons in the Enduring Stockpile 22
Table 3: Management and Operating Contractor Employment in the Nuclear Weapons Complex, 1988 Through 2000 28
Table 4: Federal Staffing in the Office of Defense Programs, 1991 Through 2000 29
Table 5: Office of Defense Programs Three-Tiered Planning Structure 36

Table 6: Major Studies of DOE's Stockpile Stewardship Program 56
Table 7: Major Responsibilities of Office of Defense Programs' Headquarters and Field Offices Reporting to the Office of Defense Programs 59
Table 8: Nuclear Weapons Complex Facilities That Participated in the W87 LEP 76
Table 9: W87 LEP Cost Estimate Comparison 77

Figures

Figure 1: Traditional Weapons Development and Production Cycle 18
Figure 2: Nuclear Weapons Complex, 1988 19
Figure 3: The New "6.X" Weapons Refurbishment Cycle 24
Figure 4: DOE's Reconfigured Nuclear Weapons Complex—Sites' Roles in 2000 and Employment Changes, 1988 Through 2000 26
Figure 5: Organization of the National Nuclear Security Administration and the Office of Defense Programs, as of October 1, 2000 62
Figure 6: Simplified Drawing of a Modern Nuclear Weapon 86

GAO
Accountability * Integrity * Reliability

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

December 14, 2000

The Honorable Ron Packard
Chairman
The Honorable Peter J. Visclosky
Ranking Minority Member
Subcommittee on Energy and Water Development
Committee on Appropriations
House of Representatives

As requested, this report addresses the Department of Energy's (DOE) management of its National Nuclear Security Administration's Stockpile Stewardship Program. Specifically, it discusses the Administration's approach to the program's (1) planning, (2) new budget structure, and (3) organizational and leadership structure. In addition, we were asked to assess the program's experience with extending the life of nuclear weapons in the stockpile and the management processes used for overseeing life extensions.

As arranged, unless you publicly announce its contents earlier, we plan no further distribution of this report until 15 days after the date of this letter. At that time, we will send copies of the report to the Honorable Bill Richardson, Secretary of Energy; John A. Gordon, Administrator, National Nuclear Security Administration; Madelyn R. Creedon, Deputy Administrator for Defense Programs, National Nuclear Security Administration; the Honorable Jacob J. Lew, Director, Office of Management and Budget; and other interested parties. We will make copies available to others upon request. Please call me at (202) 512-3841 if you or your staff have any questions about this report. Major contributors to this report include James Noël, Chris Pacheco, Delores Parrett, and Mark Gaffigan.

Gary L. Jones

(Ms.) Gary L. Jones
Director, Natural Resources
and Environment

Executive Summary

Purpose

Within the Department of Energy (DOE), the National Nuclear Security Administration's Office of Defense Programs is responsible for the nation's nuclear weapons stockpile. In response to changes in the international climate in the late 1980s, the Office of Defense Programs downsized and restructured the nuclear weapons complex to focus on a new mission—known as the Stockpile Stewardship Program—to maintain the safety and reliability of the nation's nuclear weapons stockpile indefinitely without nuclear testing. However, the Stockpile Stewardship Program faces a difficult set of challenges and constraints. For example, the program seeks to extend the life of nuclear weapons well beyond the minimum for which they were originally designed and to replace testing with scientific study, simulation, and refurbishment. In addition, the existing infrastructure in the nuclear weapons complex is very old—much of it dating from the 1940s and 1950s—making it difficult and expensive to maintain. Downsizing the complex over the last decade has also created imbalances in the federal and contractor workforce, such as an inability to hire the necessary number of skilled technicians and scientists. Finally, there is uncertainty about the level of program activities that the Stockpile Stewardship Program's annual funding of about $4.5 billion can support. To successfully address these issues, the Office of Defense Programs has attempted to develop new management approaches.

In this context, the Chairman and Ranking Minority Member of the Subcommittee on Energy and Water Development, House Committee on Appropriations, asked GAO to evaluate three aspects of the Stockpile Stewardship Program's management. Specifically, GAO was asked to assess the program's (1) planning process, (2) new budget structure, and (3) organizational framework. In addition, GAO was asked to assess the program's experience with extending the life of nuclear weapons in the stockpile and the management processes used for overseeing life extensions.

Background

From the beginning of the Manhattan Project in the 1940s, a primary mission of DOE and its predecessor agencies has been to design, test, and build the nation's nuclear weapons. To accomplish this, the Office of Defense Programs oversaw a nuclear weapons complex operated by a variety of contractor organizations and composed of three national nuclear weapons design labs, a nuclear weapons test site, and 10 production plants that produced the materials and parts and manufactured the nation's nuclear weapons. Weapon designs were continually being replaced by new

designs; accordingly, the old weapons were being removed from the stockpile, thus keeping the average age of the stockpile low. At its peak, prior to the end of the Cold War, this weapons complex employed about 60,000 people and had a budget of about $8 billion annually.

With the end of the Cold War, the Office of Defense Programs' mission changed as tensions with the former Soviet Union were eased, the first Strategic Arms Reduction Treaty reducing the size of the nation's nuclear stockpile was negotiated, and a moratorium on nuclear testing was declared. In response, DOE significantly restructured the nuclear weapons complex to meet its new mission of ensuring the safety and reliability of the stockpile under the Stockpile Stewardship Program. While the three nuclear weapons design labs were retained, the test site and the production infrastructure were significantly reduced in size, resulting in a reduction in employment for fiscal year 2000 to about 26,000 and an annual budget of about $4.5 billion. A key task for the reconfigured nuclear weapons complex is extending the life of the nuclear weapons in the stockpile well beyond that for which they were originally designed. Most recently, in March 2000, the Office of Defense Programs and its federal headquarters and field personnel became part of the new National Nuclear Security Administration.

Results in Brief

Over the last few years, the Office of Defense Programs has taken steps to address the principal challenges facing the Stockpile Stewardship Program. However, additional improvements are needed in order to (1) remedy weaknesses in the program's planning processes, (2) ensure that required budget information for effective cost management is available, (3) correct organizational and leadership deficiencies, and (4) develop an effective management process for overseeing the life extension process for nuclear weapons.

With respect to planning, the Office of Defense Programs has developed an extensive planning process to improve the management of its Stockpile Stewardship Program; however, the plans generated by this process are incomplete in two important respects. First, the Office of Defense Programs is still trying to determine some key requirements for the Stockpile Stewardship Program, such as validating the quantities of weapons to be refurbished. Until this process is complete, important aspects of the program—and, thus, the plans associated with them—are subject to change. Second, a congressionally mandated, cross-cutting plan to manage the life extension of nuclear weapons—known as the Stockpile

Life Extension Program Plan—does not contain complete information on important issues, such as firm commitments to modify facilities or hire and train additional staff to ensure that the production plants can meet the current schedule for weapons life extensions, and does not contain budget information. More fundamentally, while the Office of Defense Programs has developed over 70 plans, it has not integrated them into its system of management controls for the program, including the program's budget and the mechanisms used to oversee its contractors. The lack of effective integration essentially prevents the separate components of the program from functioning as a cohesive entity. Officials in the Office of Defense Programs have acknowledged these weaknesses in the planning processes and identified ongoing efforts to address them. However, those activities cannot be completed until firm program requirements are in place.

Concerning budgeting, the Office of Defense Programs has developed a new structure for its fiscal year 2001 budget, organized around three major program activities, that can improve the overall management of the Stockpile Stewardship Program. The new structure allows the program to potentially identify the variable costs of the program—those that change as the workload changes—and the fixed costs—those that represent the cost of keeping the nuclear weapons complex open and ready to do work. Program managers and outside technical experts believe that this new structure holds significant promise because identifying the program's fixed and variable costs can be a useful tool for improving the program's cost management. However, two problems arose during the budget's development. First, the labs and production plants did not apply the program's new budget formulation definitions consistently. Second, the Department's Office of the Chief Financial Officer was concerned that the program's application of the new structure was not consistent with various accounting standards and certain laws and regulations that contain accounting requirements. In response, an amendment to the program's budget submission for fiscal year 2001 was developed. However, the amendment makes determining the program's fixed and variable costs difficult, in turn, making the amount of funding that could be saved if an activity is cut difficult to ascertain.

With respect to the program's organization, several external and internal studies have found that the Office of Defense Programs has a dysfunctional organization with unclear lines of authority that lead to a lack of accountability. Although DOE has made repeated attempts to reorganize the nuclear weapons program, the Office of Defense Programs still does not have a clear organizational structure or, until recently, formal control

over all of the sites performing substantial amounts of work for the Stockpile Stewardship Program. Specifically, the program remains fragmented at the headquarters level, and the division of roles and responsibilities between headquarters and the field is unclear. In addition, until October 2000, three of the eight contractors performing substantial amounts of work for the weapons program reported to other program offices at DOE rather than directly to the Office of Defense Programs, including one of the weapons design laboratories and two of the production facilities. This situation reduced program integration and made it harder for managers to balance competing resource priorities. A recent reorganization is being implemented to correct this problem. Finally, the program has experienced considerable leadership instability. Specifically, the Office of Defense Programs has seen its proportion of offices vacant or with acting managers increase from 17 percent in 1996 to almost 65 percent in 2000. This instability has led to a lack of consistent management direction. In some cases, key management decisions on organization and leadership issues, such as setting priorities for the program, have been deferred for years.

Finally, one of the nine types of nuclear weapons in the current stockpile has begun the life extension process—a step that will be necessary to keep the nation's nuclear weapons safe and reliable without explosive testing. The ongoing life extension of the W87 warhead, which is carried on the Peacekeeper missile, experienced significant design and production problems that have raised its costs by over $300 million (about 70 percent) and caused a key milestone in the schedule to be delayed about 2 years. Numerous factors contributed to this outcome. The original design to enhance the structural integrity and extend the stockpile life of the W87 did not work as planned. In addition, all of the major production facilities in the nuclear weapons complex experienced significant problems from such factors as restarting production capabilities that had been moved during the downsizing of the complex and addressing safety and technician training issues. However, at the heart of many of the problems was an inadequate Office of Defense Programs management process and unclear leadership, which prevented the Office from adequately anticipating and mitigating the problems that arose. As a result of the program's experience with the W87 life extension, management improvements have been adopted, such as the development of a formal process for managing future life extensions that parallels the proven process that DOE has used for decades to design, test, and build new nuclear weapons. However, additional management improvements, such as establishing a program manager for each life extension, are needed before the Office of Defense

Programs begins extending the life of two additional warheads—the W76 and W80—that form a significant portion of the stockpile.

Principal Findings

Further Improvements Are Needed in the Office of Defense Programs' Planning Process

The Office of Defense Programs has made progress in developing a new planning process for the Stockpile Stewardship Program and is planning further improvements, such as a comprehensive database to help integrate the multitude of individual plans currently being developed. The program's planning process is underpinned by guidance that provides an overall strategy for the Stockpile Stewardship Program. A new, detailed planning structure has been developed to implement the science and production components that compose the Stockpile Stewardship Program. Finally, the Congress directed that a plan for a major part of the program's work—stockpile life extensions—be developed. The Office of Defense Programs has issued an interim Stockpile Life Extension Program Plan, which is intended to ensure that life extension activities for weapons are planned in detail, coordinated fully, and executed within fiscal resources.

While the Office of Defense Programs has developed over 70 Stockpile Stewardship Program plans, they are not complete enough to fully support the Stockpile Stewardship Program's successful implementation. The plans are incomplete in two ways. First, the program still does not have all of its work requirements finalized, such as decisions on upgrades to major weapons systems, that will drive the program's scope, schedule, and costs. Second, the Stockpile Life Extension Program Plan is not yet complete because planners do not have important information on plant capacity. For example, one production plant is unable to estimate its capacity for producing certain weapons components because it does not have a current, validated model for doing so. Without this information, managers cannot effectively plan for meeting future life extension work requirements.

The Office of Defense Programs' plans are not effectively linked to the program's management controls. For example, milestones in the plans are not effectively linked to budgets at the site level, resulting in conflicts between work requirements and available funding to adequately perform the work. Milestones and other performance management information contained in the plans are also not systematically and regularly incorporated into contracts governing the operation of laboratory and

production sites. Finally, although the Office of Defense Programs' management recognizes that it is critical for the science work of weapons design and development to be integrated with the production plants' processes and capabilities, two separate program plans have been prepared for the science and production parts of the program that cover the activities directly supporting specific weapons in the stockpile, such as the day-to-day care of the weapons, as well as planned life extensions. However, having two separate program plans makes the integration of the science and production parts of the program more difficult to achieve, and important crosscutting issues can be overlooked.

Revised Budget Information Needed to Improve the Management of the Stockpile Stewardship Program

Prior to its budget submission for fiscal year 2001, the Office of Defense Programs divided its operating budget submission into two broad program activity categories, which made determining with precision where funds were being spent difficult. To address this problem, the Office of Defense Programs began to develop a new structure around three different activities, known as Campaigns, Directed Stockpile Work, and Readiness in Technical Base and Facilities. Outside technical experts and Office of Defense Programs officials believe that developing and implementing this new program activity structure can improve the Stockpile Stewardship Program's cost management. For example, a comprehensive internal review of the Stockpile Stewardship Program (called the "30-Day Review") concluded that the three new activity categories would allow program managers to more clearly understand the fixed and variable costs of the nuclear weapons complex. The study saw the Campaigns and Directed Stockpile Work activities as encompassing the variable costs of the actual work performed by the nuclear weapons complex, while the Readiness in Technical Base and Facilities activity encompasses the fixed costs associated with the program—the costs of "keeping the doors open." The implementation of this approach would, according to the review, provide Office of Defense Programs, lab, and production plant managers with "an improved and coordinated tool for determining the costs associated with managing the nuclear weapons complex." Managers within the Office of Defense Programs held similar views.

While program officials have supported this new structure, its implementation has experienced two consistency problems. First, when the structure was used to develop the program's budget submission for fiscal year 2001, the labs and production plants did not apply the new budget definitions consistently. While the production plants included all of their fixed costs in Readiness in Technical Base and Facilities, the labs did

not. Second, the Office of the Chief Financial Officer believed that the way the program activity structure was being applied was not consistent with various accounting standards and certain laws and regulations that contain accounting requirements and could impair the Department's ability to get a satisfactory opinion on its financial statement.

Since the original budget submission, DOE and program budget officials have developed an amendment. One of the effects of this amendment has been to shift fixed costs for the plants from the Readiness in Technical Base and Facilities activity to the Campaigns and Directed Stockpile Work activities. While this was done to ensure that the labs and plants treat overhead in a consistent way, it means that the fixed and variable costs are no longer clearly delineated in the program's budget, making it more difficult to identify the amount that could be saved if an activity is cut and, thus, weakening the program's ability to improve cost management.

Fundamental Organizational and Leadership Changes Needed for the Successful Implementation of the Office of Defense Programs' New Mission

Over the past few years, internal and external studies of DOE's Stockpile Stewardship Program have pointed out numerous management problems. In particular, the studies all noted the confusing, overlapping, and, at times, conflicting lines of authority within DOE and within the Office of Defense Programs. In response to these findings, the Secretary of Energy reorganized reporting relationships between DOE's field and headquarters offices in April 1999, and the Office of Defense Programs consolidated two of its headquarters offices in August 1999. Finally, additional organizational changes are expected as the National Nuclear Security Administration's new leadership begins to address problems in implementing the new agency.

However, DOE's attempts to reorganize the Office of Defense Programs have not addressed all of the organizational issues. Problems remain in the structure of the Office of Defense Programs at three levels—within the headquarters programmatic offices, between headquarters and the field offices, and between the contractors overseeing weapons complex sites and their federal overseers in the field and headquarters. With respect to the headquarters offices, while the August 1999 consolidation reduced headquarters' programmatic offices from three to two, it left the split between the science offices and the production offices in place. This bifurcated structure has resulted in widespread dissatisfaction with the way the program is being managed among DOE and contractor officials at all levels and has led to duplication of effort and difficulties in getting the work done. Regarding the relationships between headquarters and the field

offices, one of the key problems noted in a major management study 3 years ago was the existence of "two headquarters"—one in the Office of Defense Programs' headquarters and one in the Albuquerque Operations Office. This situation still exists because clearly defined roles and responsibilities are lacking, and officials in both Offices, including the program's Principal Deputy for Operations, noted problems with uncertainty about what managers in headquarters and in the field are authorized to do. Finally, organizational issues between the Office of Defense Programs, DOE's field offices, and DOE contractors remain unresolved. Even after repeated reorganization and realignment attempts, until October 2000, the Office of Defense Programs did not have control of the contracts for all of the sites performing substantial amounts of work for the Stockpile Stewardship Program, such as the Lawrence Livermore National Laboratory and two of the program's key production facilities—the Y-12 Plant at Oak Ridge, Tennessee, and Tritium Operations at Savannah River, South Carolina. This organizational structure made the integration and coordination of the Stockpile Stewardship Program difficult and diffused accountability for the overall performance and management of key weapons complex activities. A recent reorganization was designed to correct this problem; however, implementation of the reorganization has just begun, and important issues, such as the specific reporting chain for the new area offices, are still being addressed.

Finally, the Office of Defense Programs has suffered from instability in its leadership and management team. An analysis of senior management positions in headquarters shows that the proportion of offices vacant or with acting managers has increased from 17 percent in 1996 to almost 65 percent in 2000. The President's Foreign Intelligence Advisory Board noted in its 1999 report that consistent leadership is a hallmark of effective programs and that longevity is a key to leadership. The lack of consistent management direction was cited by officials in the field and in headquarters as an area of concern. The high level of turnover in the Office of Defense Programs may be contributing to the substantial number of useful management improvements identified to respond to the various study recommendations that have not been fully implemented. The turnover may also contribute to the fact that the same problems are enumerated year after year without effective and decisive action being taken to resolve them. Finally, the high rate of turnover impairs the Office of Defense Programs' ability to provide consistent and effective leadership, to take decisive action on difficult problems, and to identify those who should be held accountable for results.

Management Improvements Needed for the Office of Defense Programs to Conduct Successful Stockpile Life Extensions

While the life extension program for the W87 warhead is the first, and only, life extension program conducted to date under the Stockpile Stewardship Program, DOE expects that all of the weapons in the stockpile will have to undergo life extensions in the future if they are to remain safe and reliable. During the early 1990s, DOE recognized the need to make structural enhancements to, and extend the life of, the W87. Since accomplishing this required disassembly and refurbishment, DOE and the Department of Defense decided to initiate a program to extend the life of the W87 for an additional 30 years.

The life extension program for the W87 has experienced both design and production problems that contributed significantly to a 2-year schedule delay in a key milestone for the program and a cost increase of $300 million (about 70 percent). The original design to enhance the structural integrity and extend the stockpile life of the W87 did not work as planned, and a major redesign was required. All of the major production facilities in the nuclear weapons complex—the Kansas City, Y-12, and Pantex Plants—experienced significant production problems that resulted from such factors as restarting production capabilities that had been moved during the downsizing of the complex and addressing safety and technician training issues.

Underpinning the problems experienced during the life extension program for the W87 was the Office of Defense Programs' lack of an effective management structure and leadership. While the Office of Defense Programs has historically used a very detailed program management process to design and build new nuclear weapons, the life extension program for the W87 was conducted with little management structure. For example, the Office did not develop an overall program plan or cost baseline to manage the entire life extension process for the W87. With respect to leadership, no one person within the Office of Defense Programs was expressly in charge of the life extension program for the W87. During the design phase, Lawrence Livermore National Laboratory's program managers led the effort, while during the production phase, DOE's Albuquerque Operations Office officials were in charge. During the transition between these phases, many participants felt that who was in charge was not clear. Without an effective management structure and leadership, the potential impact of many of the problems encountered were neither anticipated nor effectively mitigated.

As a direct result of its experience with the W87, the Office of Defense Programs has developed a specific management structure for future life

extension programs; however, the development of this process is not complete. For example, the revised process does not solve the lack of clear program management leadership throughout the life extension process. Rather, it continues the current practice of multiple program managers at multiple locations. In addition, GAO found that, to date, there has been no formal attempt to catalogue the lessons learned from the W87 life extension and directly communicate them to managers of upcoming life extension programs.

Recommendations

In order to assist DOE in its mission of effectively maintaining the safety and reliability of the nuclear weapons stockpile, this report contains recommendations to the Administrator of the National Nuclear Security Administration designed to improve program planning, the budget information available to decision makers, the organization of the program, and the management process for future stockpile life extensions. (See chs. 2, 3, 4, and 5 for GAO's specific recommendations.)

Agency Comments and GAO's Evaluation

GAO provided DOE's National Nuclear Security Administration with a draft of this report for review and comment. In general, the Administration's Office of Defense Programs agreed with the findings and recommendations of the report. In particular, the Office stated that the report presented a balanced perspective and accurately portrayed areas needing further improvement and management attention. The Office also cited instances where it had recently taken management action, such as reorganizing its field office structure, to correct some of the problems GAO identified. GAO believes that these actions are positive steps and has recognized them throughout the report.

The Office did express concern that GAO's recommendations to address program planning weaknesses and improve management data possibly were premised on misinterpretations of the fundamental underpinnings of weapons activities. However, in both cases, the Office promised to take action to comply with the intent of GAO's recommendations. While the actions the Office has promised are a useful beginning, the full extent of action GAO recommended is needed to address the problems GAO identified. Therefore, GAO has retained both recommendations. More detailed discussions of the National Nuclear Security Administration's comments are included in chapters 2, 3, 4, and 5. The Administration's comments appear in full in appendix III.

Background on DOE's Office of Defense Programs Mission and Structure

Within the Department of Energy (DOE), the National Nuclear Security Administration's Office of Defense Programs is responsible for designing and maintaining the nation's nuclear weapons stockpile. In the past, this mission has included the design, testing, and manufacture of new weapons systems, as well as the maintenance of existing systems. In the late 1980s, the Office of Defense Programs' mission changed as a result of the easing of Cold War tensions with the former Soviet Union and the negotiation of arms reduction and weapons test limitation treaties. In response, the Office of Defense Programs downsized and restructured the nuclear weapons complex to focus on a new mission of extending the life of existing nuclear weapons through scientific study, simulation, and refurbishment. However, the reconfigured weapons complex faces a difficult set of challenges and constraints.

DOE's Historical Mission in Designing and Maintaining the Nuclear Weapons Stockpile

Since the beginning of the Manhattan Project, DOE and its predecessor agencies have been responsible for designing and maintaining the nation's nuclear weapons. DOE's weapons program was structured to work with the Department of Defense (DOD) to define the nation's nuclear weapons needs and to manage the design and production of the weapons selected for the stockpile. To fulfill this mission, DOE managed a complex of research and production facilities, employing thousands of workers.

The Historical Mission of the Office of Defense Programs Was to Design, Test, and Build Nuclear Weapons

From the beginning of the Manhattan Project in the 1940s, DOE and its predecessor agencies have been responsible for designing, testing, and building the nation's nuclear weapons—weapons that would be deployed by the military. While the first nuclear weapons were relatively simple devices, modern nuclear weapons are complex. Most modern nuclear weapons consist of three sets of assemblies inside a case—a primary, a secondary, and a set of nonnuclear components. The primary is the fission stage of a nuclear weapon. Detonated first, the primary produces the extremely high temperatures and pressures required to produce fusion in the weapon's secondary. The secondary, or thermonuclear stage, of a nuclear weapon produces its energy through the fusion of deuterium and tritium nuclei. The nonnuclear components control the use, arming, and firing of the weapon. (See app. I for a simplified explanation of the mechanics of a generalized modern nuclear weapon.) Explosive testing of the devices was used to validate designs and to ensure that changes to fix potential or existing problems or address changing military requirements worked as expected.

DOE's Weapons Program Was Structured to Meet Military Requirements for Continuous Production

DOE and DOD work together to produce the Nuclear Weapons Stockpile Memorandum, which is forwarded to the President for approval annually. The memorandum contains a detailed listing of the nuclear weapons to be included in the stockpile, along with weapons retirements and other information concerning adjustments to the stockpile. Once the memorandum is approved, it forms the basis for DOE's weapons program planning, embodied in the Production and Planning Directive. This directive lays out the requirements for the nuclear weapons complex for the current year plus 5 years and directs planning for the succeeding 5-year period. The directive is converted into specific direction for the complex by DOE's Albuquerque Operations Office and serves as the primary basis for budget development.

The production of new weapons for the stockpile has traditionally been managed through a seven-phase process. (See fig. 1.) Old weapons designs were continually being replaced by new designs; the removal of old weapons from the stockpile kept the average age of the stockpile low. Production plant capability was maintained by the constant flow of new weapons programs that paid for the repair, replacement, and upgrading of facilities and capital equipment. Because of the continuing pipeline of new weapons programs, the production plants were also able to maintain adequate capacity to provide the labs' designers with weapons components for testing without derailing production schedules.

Figure 1: Traditional Weapons Development and Production Cycle

Phase 1: Weapon conception	Phase 2: Program feasibility study	Phase 2A: Design definition and cost study	Phase 3: Development engineering	Phase 4: Production engineering	Phase 5: First production	Phase 6: Quantity production and stockpile deployment	Phase 7: Dismantlement
• Exploratory studies • Military characteristics and stockpile-to-target sequence drafted • Phase 1 report	• Joint DOE-DOD feasibility study • DOE-DOD agreement on division of development and procurement responsibilites • Final military characteristics prepared • POG formed for new weapon	• Completion of design definition • Cost study	• Development design definition • Develop production processes • Design testing • Pilot production program defined • Training and acceptance equipment production	• Adaptation of development design • Pilot production • Product engineering • Process engineering • Tooling • Prototype procurement and inspection • Test and handling procedures • Quality Evaluation Release and Complete Engineering Release issued	• Designers certify weapon • Initiate production (FPU) • Implement quality control procedures • Implement inspection procedures • Issue Final Weapon Design Report and Major Assembly Release • DRAAG recommends acceptance • DOD/NWC accept design • Decision to proceed to Phase 6	• Full-scale production • Production inspection and quality assurance programs implemented • Deployment in stockpile • Routine surveillance, maintenance, and repair of deployed weapons	• Retirement from stockpile • Weapons returned from DOD • Temporary storage • Disassembly and disposal engineering • Disassembly and disposal

Legend

DRAAG = Design Review and Acceptance Group

FPU = First Production Unit

NWC = Nuclear Weapons Council

POG = Project Officers Group

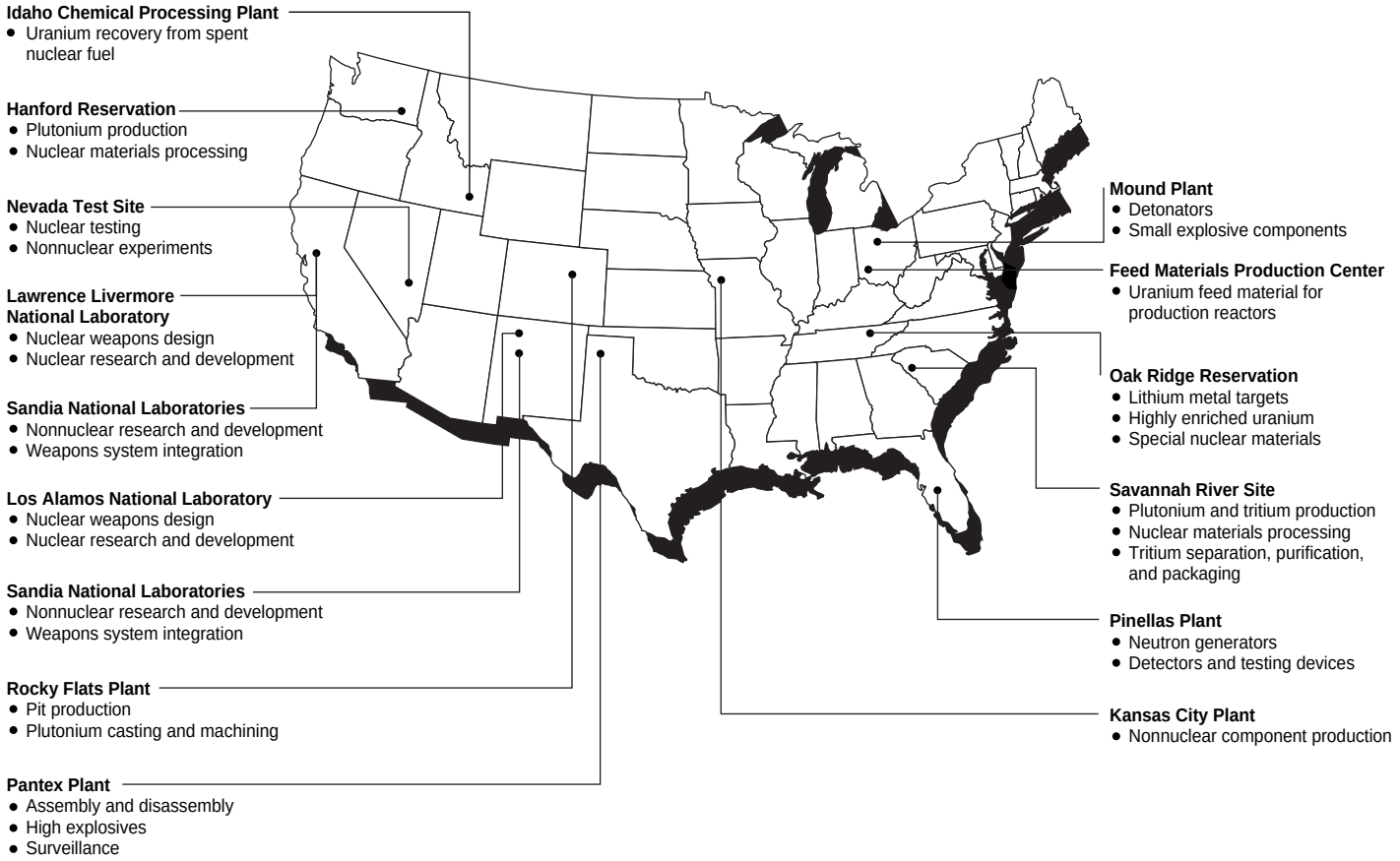
Source: GAO's analysis of DOE's data.

Nuclear Weapons Were Produced by a Nationwide Complex of Facilities

By 1988, the nuclear weapons complex employed about 60,000 people and had a total budget of about $8 billion per year. DOE oversaw 3 national weapons laboratories, a nuclear weapons test site, and 10 production sites.

(See fig. 2.) These sites were operated for the government by management and operating contractors, who employed most of the people working in the nuclear weapons complex.

Figure 2: Nuclear Weapons Complex, 1988



Note: Sandia National Laboratories has two facilities, one in California to support the Lawrence Livermore National Laboratory and one in New Mexico to support the Los Alamos National Laboratory. This map shows both locations.

Source: GAO's analysis of DOE's data.

Each of the sites identified in figure 2 had a defined role in the nuclear weapons complex. The three national laboratories—Los Alamos (N. Mex.), Lawrence Livermore (Calif.), and Sandia (N. Mex. and Calif.)—designed weapons to meet military requirements. Los Alamos and Livermore designed the nuclear portions of the weapons; Sandia designed the

nonnuclear components and ensured that all components of the systems worked in an integrated manner. Confidence in the stockpile was maintained by testing, mostly performed at the Nevada Test Site, which hosted over 900 nuclear weapons tests. The various production sites produced weapons-grade materials or components, assembled weapons, performed quality assurance and maintenance functions on the weapons in the active stockpile, and dismantled weapons retired from the stockpile. (See table 1.)

Table 1: Roles of the Production Sites in the Nuclear Weapons Complex, 1988

Site	Location	Purpose
Feed Materials Production Center	Fernald, Ohio	Production of feed materials for complex reactor sites
Hanford Reservation	Richland, Wash.	Production reactor producing plutonium; materials processing
Idaho Chemical Processing Plant	Idaho Falls, Idaho	Recover uranium from spent test reactor and naval propulsion reactor fuels
Kansas City Plant	Kansas City, Mo.	Produce and procure nonnuclear metal, plastic, and electronic components
Mound Facility	Miamisburg, Ohio	Research, development, and production of detonators and other small explosive components
Paducah Gaseous Diffusion Plant	Paducah, Ky.	Enrichment of uranium
Pantex Plant	Amarillo, Tex.	Weapons assembly, fabrication of chemical explosives, quality control, repair, retirement, disposal, and disassembly of retired weapons
Pinellas Plant	Largo, Fla.	Produce neutron-generators, detectors, and testing devices
Portsmouth Gaseous Diffusion Plant	Piketon, Ohio	Enrichment of uranium
Rocky Flats	Golden, Colo.	Cast and machine plutonium components
Savannah River Plant	Aiken, S.C.	Production reactors to produce plutonium and tritium; materials processing; and tritium separation, purification, and packaging
Y-12 Plant	Oak Ridge, Tenn.	Production of lithium metal target material for tritium production; processing and fabrication of highly enriched uranium, lithium, and other special materials

Source: GAO's analysis of DOE's data.

The Mission and Structure of DOE's Nuclear Weapons Complex Has Changed

Since the end of the Cold War, the United States has made several key decisions that have directly affected the mission of DOE's nuclear weapons complex. As a result of these decisions, the composition of the stockpile and, consequently, the mission of the nuclear weapons complex has changed from "design, build, and test" to extending the life of existing nuclear weapons through "scientific study, simulation, and refurbishment." To address this new mission, DOE created the Stockpile Stewardship Program in 1992, introduced new planning processes, and reconfigured the nuclear weapons complex and its workforce.

DOE's Mission Has Been Changed in Response to International Events

Since 1945, the nuclear weapons labs have designed more than 95 different nuclear weapons. Of these weapons, about 25 types were in the active stockpile during the Cold War era. In 1990, the United States had about 21,000 nuclear weapons. However, in 1991, two major events changed the country's nuclear posture—the first Strategic Arms Reduction Treaty (START I) between the United States and Russia was signed, and the United States announced a new arms control initiative that resulted in the withdrawal of the Army's nuclear weapons from overseas bases and the retirement of several thousand nuclear warheads. START I will reduce the number of strategic nuclear weapons in the U. S. stockpile to 6,000 when fully implemented in 2001.[1] A second treaty (START II) ratified by the United States and Russia will further reduce the U.S. strategic stockpile to about 3,500 weapons. In 1995, the administration announced that it would pursue a Comprehensive Test Ban Treaty that would limit nuclear testing by participating countries to extremely low levels, referred to as zero yield. While the Comprehensive Test Ban Treaty was rejected by the U.S. Senate in October 1999, a unilateral U.S. moratorium on testing that began in 1992 continues. At the present time, the U.S. stockpile consists of nine weapons types. (See table 2.) The lifetimes of the weapons currently in the stockpile will be extended well beyond the minimum life for which they were originally designed—generally about 20 years—increasing the average age of the stockpile and, for the first time, leaving DOE with large numbers of weapons 30 to 40 years old.

[1]These treaties limit only the number of strategic nuclear weapons that can be loaded on treaty-specified and treaty-verified strategic missiles and bombers. The total U.S. stockpile is larger than the number of weapons allowed under START because the stockpile contains weapons that are not covered by the treaties.

Table 2: Weapons in the Enduring Stockpile

Warhead or bomb mark	Description	Laboratories	Primary use	Military service
B61 3/4/10	Tactical bomb	Los Alamos, Sandia	Air to surface	Air Force
B61 7/11	Strategic bomb	Los Alamos, Sandia	Air to surface	Air Force
W62	ICBM warhead	Lawrence Livermore, Sandia	Surface to surface	Air Force
W76	SLBM warhead	Los Alamos, Sandia	Underwater to surface	Navy
W78	ICBM warhead	Los Alamos, Sandia	Surface to surface	Air Force
W80 0/1	ALCM/ACM/TLAM-N warhead	Los Alamos, Sandia	Air to surface, underwater to surface	Air Force, Navy
B83 0/1	Strategic bomb	Lawrence Livermore, Sandia	Air to surface	Air Force
W87	ICBM warhead	Lawrence Livermore, Sandia	Surface to surface	Air Force
W88	SLBM warhead	Los Alamos, Sandia	Underwater to surface	Navy

Legend

ALCM/ACM/TLAM-N = designations for cruise missiles.

ICBM = intercontinental ballistic missile.

SLBM = submarine launched ballistic missile.

Source: *FY 2000 Stockpile Stewardship Plan*, DOE (Mar. 15, 1999) p. 1-3.

DOE's Weapons Program Has Been Restructured to Address the Changing Mission

As a result of changes in arms control, arms reduction, and nonproliferation policies, DOE was directed by a 1993 Presidential Decision Directive and by the National Defense Authorization Act for Fiscal Year 1994 to "establish a stewardship program to ensure the preservation of the core intellectual and technical competencies of the U.S. in nuclear weapons." The Stockpile Stewardship Program[2] was ". . . developed to increase understanding of the basic phenomena associated with nuclear weapons, to provide better predictive understanding of the safety and reliability of weapons, and to ensure a strong scientific and technical basis for future United States nuclear weapons policy objectives."[3] The Stockpile Stewardship Program is organized around three major program segments—Campaigns, Directed Stockpile Work, and Readiness in Technical Base and Facilities. Starting in fiscal year 2001, these categories will be used for budgeting as well as program planning.

[2]Formerly, called the Stockpile Stewardship and Management Program.

[3]See *Record of Decision Programmatic Environmental Impact Statement for Stockpile Stewardship and Management*, Department of Energy (61 Fed. Reg., 68014, Dec. 26, 1996).

- *Campaigns* are technically challenging, multiyear, multifunctional efforts conducted across the Office of Defense Program's laboratories, production plants, and the Nevada Test Site. They are designed to develop and maintain the critical capabilities needed to enable continued certification of the stockpile into the foreseeable future, without underground testing. Campaigns have milestones and specific end-dates or goals, effectively focusing research and development activities on clearly defined deliverables.
- *Directed Stockpile Work* includes the activities that directly support specific weapons in the stockpile. These activities include the current maintenance and day-to-day care of the stockpile, as well as planned life extensions.
- *Readiness in Technical Base and Facilities* includes the physical infrastructure and operational readiness required to conduct Campaign and Directed Stockpile Work activities at the production plants, laboratories, and the Nevada Test Site. This includes ensuring that the infrastructure and facilities are operational, safe, secure, compliant, and ready to operate.[4]

In addition, a major part of DOE's new Stockpile Stewardship Program is the Stockpile Life Extension Program, which establishes a planning process by which life extension activities for weapons are managed, enabling the weapons laboratories to develop viable options for maintaining the safety and reliability of the U.S. nuclear stockpile. To implement the Stockpile Life Extension Program, DOE has developed a revised weapons acquisition process, called the "6.X process" for the Stockpile Life Extension Program. The 6.X process replaces Phase 6 in the traditional weapons development and production cycle (shown in fig. 1) with a new series of steps designed to assess the weapons, determine options for changes, and direct the performance of the chosen option. (See fig. 3.)

[4]Under the current budget system, construction projects to provide new facilities are budgeted for separately. Once the facilities are built, they will come under the jurisdiction of the Readiness in Technical Base and Facilities category.

Figure 3: The New "6.X" Weapons Refurbishment Cycle

Phase 6.1: Concept assessment	Phase 6.2: Feasibility study and option downselect	Phase 6.2A: Design definition and cost study	Phase 6.3: Development engineering	Phase 6.4: Production readiness engineering	Phase 6.5: First refurbishment	Phase 6.6: Full-scale production
• Review of stockpile evaluation, baselining, and experience • Risk assessment (must, should, etc.) • Life extension option formulation • Initiate POG interface • Workload analysis	• Joint DOE/DOD in-depth analysis • Extended service life considerations • System trade-offs (design and cost) • LEP proposal	• Design definition • Program planning • Baseline cost analysis • Impact assessment (design and production) • LEP approval	• Engineering and production development • Development test support • Process characterization	• Process prove-in • Product qualification • Certification models and tests • Type and trainer support	• First refurbishment unit delivery • First weapon refurbishment • REST evaluation	• Full-scale refurbishment • Continue retrofit evaluation
	Concurrent engineering					

☆ Nuclear Weapons Council's approval

◊ DOE decision

Legend

LEP = Life Extension Program

POG = Project Officers Group

REST = Retrofit Evaluation System Test

Source: GAO's analysis of DOE's information.

To support the Stockpile Stewardship Program, DOE has also proposed building several large experimental facilities, including the National Ignition Facility at Lawrence Livermore National Laboratory, the Dual Axis Radiographic Hydrodynamic Test Facility at Los Alamos National Laboratory, and the Processing and Environmental Technology Laboratory at Sandia National Laboratory. These facilities, along with greatly enhanced computational capabilities, are meant to enable weapons designers to develop sophisticated, three-dimensional models of nuclear weapons explosions to supplement existing data collected during tests.[5] The ultimate goal is to enable DOE and DOD to jointly certify the safety and reliability of the enduring stockpile without the use of nuclear testing.

In addition, the Congress established the National Nuclear Security Administration in October 1999 as a semiautonomous agency within DOE with responsibility for the national nuclear weapons, nonproliferation, and naval reactors programs. The agency was established to correct long-standing management problems at DOE, which were most recently highlighted by major security problems at its national laboratories.

The Weapons Complex Has Been Restructured to Meet New Mission Requirements

DOE significantly restructured the nuclear weapons complex to meet its new mission of ensuring the safety and reliability of the stockpile under the Stockpile Stewardship Program. While the three weapons design labs were retained, the Nevada Test Site and the production plant's infrastructure were significantly reduced in size. (See fig. 4.) Some or all weapons program work was discontinued at eight production sites, leaving only four in the reconfigured nuclear weapons complex. In addition, some production work was transferred to two of the weapons design labs.

[5]See *Nuclear Weapons: DOE Needs to Improve Oversight of the $5 Billion Strategic Computing Initiative* (GAO/RCED-99-195, June 28, 1999) and *National Ignition Facility: Management and Oversight Failures Caused Major Cost Overruns and Schedule Delays* (GAO/RCED-00-141, Aug. 8, 2000).

Figure 4: DOE's Reconfigured Nuclear Weapons Complex—Sites' Roles in 2000 and Employment Changes, 1988 Through 2000

Notes:

Sandia National Laboratories has two facilities, one in California to support the Lawrence Livermore National Laboratory and one in New Mexico to support the Los Alamos National Laboratory. This map shows both locations.

Numbers shown in parenthesis indicate the percent decrease in employment from 1988 to 2000.

Source: GAO's analysis of DOE's data.

In addition, the specific missions of some sites have also changed. For example, because sites where weapons material production reactors were located, such as Savannah River, no longer operate those reactors, the production of new weapons-grade plutonium has been discontinued. Some functions of closed sites were transferred to other portions of the complex, whereby the weapons labs took on limited production functions in addition to their research, development, and design functions. For example, a limited capacity to produce plutonium pits[6] is being developed at Los Alamos National Laboratory to replace the production capability lost when the Rocky Flats Plant closed, and the production of neutron generators was transferred from the Pinellas Plant to Sandia National Laboratories.[7] The role of the Pantex Plant was expanded to include temporary storage of strategic reserve pits, and all uranium purification and reprocessing was consolidated at the Y-12 Plant.

Employment throughout the complex peaked in 1990 and began to decline after that date as production ceased at many sites and those sites were transferred to DOE's Office of Environmental Management for environmental cleanup. (See table 3 for management and operating contractor employment data.) However, that decrease has not been spread uniformly throughout the complex. From 1988 through 2000, employment at Los Alamos has increased about 50 percent, while the Savannah River Site has seen Defense Programs' employment fall about 90 percent.[8] Overall, the remaining production plants have had to manage a 66-percent decrease in employment, while the labs have increased employment about 9 percent.

[6]A pit is the initial, subcritical assembly of fissile material in a nuclear weapon. In such an assembly, a fission chain reaction can be sustained only by the addition of neutrons from an independent source.

[7]A neutron generator is a device that produces neutrons that are injected into the pit of a nuclear weapon to initiate the chain reaction that changes the reaction to a self-sustaining, or critical, reaction within the weapon.

[8]While these workers have left the nuclear weapons complex, not all of them have left DOE, since many former nuclear weapons complex workers were transferred, along with facilities, to the Environmental Management Program.

Table 3: Management and Operating Contractor Employment in the Nuclear Weapons Complex, 1988 Through 2000

	Employment by fiscal year				
Weapons complex site	**1988**	**1992**	**1995**	**2000**	**Percent change, 1988 through 2000**
Rocky Flats Plant	4,990	5,332	935	0	(100)
Pinellas	1,565	1,386	511	0	(100)
Mound	1,754	1,305	679	0	(100)
Oak Ridge/Y-12 Plant	5,615	5,384	4,767	3,612	(36)
Savannah River	16,616	14,796	7,618	1,714	(90)
Pantex Plant	2,462	2,529	3,007	2,706	10
Kansas City Plant	5,760	3,941	2,984	2,499	(57)
Nevada Test Site	4,609	4,216	2,406	1,670	(64)
Lawrence Livermore National Laboratory	3,841	3,609	3,251	3,934	2
Los Alamos National Laboratory	3,173	3,194	3,143	4,746	50
Sandia National Laboratories	4,278	4,548	4,168	3,620	(15)
Other	167	1,598	359	2	(99)
Total	**54,830**	**51,838**	**33,828**	**24,503**	**(55)**

Source: GAO's analysis of DOE's data.

Total federal employment in the complex has also declined about 34 percent over the last decade from a high of 3,241 in fiscal year 1993 to 1,749 in fiscal year 2000. Employment in the Office of Defense Programs headquarters office has fallen by about 20 percent from 1991 through 2000. (See table 4.) The majority of federal staff is located in the Albuquerque Operations Office.[9] In fiscal year 2000, the Albuquerque Operations Office had more than 2-1/2 times as many federal staff as headquarters did (744 to 276, respectively), making the former the largest federal office in the complex. As of March 1, 2000, headquarters and field personnel working in

[9]The staff of the Transportation Safeguards Division are not included in the total staffing for the Albuquerque Operations Office because DOE now reports this unit separately. The Transportation Safeguards Division staffs DOE's program to ship materials that require special security measures, such as nuclear weapons and materials, to and from military locations and between facilities in the weapons complex within the continental United States.

the weapons program became employees of the new National Nuclear Security Administration.

Table 4: Federal Staffing in the Office of Defense Programs, 1991 Through 2000

	Employment by fiscal year				
Location	**1991**	**1993**	**1995**	**2000**	**Percent change 1991 through 2000**
Headquarters	343	515	366	276	(19.5)
Albuquerque[a]	1,340	1,495	964	744	(44.5)
Idaho	21	27	0	0	(100.0)
Nevada	305	362	307	235	(23.0)
Oakland	63	91	87	83	31.7
Oak Ridge	81	97	77	59	(27.2)
Rocky Flats	130	185	0	0	(100.0)
Savannah River[b]	384	469	18	29	(92.4)
Secure Transportation	[a]	[a]	366	323	[a]
Total	**2,667**	**3,241**	**2,185**	**1,749**	**(34.4)**

[a]Until 1995, the staff level for the Albuquerque Operations Office included staffing for the Secure Transportation function. Beginning in 2000, DOE began tracking Secure Transportation as a separate decision unit. DOE's figures account for that change retroactively for the period from fiscal year 1995 through fiscal 2000. Thus, the percent change in staffing for the Secure Transportation unit from fiscal year 1991 to fiscal 2000 cannot be calculated from the available data. However, the unit has an average staffing level of 330 for the period from fiscal year 1995 through fiscal 2000.

[b]In fiscal year 1991, the staffing level for Savannah River included staffing for the reactor restart program that was discontinued after fiscal 1992.

Source: GAO's analysis of DOE's data.

The Reconfigured Weapons Complex Faces Challenges and Constraints

DOE's Stockpile Stewardship Program faces difficult challenges and constraints. The directors of DOE's nuclear weapons laboratories acknowledge that the ability to continue to certify the nation's nuclear weapons without testing is problematic. In addition, the existing infrastructure in the nuclear weapons complex is very old—much of it having been built in the 1940s and 1950s—making it difficult and expensive to maintain. Downsizing has also created imbalances in the federal and contractor workforce. Finally, DOE must determine what program its funding of about $4.5 billion annually can support. Meeting these challenges requires long-term planning and budget support to ensure that all parts of the weapons complex can perform their missions.

Stockpile Stewardship Seeks to Replace Testing With Simulation Based on the Results of Experiments

Among the questions that remain to be answered about Stockpile Stewardship are several that bear on whether the enduring stockpile can be maintained without testing. As time passes, the weapons themselves will change as the materials used in them age in "dynamic and not necessarily predictable ways," according to the Director of the Lawrence Livermore National Laboratory. In addition, according to the Director of the Sandia National Laboratories, exhaustive nonnuclear tests of components and systems are needed. Finally, new computer models are being developed to predict the performance of various aspects of nuclear weapons. The most advanced supercomputers available today do not provide "sufficient accuracy and . . . sufficient detail to provide maximum confidence in the stockpile," according to the Director of the Los Alamos National Laboratory.

Another issue is deciding what changes can and should be made to weapons in the enduring stockpile—defining the requirements for each weapon in the enduring stockpile. Some changes are inevitable, since some of the processes and materials used for particular components are no longer available. However, weapons are most likely to have defects requiring action early in their life cycle, that is, shortly after changes have been introduced into a design. Thus, even changes that would generally be viewed as beneficial, such as those designed to improve safety, could introduce new defects. Evaluating whether changes will be made to a weapon will hinge on having a good understanding of the requirements and trade-offs involved.

Recapitalization of the Nuclear Weapons Complex's Infrastructure to Efficiently Perform Its Mission Will Be Expensive

Although DOE has met production goals over the last decade, DOE officials acknowledge that they have done so by neglecting the infrastructure and allowing some key production capabilities to become unusable. In order to continue to maintain the existing cadre of weapons, DOE must maintain all of the processes and capabilities required to rebuild or refurbish any component of any weapon in the enduring stockpile. The basic capabilities needed to maintain the stockpile do not vary significantly in relation to the number of weapons or the number of weapons types in the stockpile, leading to high fixed costs to maintain production capability. Senior DOE officials acknowledge that the condition of the infrastructure, especially at the production facilities, has deteriorated to the point that it threatens DOE's ability to meet its stockpile stewardship mission.

Much of the infrastructure of the nuclear weapons complex was originally built in the 1950s. Buildings of that age are expensive to maintain and

operate under the best of conditions and often cannot meet current safety and environmental standards without expensive renovations. Preventive and corrective maintenance spending has been reduced and, at the production plants, is a fraction of what comparable private industry facilities spend. For example, contractor officials at the Pantex Plant reported that they have been able to reinvest only 1 to 2 percent of the value of capital equipment each year to fund the repair and replacement of capital equipment and productivity improvements. In contrast, they estimate the average reinvestment in private industry for capital equipment at about 9 to 11 percent per year. Overall, program officials believe that 3 to 5 percent should be the reinvestment goal for the entire facility.

In addition, officials at both Y-12 and Pantex reported that there are infrastructure projects that should be started now if they are to meet the current Stockpile Life Extension Program schedule, but these projects are not funded. While projects to correct problems with the infrastructure, such as making major repairs, take 5 to 7 years to plan, budget, and implement, some existing infrastructure conditions reported by the production plants have the potential to shut down work and represent potential safety hazards. For example, the Y-12 Plant has been unable to fund the maintenance or demolition of an obsolete wooden cooling tower that represents a fire hazard. Because the operating cooling tower is situated immediately adjacent to the obsolete cooling tower, a fire in the old tower could destroy both, leading to a shut down of operations. At the Pantex Plant, specially designed blast-mitigating roofs that cover the cells and bays used for working with high explosives in nuclear weapons assembly and disassembly operations need constant repair to prevent native plants from rooting in cracks, causing leaks that can restrict or stop production activities. At the Y-12 Plant, some facility walls and roofs are in such poor condition that workers are no longer able to work in portions of some production buildings.

Rebuilding the Weapons Complex Workforce Presents Additional Challenges

In addition, with the reconfiguring of the complex and decrease in program budgets, many of the sites have been unable to do the hiring necessary to supply the complex with skilled technicians, machinists, engineers, and scientists. Weapons design and production require unique skills and process knowledge, as well as a national security clearance. As workers have left the nuclear weapons complex, those skills have been lost to the complex, even when the workers were still employed by contractors operating other DOE programs, such as workers transferred along with sites to the Environmental Management Program. For example, technicians

dismantling weapons must be certified before they are allowed to work on a specific weapon type. Gaining certification requires rigorous training, including hands-on work on the weapon under the supervision of a certified technician, while maintaining certification requires that the technicians continue working on the process for which they are certified. In some cases, only one or two people with knowledge of key processes remain at a site. This situation has resulted in an aging workforce and lost opportunities to pass knowledge and skills from one generation of workers to the next. Each site's situation is unique in terms of the challenges that the site must meet to recruit new workers in key skill areas. But, while the sites have plans for renewing their workforce, a senior DOE official acknowledges that these plans have not been fully funded.

Fitting the Stockpile Stewardship Program Into the Reduced Budget

DOE's weapons budget fell from about $8 billion a year in the late 1980s to about $4.5 billion in the late 1990s. In October 1997, an agreement was struck between DOE, the Office of Management and Budget, and the National Security Council on a 10-year budget of $45 billion for the emerging Stockpile Stewardship Program. That agreement helped to stabilize the weapons program during the early part of the transition to its new mission. However, DOE officials believe that it has since become clear that $4.5 billion a year in funding may not pay for the program that was envisioned at that time—building new experimental facilities, recapitalizing the nuclear weapons complex's infrastructure, rebuilding atrophied production capabilities, and extending the life of all of the weapons in the stockpile by an additional 30 years. Thus, according to senior Office of Defense Programs managers, DOE recognizes that it must more clearly articulate the choices inherent in level funding of the program so that policymakers can decide whether to rescope the objectives of the program or change the funding constraint.

DOE Has Begun to Make Management Improvements to Address These Challenges and Implement Its New Mission

In response to its new mission, DOE has made changes to the management structure of the Office of Defense Programs to implement the Stockpile Stewardship Program and to implement the new National Nuclear Security Administration. The Office of Defense Programs has also begun to take steps to meet the challenges and constraints that face the Stockpile Stewardship Program. For example, the Office of Defense Programs has developed new planning processes to fit its changing mission. (See ch. 2.) The Office has also developed a new budget structure to provide additional management information. (See ch. 3.) DOE and the Office of Defense Programs have made numerous changes in the Stockpile Stewardship

Program's organizational structure to address the changing demands of the program's new mission. (See ch. 4.) Finally, the Office of Defense Programs has begun to develop management processes to oversee the weapon life extension process. (See ch. 5.)

Further Improvements Are Needed in the Office of Defense Programs' Planning Process

The Office of Defense Programs has developed an extensive, multitiered planning process to manage its Stockpile Stewardship Program; however, the plans generated by this process are incomplete in two important respects. First, the Office of Defense Programs is still trying to determine some key requirements for the Stockpile Stewardship Program, such as validating the quantities of weapons to be refurbished. Until this process is complete, important aspects of the program, and thus the plans associated with them, are subject to change. Second, a congressionally mandated, cross-cutting plan to support the life extension of the nuclear stockpile—known as the Stockpile Life Extension Plan—does not contain complete information on such important issues as production plant capacity and budget issues. More fundamentally, while the Office of Defense Programs has developed over 70 plans, it has not integrated them into its system of management controls for the Stockpile Stewardship Program, including the program's budget and the mechanisms used to oversee its contractors.

The Office of Defense Programs Has Developed a New Planning Process to Fit Its Changing Mission

The Office of Defense Programs' planning process is evolving from a process intended to support a design, test, and build mission to a process designed to better fit the Office's revised Stockpile Stewardship mission of refurbishing the existing stockpile under a nuclear test moratorium. As such, many elements of the planning process are being adjusted to better fit current mission needs, including the structuring of an entirely new set of plans for carrying out the Stockpile Stewardship Program.

DOE's Strategic Plan and the Stockpile Stewardship Plan Describe the Overall Strategy for the Stockpile Stewardship Program

Two documents are intended to provide the overall plans for DOE's nuclear weapons program—DOE's Strategic Plan and the Office of Defense Programs' Stockpile Stewardship Plan. DOE's Strategic Plan represents the fundamental basis for all planning within the Department. It sets the long-term directions and policies to be carried out by the Department's programs and field organization. The Strategic Plan contains four business lines—Energy Resources, Environmental Quality, National Nuclear Security, and Science. The National Nuclear Security business line includes a set of performance goals and strategies for addressing how DOE will effectively support and maintain a safe and reliable stockpile without nuclear testing.

The Stockpile Stewardship Plan (or so-called "Green Book") was first developed in 1995 to describe to customers, such as DOD, the Office of Defense Programs' efforts to support and maintain a safe and reliable stockpile. This plan consists of a "corporate-level, multiyear program plan

that describes the Stockpile Stewardship strategy." Annual preparation of the plan was required by the National Defense Authorization Act for Fiscal Year 1998. However, according to planning officials in the Office of Defense Programs, past Stockpile Stewardship Plans simply listed program activities and did not serve as a comprehensive planning document that set priorities and allocated resources. As a result, some users found the plan's usefulness limited.

A New, Detailed Planning Structure Has Been Developed to Implement the Stockpile Stewardship Program

To improve planning for the Stockpile Stewardship Program, the Office of Defense Programs has recently developed a new planning structure. This structure is built around two high-level efforts: (1) Research, Development, and Simulation and (2) Military Application and Stockpile Operations. The Research, Development, and Simulation effort is intended to encompass the research capability necessary to support a safe and reliable stockpile, while the Military Application and Stockpile Operations effort is intended to include the regular maintenance of weapons in the stockpile. For each effort, the Office of Defense Programs has defined a three-tiered planning structure situated below the top-level Strategic Plan and the Stockpile Stewardship Plan. This three-tiered structure is intended to bring together high-level requirements—strategic performance goals—with lower-level objectives, strategies, and performance measures, such that each lower-level plan provides an additional level of detail. Table 5 provides more detail on this structure. Finally, to accommodate the variety and differing nature of work within the Stockpile Stewardship Program, the Office of Defense Programs organized work within its new planning structure into three areas—Campaigns, Directed Stockpile Work, and Readiness in Technical Base and Facilities. (See ch. 1 for a definition of these areas.)

Table 5: Office of Defense Programs Three-Tiered Planning Structure

Tier	Plan	Description
1	Research, Development and Simulation Plan; and Military Application and Stockpile Operations Plan	These plans define responsibilities for activities described in the Stockpile Stewardship Plan and "higher-level planning documents," such as the DOE Strategic Plan.
2	Program Plans	These plans exist for each major area of work, such as for Campaigns, Directed Stockpile Work, and Readiness in Technical Base and Facilities. They describe "what" will be done to fulfill each program's responsibilities for the Stockpile Stewardship Plan.
3	Implementation Plans	These plans describe "how" the various programs and campaigns will accomplish their objectives and milestones for doing so. Some of these plans are weapon-specific.

Source: GAO's analysis of DOE's data.

In addition to this new planning structure, the Office of Defense Programs has retained other planning processes from its prior mission. Some of these processes provide work direction for the production plants, while others serve as site-level strategic plans. For example, the annual Production and Planning Directive provides detailed guidance regarding monthly schedules of production for the production plants. At the strategic level, each site performing Office of Defense Programs activities is required to prepare annually a 10-Year Site Plan for the long-range management of its facilities and infrastructure.

A Stockpile Life Extension Program Plan Has Also Been Developed

Because the nation is no longer performing nuclear tests and producing new weapons, the life of the current stockpile must be extended. The complexity of the task and the extent and size of the current nuclear weapons complex make this a major challenge. As a result, in fiscal year 1996, the Office of Defense Programs established the Stockpile Life Extension Program, managed by the Office of Military Application and Stockpile Operations.

To plan for the work of stockpile life extension, the Congress, in Section 3133 of the National Defense Authorization Act for Fiscal Year 2000, required DOE to prepare an annual Stockpile Life Extension Program Plan that was due in January 2000 and thereafter with each subsequent annual budget submission. The plan's goal is to ensure that stockpile life extension activities are planned in detail, coordinated fully, and executed within fiscal resources. In the act, the Congress also required the Secretary of Energy to incorporate mechanisms into the plan to (1) expedite the collection of information necessary for the Stockpile Life Extension Program; (2) ensure

the assignment of roles and missions for each laboratory and plant, including allocating workload, modernizing facilities, and retaining worker skills; and (3) identify the funds needed in current and future fiscal years and allocate funds by weapon type and facility.

The Stockpile Stewardship Program's Plans Are Incomplete and Are Not Linked With Management Controls

While the Office of Defense Programs has developed over 70 Stockpile Stewardship plans with varying levels of detail, these plans are not complete enough to fully support the successful implementation of the program and are not linked to program management controls. First, the Office of Defense Programs is in the process of reassessing and prioritizing important program requirements for maintaining a safe and reliable stockpile. Until this process is complete, important aspects of the program, and the plans associated with them, are subject to change. Second, the Stockpile Life Extension Program's plan does not have the current and complete information necessary to detect and correct plant capacity shortfalls and lacks information necessary to address site workload and budget issues. Third, planning efforts are not fully linked to management controls such as program budgets, contracts, and other associated plans.

Stockpile Stewardship Plans Are Not Based on Firm Work Requirements

Following the defeat of the Comprehensive Test Ban Treaty in October 1999, the Secretary of Energy directed the Under Secretary to conduct a review of the Stockpile Stewardship Program, called the "30-Day Review." One key finding of this review was that the Stockpile Stewardship Program did not have a formal process for (1) assessing the program's requirements, that is, what actually needs to be done; (2) developing implementation plans, with corresponding scopes, schedules, and budgets; and (3) prioritizing the work. The 30-Day Review concluded that this situation had put significant stress on the program as it tried to accept additional requirements without additional budget resources.

In response, the Office of Defense Programs established a Requirements Assessment and Implementation Team in May 2000 to review, prioritize, and approve program activities for maintaining a safe, secure, and reliable stockpile. The team's mission includes assessing and prioritizing DOE's activities and validating program requirements (i.e., determining what work requirements are valid and necessary). The team will review the developed options for extending the life of weapons in order to balance military needs with the limited resources available. According to planning officials in the Office of Defense Programs, requirements for the Stockpile Stewardship Program will be "validated" through a series of negotiations to

take place with DOD and others between now and the end of fiscal year 2001.

Although most of the Stockpile Stewardship Program's plans were considered to be "final" in May 2000, planning officials in the Office of Defense Programs have stated that the plans will require significant change as a result of the effort to redefine work requirements. For example, the Requirements Assessment and Implementation Team is awaiting information from DOD for validating warhead quantities relative to that Department's delivery systems—missiles, airplanes, or submarines. While information is not due until December 2000, it is needed to accurately plan for production plant capacity needs.

According to the Office of Defense Programs, the Stockpile Stewardship Program is working to develop valid requirements between DOE and DOD, and update plans to reflect requirement changes, which is an ongoing process. In addition to the Requirements Assessment and Implementation Team process, DOE is currently defining the pace, scope, and schedule for the W80, W76, and B61 stockpile life extensions with DOD. Initial agreement was reached on the W80 in a Nuclear Weapons Council meeting held in October 2000, and the W76 and B61, respectively, will be addressed at the November and December 2000 meetings. On the basis of its activities, DOE has developed a draft letter describing the concerted efforts of the team to enhance the communications of weapons requirements between DOD and DOE. The Office of Defense Programs also stated that DOD recently transmitted to DOE prioritized weapons requirements. DOD has agreed upon a single list, and DOE and DOD will work together to refine this list into one that is more accurate, consistent, and complete for both Departments. This list will be refined and presented to the Nuclear Weapons Council, in a future meeting, as a path forward for the Stockpile Stewardship Program.

The Stockpile Life Extension Program Plan Is Incomplete

The Stockpile Life Extension Program Plan is also incomplete. This plan, which focuses on extending the life of various nuclear weapons in the nation's stockpile, was not expected to be finalized until after September 2000, but now, the information has been delayed until the submission of the budget request for fiscal year 2002 in early 2001. In the meantime, the Office of Defense Programs produced an "interim plan;" however, this plan is incomplete. While the interim plan thoroughly describes the planning process, it does not meet all of the requirements stated in the National Defense Authorization Act for Fiscal Year 2000. In particular, it does not yet

effectively collect complete and current information necessary to implement the program, does not address potential plant capacity issues, and does not include budget information.

We found that information used in the interim plan regarding plant capacity was not complete. For example, Y-12 Plant capacity estimates for producing certain weapons components at that site are not available because the Y-12 Plant does not have a current, validated model for estimating plant capacity. The contractor at the Y-12 Plant agrees that such information is needed and expects to develop a complete and validated model in fiscal year 2003.

The interim plan also does not address how to remedy potential plant capacity shortfalls. For example, by 2016, Pantex officials expect the beginning of a 6-year period where workload may significantly exceed plant capacity for performing a variety of weapons operations and tests. Although the draft 10-Year Site Plan for Pantex describes these potential shortfalls, the Stockpile Life Extension Program plan does not specifically address how to deal with them. In particular, it does not establish activities and make firm commitments to modify facilities or hire and train additional staff to prevent impacts to the schedule. Although separate and more detailed Implementation Plans are intended to describe "how" the work will be accomplished, they do not address these capacity issues either.

Finally, the interim plan does not include budget information necessary for managing the Stockpile Life Extension Program's funds. Specifically, the plan neither projects budget needs for the program nor allocates funds either by weapon type or by facility. Without such basic budgeting information, managers in the Office of Defense Programs cannot use the plan for budget decisions. As noted above, weapons-specific Implementation Plans intended to address how the work will be completed also do not include this budget information. As of June 2000, according to a key planning official in the Office of Defense Programs, although the Office had attempted to include budget information for one weapon system, the information was not yet valid and useable. The Office of Defense Programs subsequently stated in November 2000 that budget information is available for two weapons systems—the W76 and W80.

Planning Efforts Are Not Linked to Management Controls

The standards we have developed require federal agencies to establish and maintain an effective system of internal controls over their operations.[1] Internal controls include such things as the plans used to meet missions, goals, and objectives. In an August 1999 memo, the acting Assistant Secretary for Defense Programs stated that the implementation of the Office of Defense Programs' management controls "is envisioned to have annual program execution controlled through written implementation plans linked to budgets, contracts, and other performance management documents." The memo set a goal of completing the implementation of these controls by October 1, 2000. Although the Office of Defense Programs has developed over 70 plans, it has yet to fully integrate them into the program's management controls as envisioned by the acting Assistant Secretary.

Stockpile Stewardship Plans Have Not Been Integrated With Program Budgets

The various Stockpile Stewardship Program plans are not adequately linked to the program's budget, rendering them less useful to decision makers and setting up the potential for conflicts between work requirements contained in the plans and the budget resources available to adequately perform the work. For example, the program's overall Stockpile Stewardship Plan—the "Green Book"—historically has not contained detailed budget information. Although program officials told us that the primary customer of the Green Book is the military, the Director of the Air Force's Nuclear Weapons and Counter Proliferation Agency told us that the Green Book has had limited usefulness for him because he cannot tell how much emphasis the Office of Defense Programs is placing on various activities without knowing how much they are spending on the activities. However, officials from the Office of Defense Programs believe that although earlier drafts of the plans did not contain budget data, DOD and others were provided with budget details in briefings and follow-on discussions. Our review of the Stockpile Stewardship Plan for fiscal year 2001, recently approved by the Secretary of Energy on June 12, 2000, shows that it now contains detailed budget information.

With respect to conflicts between work requirements and funding, we found several examples during our fieldwork. For example, when the laboratories specify new requirements for weapons test assemblies (units with mock components used for testing purposes), the plants must perform

[1]See *Standards for Internal Control in the Federal Government* (GAO/AIMD-00-21.31, Nov. 1999).

many activities to fully understand the design and build a new production line for the assemblies that will meet the new specifications—not a quick and simple task, according to plant officials. However, the plants often receive these and other types of testing requirements outside of the planning and budgeting processes. Plant officials told us that when they receive such additional requirements, they are expected to simply "do it all." To compensate, officials reported that they have met such additional requirements by cutting back on facility maintenance. For example, according to Pantex officials, the plant's deferred maintenance backlog increased from about $130 million in fiscal year 1998 to about $195 million in fiscal 1999. To correct this problem, yet another Program Plan, this one for managing infrastructure issues across the nuclear weapons complex, is being developed, according to planning officials in the Office of Defense Programs.

This is not a new problem. A March 1997 study by the Institute for Defense Analyses also found a weak link between the program's work requirements and its budget.[2] Specifically, the study found that there was no single, disciplined process for ensuring that all decisions with resource implications are weighed against one another in a complete and consistent fashion. The study found no formal means to evaluate and resolve disagreements.

Plans Are Not Linked to Contracts

The work of the Stockpile Stewardship Program is carried out by contractors that operate the design laboratories and production plants for the Office of Defense Programs. To date, milestones and other performance measurement information contained in the Program and Implementation Plans have not been systematically incorporated into contracts used to manage the operation of the laboratories and production plants. According to key planning officials in the Office of Defense Programs, the Office of Planning and Integration has only been recently asked to generate a list of items that should be addressed in assessing the contracts presently up for award and in developing contractor performance assessment plans for fiscal year 2001. This would be the first time that Program and Implementation Plans were used to assess contracts and performance assessment plans. However, the completion of this effort will depend on the success of the effort to reassess program requirements; therefore, the time frame for completion remains uncertain.

[2] *The Organization and Management of the Nuclear Weapons Program, Institute for Defense Analyses* (IDA Paper P-3306, Mar. 1997).

More fundamentally, while the Program and Implementation Plans for the various Campaigns contain numerous milestones and deliverables, the Office of Defense Programs has not established a method for tracking and holding contractors accountable for the milestones and deliverables. According to a key planning official in the Office of Defense Programs, the Office will soon establish a team to develop a detailed process to provide for periodic updates of Campaign milestones and deliverables and to evaluate progress.

Plans Are Not Fully Integrated With Other Plans

In order to be effective, the various Program Plans need to be integrated with each other. For example, in order to conduct work in the Directed Stockpile Work area, weapons research and development activities need to be integrated with the efforts of the production plants. However, all of the Directed Stockpile Work is not integrated into a single Program Plan. Rather, the Office of Research, Development, and Simulation, which oversees the research and development activities, has its own Program Plan, while the Office of Military Application and Stockpile Operations, which oversees production activities, has a separate program plan.

Because of these two separate Directed Stockpile Work Program Plans, important cross-cutting issues can be overlooked. For example, significant and unexpected design changes to weapons' Life Extension Options can create problems for the production plants that must produce components from designs provided by the weapons laboratories. While the Directed Stockpile Work Program Plans acknowledge the need to annually update the Life Extension Options, they do not address how changes will be minimized or the impacts on the plants mitigated. Planning officials in the Office of Defense Programs agree that these two plans could be better integrated; however, they are awaiting key decisions on program requirements and a potential reorganization that they believe could help remedy this situation.

More broadly, the Office of Defense Programs does not have an effective approach for integrating all of the plans in the Stockpile Stewardship Program. As noted earlier, the Office has over 70 Program and Implementation Plans. Currently, if a change occurs in one plan that affects another, such as a change in a deliverable or milestone, the coordination of this change with the other plan must be done on an ad hoc basis. Program officials may need to gather and search through an extensive list of plans or contact an extensive list of individuals before they are assured that they have reliable and current information. This can be difficult and time

consuming, given the number of plans that exist. Planning officials in the Office of Defense Programs agree that a single focal point document to provide a common linkage between the plans would be a useful tool for achieving and sustaining the program's integration. They said they expect to develop a large-scale database for this purpose.

Conclusions

The Office of Defense Programs' comprehensive planning process represents an important step in improving how the Stockpile Stewardship Program is managed. However, until the Office determines the requirements that will drive the program, its planning process cannot be considered complete. Moreover, a significant portion of the Stockpile Stewardship Program will be the effort to extend the lifetime of the nation's nuclear stockpile. As the Congress recognized in the National Defense Authorization Act for Fiscal Year 2000, a comprehensive Stockpile Life Extension Program plan that includes information on capacity, workload, and budget is vital to successfully managing the integrated activities of the design labs and production plants and to making well-informed decisions on issues such as recapitalizing production infrastructure in a resource-constrained environment. Finally, in order not to become hollow documents sitting on a shelf, the Office of Defense Programs' plans need to be integrated with key management controls, such as budgets and contracts, and must be linked with each other. Program officials have told us of many initiatives that they have under way to deal with these issues. While we commend these efforts, we believe that the program must act on all of these initiatives, especially the establishment of requirements, as quickly as possible.

Recommendations for Executive Action

To ensure that the Stockpile Stewardship Program has a planning process that is complete and supports the management of the nuclear weapons complex and the extension of the life of the nation's nuclear weapons stockpile, we recommend that the Administrator of the National Nuclear Security Administration direct that the Deputy Administrator for Defense Programs do the following:

- Complete, as expeditiously as possible, the process of establishing valid program requirements and update the program's plans to reflect requirement changes.
- Ensure that the completed Stockpile Life Extension Program plan contains all of the information required by the National Defense

Authorization Act for Fiscal Year 2000, especially information on plant capacity and budget.

- Ensure that the planning process is fully integrated with management controls, and that
  - the plans' milestones are reflected in contractors' performance criteria and evaluations,
  - the process is coordinated with the budget planning and formulation process, and
  - an overall planning mechanism is developed that links individual plans with other plans across both the science and production segments of the Stockpile Stewardship Program.

Agency Comments and Our Evaluation

The National Nuclear Security Administration's Office of Defense Programs agreed with our recommendations that it needs to validate the Stockpile Stewardship Program's requirements and to integrate its planning process with its management controls. As evidence of this, it cited a variety of what it called "incremental steps" that it is taking or planning to take. For example, it stated that various efforts are under way to resolve the pace, scope, and schedule for the W80, W76, and B61 stockpile life extensions. In addition, it noted that on October 12, 2000, the Administrator of the National Nuclear Security Administration directed the development of a corporate-level strategic plan, to cover the time frame for fiscal years 2003-17. Finally, to help ensure that the program plans' milestones are reflected in contractors' performance criteria and evaluations, the Office of Defense Programs stated that it has directed field offices to negotiate contracts that add specific self-assessments addressing planning and execution processes. We agree that these initiatives have the potential to improve the management of the Stockpile Stewardship Program. However, we believe that it is too soon to determine how effectively they will be implemented and, hence, whether they will lead to substantial improvements. We are encouraged by the actions that the new leadership of the National Nuclear Security Administration and the Office of Defense Programs has taken to improve planning for the program, as delineated in the comments on a draft of this report. (See app. III.)

With respect to our recommendation that the Office of Defense Programs ensure that the completed Stockpile Life Extension Program plan contains all of the information required by the National Defense Authorization Act for Fiscal Year 2000, the Office expressed the view that stockpile life extension is a "process" —not a "program." It stated that the stockpile life extension process supports the Directed Stockpile Work Program, which is

part of the Stockpile Stewardship Program's new budget structure. The Office stated that it would comply with the intent of the recommendation by providing the information requested by the National Defense Authorization Act for Fiscal Year 2000 as part of the Directed Stockpile Work plans to be submitted with its budget request for 2002. We are encouraged that the Office intends to make the information available to the Congress, albeit by an alternative reporting method. However, we believe that regardless of whether the Office calls it a "process" or "program," the final result must include information on capacity, workload, and budget, so that the Office can successfully manage the integrated activities of the design labs and production plants and make well-informed decisions in a resource-constrained environment.

Revised Budget Information Needed to Improve Management of the Stockpile Stewardship Program

The Office of Defense Programs has developed a new program activity structure within the Weapons Activities budget presentation. The Office developed this new structure to enhance its management of the program in several ways that better reflect its current and future missions; focus budget justification on major program thrusts; and improve the linkage between planning, budgeting, and performance evaluation. In addition, program managers and outside technical experts believe that this new structure holds significant promise for identifying the fixed and variable costs of the Stockpile Stewardship Program, thus improving cost management. This new structure was first used in developing the program's budget request for fiscal year 2001. However, two problems arose. First, the labs and production plants did not apply the program's new budget formulation definitions consistently. Second, DOE's Office of the Chief Financial Officer was concerned that the program's budget structure was not consistent with various accounting standards and certain laws and regulations that contain accounting requirements. Consequently, an amendment to the program's budget submission for fiscal year 2001 was developed. However, the amendment makes it difficult to determine the program's fixed and variable costs.

The Office of Defense Programs Has Developed a New Budget Structure for the Weapons Activities Account That Is Intended to Improve Program Management

Prior to its budget submission for fiscal year 2001, the Office of Defense Programs divided the operating portion of the Weapons Activities account into two broad program activities—stockpile stewardship and stockpile management. *Stockpile stewardship* was defined as the set of activities needed to "provide the physical and intellectual infrastructure required to meet the scientific and technical requirements of the (overall) Stockpile Stewardship Program." *Stockpile management* activities included DOE's historical responsibilities for surveillance, maintenance, refurbishment, and dismantlement of the enduring stockpile. However, each category was dominated by a single large activity known as core stewardship and core management, which made it difficult to determine where funds were being spent with precision. For example, in the Office of Defense Programs' budget submission for fiscal year 2000, core stewardship accounted for 48 percent of the stockpile stewardship activity's budget request, while core management accounted for 73 percent of the stockpile management activity's budget request. The lack of clarity associated with this broad structure caused concern both at DOE and in the Congress.

In February 1999, the Deputy Assistant Secretary for Research, Development, and Simulation, who manages the stockpile stewardship activity, began to develop a new program activity structure to improve the

planning process for his program and more closely integrate the program with the needs of the stockpile. The new structure was built around three new program activities—Campaigns, Directed Stockpile Work, and Readiness in Technical Base and Facilities. (See ch. 1 for a definition of these activities.) Within each of these three activities is a set of more detailed subactivities. For example, within the Campaigns activity are individual campaigns to study, among other things, the primary in a nuclear weapon or to develop a new capability to produce nuclear weapons pits.[1,2] Similarly, the Directed Stockpile Work activity includes subactivities to conduct surveillance or produce components that need regular replacement within nuclear weapons. Finally, the Readiness in Technical Base and Facilities activity includes subactivities to capture the costs for the operation of its facilities. In submitting its new program activity structure to the Office of the Chief Financial Officer for review and approval for use in the budget submission for fiscal year 2001, the Office of Defense Programs believed that the new structure would, among other things, better reflect its current and future missions; focus budget justification on major program thrusts; and improve the linkage between planning, budgeting, and performance evaluation.

Outside experts and Office of Defense Programs officials both believe that developing and implementing the program's new program activity structure are critical to effective management. Specifically, in October 1999, the Secretary of Energy directed the Under Secretary of Energy to conduct a comprehensive internal review of the Stockpile Stewardship Program (called the "30-Day Review"). As part of this review, conducted by the Under Secretary and a group of senior technical advisors, the program's new activity structure was examined. The 30-Day Review strongly supported the new program activity structure and what it called the program's "new business model."

In particular, the 30-Day Review stated that the three new activity categories would allow program managers to more clearly understand the fixed and variable costs of the nuclear weapons complex. The study saw

[1]The primary is the fission stage of a nuclear weapon. Detonation of the primary produces the extremely high temperatures and pressures required to produce fusion in the weapon's secondary.

[2]A pit is the initial, subcritical assembly of fissile material in a nuclear weapon. In such an assembly, a fission chain reaction can be sustained only by the addition of neutrons from an independent source.

the Readiness in Technical Base and Facilities activity as encompassing the fixed costs associated with the program. These costs included those associated with maintaining the infrastructure, facilities, capital equipment, construction, and other functions that are necessary to have a viable nuclear weapons complex. The 30-Day Review saw the Campaigns and Directed Stockpile Work activities as encompassing the variable costs of the actual work performed by the nuclear weapons complex. The implementation of this approach would, in the view of the 30-Day Review, provide Office of Defense Programs, lab, and production plant managers with "an improved and coordinated tool for determining the cost associated with managing the nuclear weapons complex." The 30-Day Review saw the identification of the program's fixed and variable costs, along with improved program planning, as essential to improving the management of the program.

Program officials have echoed the views of the 30-Day Review. For example, the Deputy Assistant Secretary for Research, Development, and Simulation told us it is vital that the Office of Defense Programs gets a handle on the fixed costs associated with Readiness in Technical Base and Facilities. He felt that these costs were "eating the program alive" and that the Office had to find ways to reduce them. In a similar vein, the Director of the Office of Planning, Analysis, and Nuclear Weapons Integration, under the Deputy Assistant Secretary for Military Application and Stockpile Operations, told us that the Office of Defense Programs needs to be able to identify and trend the costs that make up Readiness in Technical Base and Facilities, such as security and safety, so that it is able to exercise effective cost management. Finally, the Associate Deputy Assistant Secretary for Nuclear Weapons Stockpile believes that Readiness in Technical Base and Facilities should represent the program's fixed costs, including overhead, while the Campaigns and Directed Stockpile Work should capture the marginal cost of doing a specific activity. Representing the costs for Campaigns and Directed Stockpile Work in this way makes it clear what is actually saved if an activity is cut. Currently, he noted, if one were to cut a campaign, the program would not save all of the funds associated with that campaign, since a significant portion goes to overhead.

The New Structure Was Not Implemented Consistently

While the Office of Defense Programs has developed a new structure that promises to be a useful tool for improving program management, including cost management, the implementation of the structure has been hampered by two problems. First, the labs and production plants did not apply the program's new budget formulation definitions consistently. Second, the

Department's Office of the Chief Financial Officer was concerned that the program's application of the new structure was not consistent with various accounting standards and certain laws and regulations that contain accounting requirements.

The Program's Labs and Plants Did Not Consistently Implement the New Structure

The principal problem the Office of Defense Programs experienced in executing its new program activity structure was in the Operation of Facilities subactivity category in the Readiness in Technical Base and Facilities activity. The Operations of Facilities category accounts for $1.3 billion (28 percent) of the Office of Defense Program's $4.6 billion budget request for Weapons Activities for fiscal year 2001. This category is defined in the budget request as the Office of Defense Programs' share of the "cost of all structures, equipment, systems, materials, procedures and personnel necessary to provide program sponsors with a facility that is safe, secure, reliable and 'ready for operations'"—or what many program officials believed were the fixed costs of conducting the program. However, this definition was applied inconsistently. For example, Lawrence Livermore National Laboratory included in Operations of Facilities only the costs for the National Ignition Facility's operations and facility's ramp-up; a facility known as *Superblock*, where plutonium is handled; and other unspecified facilities.[3] The other two weapons labs—Los Alamos and Sandia—were only slightly more expansive, including the costs for capital equipment, general plant projects, and waste management with specific facilities.

In contrast, the three major production plants—Y-12, Kansas City, and Pantex—included not only the cost of specific facilities but also the costs for capital equipment; general plant projects; environment safety and health programs; security; and, most significantly, overhead. The broader application of the definition by the production plants meant that they included all of the costs needed to operate a facility in the Operations of Facilities subactivity. The Office of Defense Programs recognized in its budget submission that, for the production plants, all site overhead was included in the Readiness in Technical Base and Facilities activity. The Office did not specify that lab overhead was not included. But, according to program officials, the labs did not include all site overhead costs in the Operations of Facilities subactivity. In its budget submission, DOE recognized that there were problems and said that it might offer some technical amendments to its budget request.

[3]The National Ignition Facility is still under construction.

The inconsistent application of the definition makes the Office of Defense Programs' budget submission misleading. On the one hand, because the labs did not include all of their facility and overhead costs in the Readiness in Technical Base and Facilities activity, the cost of simply keeping the weapons complex open—ready for operations—is understated. The impression is created that operating the labs and production plants is consuming only about one-third of the Office of Defense Programs' resources. In contrast, DOE's functional cost reports have shown that, typically, the Office of Defense Programs' costs for general and mission support—a rough equivalent for operation of facilities—consumed over 40 percent of every operating dollar from fiscal year 1995 through fiscal 2000. Conversely, the impression is also created that more budget resources are going directly to supporting the stockpile. However, since each of the labs must fully recover its costs, if the costs are not in the Readiness in Technical Base and Facilities activity, then they must be contained in the Campaigns or Directed Stockpile Work activity.

DOE's Chief Financial Officer Was Concerned About the Budget Submission's Consistency With Accounting Laws and Regulations

While the Office of Defense Programs was completing its budget submission for fiscal year 2001, DOE's Office of the Chief Financial Officer began raising concerns regarding the budget treatment of Readiness in Technical Base and Facilities. According to the Deputy Controller, in addition to the issue of the inconsistent application of the definition discussed above, the Office of the Chief Financial Officer had the following concerns:

- DOE's management and operating contractors are required to comply with cost accounting standards and to disclose their practices in formal disclosure statements approved by departmental contracting officers. Pursuant to Cost Accounting Standard (CAS) No. 418, contractors are required to accumulate indirect costs in cost pools and to allocate these costs consistently on the basis of the causal or beneficial relationship of the indirect costs to final cost objectives. In the Deputy Controller's view, if the Office of Defense Programs' share of overhead costs is allocated only to the Readiness in Technical Base and Facilities activity and not to all benefiting programs and projects, this would constitute a CAS violation and would place the contractors in noncompliance with the CAS provisions of their contracts with the Department.
- DOE is required to comply with Statements of Federal Financial Accounting Standards (SFFAS) promulgated by the Federal Accounting Standards Advisory Board (FASAB). One of these Statements, SFFAS No. 4, Managerial Cost Accounting Standards, requires federal agencies

to provide reliable and timely information on the full cost of federal programs, their activities, and outputs. According to the Deputy Controller, if the Office of Defense Programs' share of overhead costs is allocated only to the Readiness in Technical Base and Facilities activity and not to all benefiting programs and projects, the Department would be in noncompliance with the intent of the Managerial Cost Accounting Standards, the federal equivalent of generally accepted accounting principles.

- Under the Federal Financial Management Improvement Act of 1996, agencies are required to comply with federal financial management systems requirements contained in Office of Management and Budget Circular A-127, Financial Management Systems, and federal accounting standards issued by FASAB. One of the specific purposes of this act is to require federal financial management systems to support full disclosure of federal financial data, including the full costs of federal programs and activities so that programs and activities can be considered on the basis of their full costs and merits. In conducting audits of federal financial statements, cognizant auditors are required to report whether an agency's financial management system substantially complies with federal financial management system requirements and federal accounting standards. In the Deputy Controller's view, the failure to comply with CAS at the contractor level and to meet the full cost reporting requirements contained in SFFAS No. 4 would result in a lack of substantial compliance with the Federal Financial Management Improvement Act.

Finally, the Government Management Reform Act of 1994 amended the requirements of the Chief Financial Officers Act of 1990 by requiring, among other things, the annual preparation and audit of organizationwide financial statements of 24 executive departments and agencies, including DOE. In the Deputy Controller's view, the failure to comply with both CAS and the federal financial accounting standards as well as lack of substantial compliance with the provisions of the Federal Financial Management Improvement Act could result in the auditor's qualification or disclaimer of opinion on DOE's financial statements.

These concerns were raised in January 2000—very late in the budget development cycle. Consequently, DOE and program budget officials decided to submit the budget as developed with a caveat that recognized the problems with the Readiness in Technical Base and Facilities activity.

DOE Amended the Fiscal Year 2001 Budget Submission to Improve Consistency, but the Revisions Miss the Opportunity to Improve Program Management

Since the original budget submission, DOE and program budget officials have developed an amendment to the program's original budget submission for fiscal year 2001. One of the principal effects of this amendment has been to shift overhead costs for the production plants from the Readiness in Technical Base and Facilities activity to the Campaigns and Directed Stockpile Work activities. This was done to ensure that the labs and plants treat overhead in a consistent way and to address the Deputy Controller's concerns. Program budget officials told us that they also made additional adjustments to correct for errors that occurred when the budget submission for fiscal year 2001 was originally prepared. For example, they found that Sandia was accounting for a facility under a campaign activity that should have been included in the Readiness in Technical Base and Facilities activity. They felt that errors of this latter type were a normal outcome of making such a large change in the program's budget and accounting system. According to DOE's Office of the Chief Financial Officer and program budget officials, the amendment has been transmitted to the staffs of the House and Senate Appropriations Committees and authorization committees. In creating the amendment to the Office of Defense Programs' budget request for fiscal year 2001 to address the concerns of the Office of the Chief Financial Officer, the program has made it difficult to determine its fixed and variable costs. Officials in the Office of the Chief Financial Officer, including the Deputy Controller, indicated that understanding the relationship between cost and activity levels was necessary and that fixed and variable costing was one method of accomplishing this. They felt that a spreadsheet that delineated fixed and variable costs could be developed.

Conclusions

The Office of Defense Programs has taken an important step toward improved program management with its new program activity structure. We agree with the views of the 30-Day Review and various program officials that understanding and measuring the fixed and variable costs of the program are vital to improving the cost performance of the program and making well-informed decisions about program trade-offs when faced with a constrained budget. Such information will also be important to the Congress as it exercises its oversight role. We recognize that DOE needs to meet a variety of financial management requirements, such as the cost accounting standards, and the amendment the Department developed represents an initial attempt to reflect some of these types of concerns in its budget submission. However, more needs to be done to give program officials and congressional decisionmakers the information on fixed and

variable costs they need. If the Department is committed to improving program management through a new program activity structure, it needs to find a way to more closely relate this new budget structure to its cost accounting framework.

Recommendation for Executive Action

To improve the management and oversight of the Stockpile Stewardship Program, we recommend that the Administrator of the National Nuclear Security Administration direct the Deputy Administrator for Defense Programs to develop a method to relate its new program activity structure to DOE's cost accounting considerations so that fixed and variable costs of the program's activities can be determined and made available when the program makes its annual budget submission.

Agency Comments and Our Evaluation

The National Nuclear Security Administration's Office of Defense Programs stated that the determination of the program's fixed and variable costs was never an essential purpose of its new program activity structure. Rather, the Office felt that the purpose of the new program activity structure was to improve the program's management by, among other things, aligning the program's planning, budgeting, and performance evaluation functions. By placing emphasis in our report on understanding the program's fixed and variable costs, the Office believed that we were implying that it had failed to meet a goal of its new program activity structure. While the Office recognized the value of understanding the program's fixed and variable costs, it felt that it was required to amend its budget submission for fiscal year 2001 in order "to comply with Federal accounting statutes and regulations." However, consistent with our recommendation, it did offer to develop additional information on cost elements for submission with its budget request for fiscal year 2002 with the understanding that it would not change its method of cost accounting.

We recognize throughout our report that the program's new activity structure serves multiple purposes and believe it is an important step forward in improving the program's overall management structure. However, we believe that understanding the program's fixed and variable costs is vital to effective program management, especially when the program is faced with a constrained budget. This is consistent with the views of the Secretary's 30-Day Review and numerous program officials. However, we have modified our recommendation to make it clear that we do not expect DOE to engage in a wholesale modification of its cost

accounting systems. In the end, we believe that the Office's willingness to develop additional cost information and include it with its budget request is an important first step to improved program cost management.

Fundamental Organizational and Leadership Changes Needed for Successful Implementation of the Program's New Mission

Over the past few years, internal and external studies of DOE's Office of Defense Programs have pointed out numerous management problems. In response, DOE has identified and begun implementing dozens of specific actions intended to address the problems identified in these studies. In particular, DOE has made repeated attempts to reorganize the Office of Defense Programs; however, these efforts have met with only limited success. For example, the Secretary of Energy instituted a reorganization in April 1999 that clarified some departmental level reporting relationships between headquarters and field offices. The Deputy Secretary made further adjustments to departmental reporting relationships, effective October 2000. In addition, the Office of Defense Programs is currently engaged in another realignment of its own headquarters and field structure. However, the implementation of these changes, which should help to clarify the organizational structure and give the Office of Defense Programs formal control over all of the sites performing substantial amounts of its work, have just begun. Just as importantly, a 1999 presidential report noted that consistent leadership is a hallmark of an effective program and that longevity is a key to leadership. However, the Office of Defense Programs has seen its proportion of offices vacant or with acting managers increase from 17 percent in 1996 to about 65 percent in 2000.

DOE Has Reorganized the Office of Defense Programs to Meet Its Changing Mission

The Office of Defense Programs' organizational structure and leadership have been critiqued numerous times since the Stockpile Stewardship Program was created in 1992. These internal and external reviews of the program have repeatedly cited organizational problems that deter the program's managers from effectively implementing the Stockpile Stewardship Program. In response to those critiques, DOE has made changes to the program's organizational structure, ranging from a DOE-wide reorganization to changes within the Office of Defense Programs.

The Office of Defense Programs' Organizational Structure Has Been Critiqued in Numerous Studies Since the Stockpile Stewardship Program Began

Almost immediately after the Stockpile Stewardship Program was created in 1992, reviews of the organization and content of the new program began. Since 1994, six major studies have been conducted by external review groups and internal DOE task forces. (See table 6.) In addition, both the Congressional Budget Office and the Congressional Research Service have written numerous reports on various aspects of the program. Some of these studies examined the program as a whole, while others focused on specific portions of the program, such as the selection of a new tritium production source or the changing roles of the laboratories.

Table 6: Major Studies of DOE's Stockpile Stewardship Program

Study title	Authoring group	Date	Type of study	Focus of study
Science Based Stockpile Stewardship	JASON, The MITRE Corporation	Nov. 1994	External; under DOE contract	Contribution to scientific understanding and national goals, maintaining and renewing technical and scientific skills, and maintaining confidence in the stockpile without nuclear testing
The Organization and Management of the Nuclear Weapons Program	Institute for Defense Analyses (a.k.a., 120-Day Study)	Mar. 1997	External; under DOE contract	Program's roles, responsibilities, and organization
Report of the Commission on Maintaining United States Nuclear Weapons Expertise to Congress and the Secretary of Energy	Commission on Maintaining United States Nuclear Weapons Expertise (a.k.a., Chiles Commission)	Mar. 1999	External; legislative mandate	Issues surrounding the recruitment and retention of scientific, engineering, and technical personnel; and weapons complex infrastructure
Science at Its Best, Security at Its Worst	President's Foreign Intelligence Advisory Board	June 1999	External	Security and counterintelligence threats to the nuclear weapons laboratories and effectiveness of responses to those threats
FY 1999 Report of the Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile	Foster Panel	Nov. 1999	External; legislative mandate	Critical needs for preserving existing test data, ensuring production capability, and improving the stockpile certification process
U.S. Department of Energy Stockpile Stewardship Program 30-Day Review	DOE Under Secretary and Senior Technical Advisors (a.k.a., 30-Day Review)	Nov. 1999	Internal; requested by Secretary of Energy	Structure, balance, and ability of the Program to maintain a safe, secure, and reliable nuclear weapons stockpile without nuclear testing

The studies cited continuing problems with the Stockpile Stewardship Program in the areas of overall management, organization, priority setting, external relations, and maintenance of a viable infrastructure and workforce. With respect to the program's organization, for example, the President's Foreign Intelligence Advisory Board found that DOE had a dysfunctional management structure with convoluted, confusing, and often contradictory reporting channels.[1] In addition, they found that diffuse authority has led to a lack of accountability, a finding echoed by the Foster Panel, which found "clouded lines of authority and blurred responsibility and accountability."[2] The 120-Day Study cited ambiguities and overlaps in the roles of headquarters and the Albuquerque Operations Office as a primary source of inefficiencies and conflict within the program. Finally, the Chiles Commission cited uncertainties created by unclear government roles in the supervision of operations. [3]

More broadly, the studies cited issues requiring decisive leadership action, such as setting priorities and allocating resources among competing needs. For example, the Chiles Commission expressed concern over the balance of funding between the production plants and the laboratories and a lack of consistency in priorities, leading to inefficient cycles of program stops and starts. Finally, DOE's own 30-Day Review reported significant gaps in the production complex—such as pit-manufacturing capability, special materials processing, and the capability to implement new certification and recertification techniques—owing to a lack of investment in production capability.[4]

[1] *Science At Its Best, Security At Its Worst*, President's Foreign Intelligence Advisory Board (June 1999), pp.3-4.

[2] *FY 1999 Report of the Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile*, Foster Panel (Nov. 1999), p.10.

[3] *Report to Congress and the Secretary of Energy*, Commission on Maintaining United States Nuclear Weapons Expertise (a.k.a., the Chiles Commission) (Nov. 1999), p.16.

[4] *Stockpile Stewardship Program 30-Day Review*, Department of Energy (Nov. 23, 1999).

In Response to Critiques, DOE Has Made Changes to the Program's Organizational Structure

DOE and the Office of Defense Programs' management recognize that serious problems exist and have taken some steps to address the recommendations made in the studies. Overall, DOE has proposed a total of 136 actions in response to recommendations in the four major studies—the 120-Day Study, the Chiles Commission, the Foster Panel, and the 30-Day Review—that dealt primarily with management issues.[5] Overall, about 48 percent of the actions identified have been completed, meaning that a one-time action is finished or that a continuing action (such as instituting a revised planning process) is now part of routine operations.[6] In addition to those specific actions, DOE has made changes to the organizational structure of the Office of Defense Programs.

Until the advent of the Stockpile Stewardship Program in 1992, the Office of Military Application and Stockpile Management within the Office of Defense Programs oversaw all of the nuclear weapons programs. Those activities were coordinated at the field level by the Albuquerque Operations Office. With the establishment of the Stockpile Stewardship Program, the oversight of the stockpile management and maintenance portion of the work continued to be overseen by the Office of Military Application and Stockpile Operations at DOE's headquarters. However, the science portion of the work, done primarily at the nuclear weapons laboratories, was allocated to two other programmatic offices at headquarters—the Office of Strategic Computing and Simulation and the Office of Research and Development. In August 1999, management in the Office of Defense Programs consolidated the two programmatic offices that oversaw the science portion of the Stockpile Stewardship Program to create the Office of Research, Development, and Simulation. Thus, the Office of Defense Programs is currently organized in two programmatic offices—Research, Development, and Simulation (DP-10) and Military Application and Stockpile Operations (DP-20). (Table 7 shows how the Office of Defense Programs has divided responsibility for its programs among the

[5]We did not analyze DOE's responses to the November 1994 JASON study because its recommendations dealt primarily with technical research issues. We also did not analyze DOE's responses to the June 1999 report by the President's Foreign Intelligence Advisory Board because its recommendations dealt primarily with security and counterintelligence issues.

[6]About 9 percent of the proposed actions have been deferred owing to the unavailability of funding or have been dropped because the Office of Defense Programs did not concur that the cited changes need to be made. The remaining 43 percent of proposed actions had not been completed as of July 2000.

headquarters and field offices.) Finally, in response to the October 1999 passage of legislation establishing the semiautonomous National Nuclear Security Administration, the Secretary issued an implementation plan for the new agency in January 2000.

Table 7: Major Responsibilities of Office of Defense Programs' Headquarters and Field Offices Reporting to the Office of Defense Programs

Office	Location	Responsibilities
Research, Development, and Simulation (DP-10)	Headquarters	• Programmatic oversight of the weapons labs and Nevada Test Site • Lead on eight campaigns • Joint lead with DP-20 on three campaigns • Oversight of experimental programs • Oversight of advanced simulation development • Maintenance and development of infrastructure at weapons labs and Nevada Test Site
Military Application and Stockpile Operations (DP-20)	Headquarters	• Programmatic oversight of the weapons production complex • Lead on seven readiness campaigns • Joint lead with DP-10 on three campaigns • Oversight of the production complex • Oversight of the directed stockpile work at production facilities located at weapons labs • Maintenance and development of infrastructure at production plants and production facilities at weapons labs
Albuquerque Operations Office	Field	• Execution of directed stockpile work at production plant sites • Contract oversight for Los Alamos and Sandia • Contract oversight for Pantex Plant and Kansas City Plant
Nevada Operations Office	Field	• Execution of test readiness and subcritical experiment program at Nevada Test Site • Contract oversight of Nevada Test Site

Source: GAO's analysis of DOE's data.

Since DOE was established in 1977, virtually every Secretary has made management reforms and reorganizations at the departmental level. In April 1999, the Secretary of Energy reorganized the Department's programmatic and field offices . This reorganization changed the reporting relationships between the field offices and headquarters program offices. Previously, the field offices had reported to the Secretary through the Office of Field Management.[7] As a result of the changes ordered by the Secretary, the Albuquerque and Nevada Operations Offices have begun reporting directly to the Office of Defense Programs. Most recently, the Deputy Secretary announced yet another restructuring, effective October 1, 2000.

Under the April 1999 reorganization, the Office of Defense Programs' responsibilities for the various sites in the weapons complex varied, depending on whether the sites reported directly to the Office of Defense Programs or to another program office within DOE. For two field offices—the Albuquerque and Nevada Operations Offices—the Office of Defense Programs served as the Lead Program Secretarial Office. A Lead Program Secretarial Office is responsible for institutional health and long-term planning, landlord activities,[8] and overall site integration and operations. Lead Program Secretarial Offices also have line accountability for environment, safety, and health; for safeguards and security; and for the implementation of departmental policy. However, as noted in chapter 1, substantial stockpile stewardship work is performed at three other sites—the Y-12 Plant in Oak Ridge (Tenn.), Savannah River Tritium Operations (S.C.), and Lawrence Livermore (Calif.)—that did not report to the Office of Defense Programs under this reorganization. For those sites, the Office of Defense Programs served as Cognizant Secretarial Office and was considered a "customer" of the field office where its work was being performed.

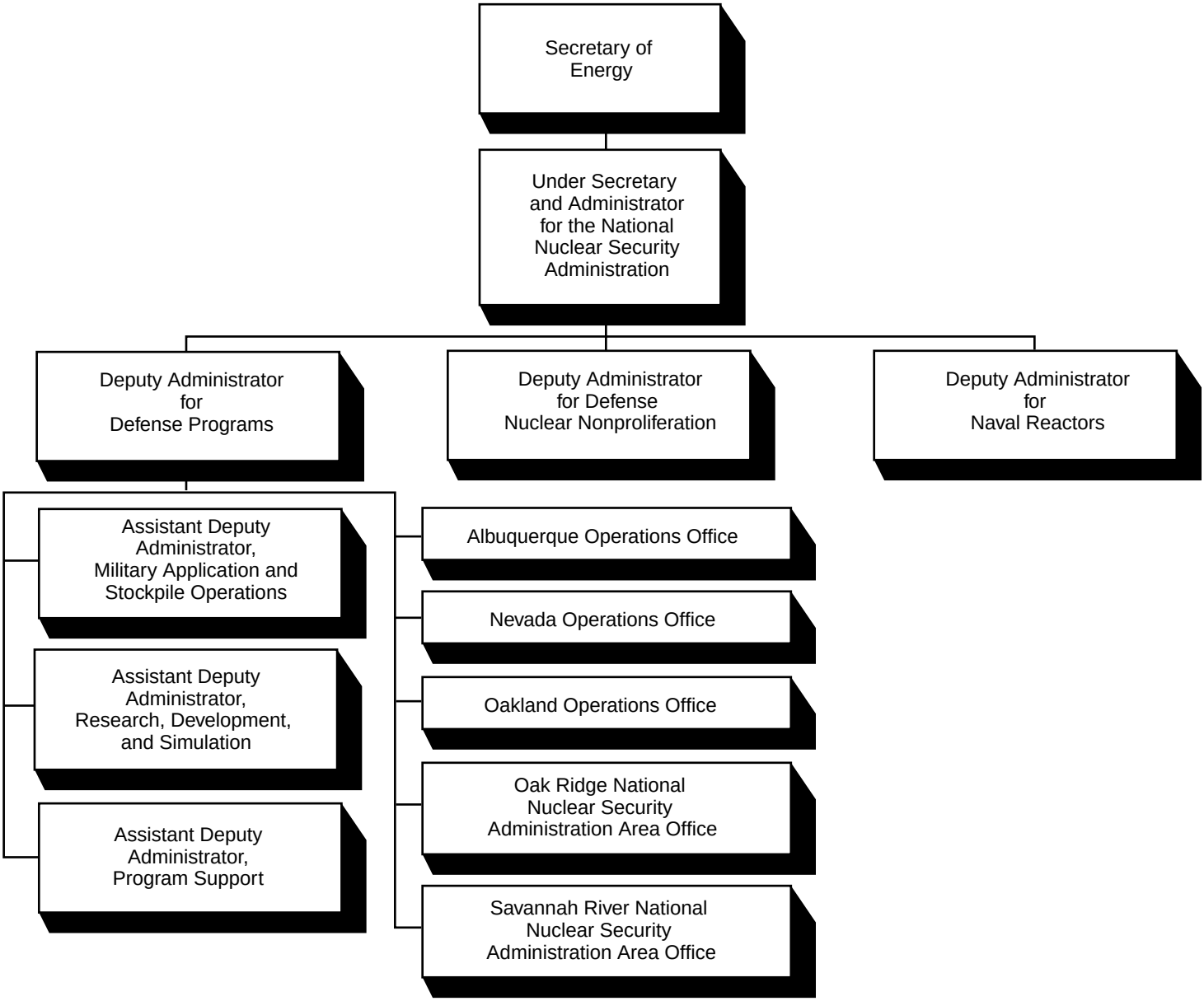
Finally, in October 1999, the Congress passed legislation establishing the National Nuclear Security Administration as a semiautonomous agency within DOE with responsibility for the nation's nuclear weapons, nonproliferation, and naval reactors programs. As of March 1, 2000,

[7]Under the April 1999 Department-wide reorganization, the Office of Field Management was renamed the Office of Field Integration, and a Field Management Council was established to serve as a coordination point and conflict resolution vehicle for inter-program relations.

[8]"Landlord activities" refers to providing the physical and corporate infrastructure for site operations, including facilities maintenance and repair, roads, and utilities.

headquarters and field personnel of the Office of Defense Programs became employees of the new agency. (See fig. 5.) In the summer of 2000, the Administrator and Deputy Administrator for Defense Programs were selected and confirmed, providing a new leadership team for the National Nuclear Security Administration.

Figure 5: Organization of the National Nuclear Security Administration and the Office of Defense Programs, as of October 1, 2000



Source: Compiled by GAO from DOE's and the National Nuclear Security Administration's data.

DOE's Attempts to Reorganize Have Not Addressed All of the Organizational and Leadership Issues

Organizational structure problems, including confusing and overlapping roles and responsibilities and a lack of clear accountability, continue to plague the Office of Defense Programs. In addition, instability in the Stockpile Stewardship Program's leadership has led to a lack of consistent management direction. Standards we have developed require federal agencies to establish and maintain an effective system of internal controls over their operations.[9] Such a system is the first line of defense in safeguarding assets and preventing and detecting errors. Under our standards, managers should, among other things, ensure that their staff have the required skills to meet organizational objectives, that the organizational structure clearly defines key areas of authority and responsibility, that progress be effectively measured, and that operations be effectively monitored.

Problems Remain in the Organizational Structure at Three Levels

In spite of repeated attempts to improve the organizational structure of the Office of Defense Programs, problems remain at three levels—within the Stockpile Stewardship Program's headquarters, between headquarters and the field offices, and between contractor-operated sites and their federal overseers. These problems result in overlapping roles and responsibilities for the federal workforce overseeing the Stockpile Stewardship Program and confusion and duplication of effort for the contractors implementing the program at sites in the nuclear weapons complex.

The Structure of the Office of Defense Programs Remains Fragmented at the Headquarters Level

In 1998, a Program Integration Task Force consisting of representatives from throughout the downsized weapons complex identified fragmentation in the Office of Defense Programs headquarters as "a structural obstacle" to the coherent planning, prioritization, and execution of the Stockpile Stewardship Program. They identified instances in which the research and development, simulation, and production portions of the program—managed by three separate headquarters' offices—were not synchronized to support planned stockpile refurbishments. As part of the August 1999 reorganization of the Office of Defense Programs, the two science offices—the Office of Strategic Computing and Simulation and the Office of Research and Development—were consolidated to create the Office of Research, Development, and Simulation, and definitions of the headquarters offices' roles and responsibilities were issued. However, the

[9] *Standards for Internal Control in the Federal Government* (GAO/AIMD-00-21.3.1, Nov. 1999).

definition of "missions" and "functions" for the new Office of Research, Development, and Simulation did not specifically mention integration with the production program, even though the coordination of effort and allocation of resources between the two are critical to the Stockpile Stewardship Program's success.

While this action reduced fragmentation in the science offices, it left the split between the science program and the production program in place. This bifurcated structure has resulted in widespread dissatisfaction with the way the program is being managed. Officials at DOE's headquarters, field offices, labs, and production plants repeatedly cited to us numerous ways that the split between the science and production portions of the Stockpile Stewardship Program at the headquarters level negatively affects coordination throughout the complex. For example, the Office of Research, Development, and Simulation and the Office of Military Application and Stockpile Operations share responsibility for several campaigns, including the Advanced Design and Production Technologies campaign. Officials at both the labs and production plants told us that each headquarters organization has provided different amounts of funding and imposed different reporting requirements on the contractors doing the work under this campaign. This has resulted in difficulties in getting the work done, as well as duplication of effort, as the contractors attempt to satisfy the requirements of the two groups.

Organizational Issues Between Headquarters and the Field Remain Unresolved

One of the key problems noted in 1997 in the 120-Day Study was the existence of "two headquarters"—one in the Office of Defense Programs' headquarters and one in the Albuquerque Operations Office. The study noted that, with the end of the design and production of new weapons, there had been a natural tendency for "mission creep," whereby Albuquerque attempted to assume policy and planning responsibilities typically performed by a headquarters function and the Office of Defense Programs' headquarters staff became more heavily involved in the Stockpile Stewardship Program's execution—an Albuquerque responsibility.

Three years later, this situation still persists. For example, officials in the Albuquerque Operations Office believe that headquarters is still trying to give specific program direction to the contractors, a function that is properly the responsibility of the contracting officer located in the Albuquerque Operations Office. For example, they noted that headquarters staff gave direction to the Kansas City Plant about how many specific weapons components to produce. They noted that specific production

direction has always been contained in documents produced by the Albuquerque Operations Office. Conversely, officials at the Nevada Operations Office have similar concerns, and the Operating Office Manager noted that many headquarters and field staff are not "staying in their boxes" organizationally. Finally, the Principal Deputy for Operations told us that there have been problems, since headquarters and field staff are "not playing well together" because roles and responsibilities are not clearly defined.

Underlying this problem is the fact that the document—a memorandum—that defines the roles and responsibilities of the Office of Defense Programs and the Albuquerque Operations Office was last issued in May 1968, clearly predating the creation of the Stockpile Stewardship Program. In this memo, the then Division of Military Application in headquarters was responsible for the "overall management of the weapons development and production program," while the Albuquerque Operations Office managed the production complex, including "determining production responsibilities and schedules."

DOE officials told us that there have been several attempts during the last several years to resolve and clarify the organizational relationships between the Office of Defense Programs' headquarters and its field structure; however, none of them have been successful. Elaborating on comments made in the 120-Day Study, officials told us that this problem has been allowed to exist because the former Assistant Secretary for Defense Programs was simply not interested in management and organizational issues. Officials at levels as high as the Field Office Manager level told us that the former Assistant Secretary relied on an informal network of trusted associates to run the nuclear weapons program and placed little stock in formal organizational structure.

Most recently, the Principal Deputy for Operations has begun yet another effort to resolve the organizational problems within the Office of Defense Programs. While waiting for the National Nuclear Security Administration's new Administrator and Deputy Administrator to be selected and confirmed, he implemented several small efforts, such as hiring new technical staff. He expects a renewed effort now that a new Administrator and Deputy Administrator for the National Nuclear Security Administration have been installed. Although the scope of the realignment effort is still being defined, he believes that a fundamental principle that needs to underpin this effort is that the Office of Defense Programs needs to clearly assign responsibility for each of its various programs. He also felt that it

was important to move federal program oversight as close to the contractors as possible and that the Office needed to move to a climate where everyone considered themselves part of the Office of Defense Programs—not headquarters staff or field staff. Officials in the Albuquerque and Nevada Operations Offices told us that they support the Principal Deputy's efforts and agree with the principles embodied in the realignment effort.

Both the 120-Day Study and the Chiles Commission report contain important principles that can guide any eventual reorganization. In particular, the 120-Day Study also advocated moving the people doing the program work of the Office of Defense Programs as close to the field as possible. The study supported a smaller headquarters staff focused on top-level management tasks, such as strategic management and dealing with the Stockpile Stewardship Program's external customers—the Department of Defense and the Congress. The Chiles Commission endorsed the recommendations of the 120-Day Study, noting that the Office of Defense Programs needed to be structured to eliminate overlapping responsibilities between headquarters and the Albuquerque Operations Office. Like the 120-Day Study, the Chiles Commission felt that headquarters staff should focus on top management tasks, while the field staff should be responsible for operational tasks, such as contract management, facility operations, and oversight.

Organizational Issues Between the Office of Defense Programs, DOE's Field Offices, and DOE Contractors Also Remain Unresolved

A key finding of the Chiles Commission was that direct reporting chains should be established for operations offices administering nuclear weapons contracts. The study stated that such a structure would provide the Assistant Secretary for Defense Programs with oversight authority for all facilities supporting the nuclear weapons program, as well as for the execution of the program.[10] The President's Foreign Intelligence Advisory Board found that "(c)onvoluted, confusing, and often contradictory reporting channels make the relationship between DOE headquarters and the labs, in particular, tense, internecine, and chaotic."

[10]This position is now the Deputy Administrator for Defense Programs in the National Nuclear Security Administration.

In April 1999, the Secretary of Energy reorganized DOE to bring all of DOE's field offices, like the Albuquerque Operations Office, under a specific headquarters program office. However, under that departmental structure, not all of the field sites that performed work for the nuclear weapons complex reported directly to the Office of Defense Programs. Specifically, while the Albuquerque and Nevada Operations Offices (and their contractors) reported directly to the Office of Defense Programs, contractors operating the Savannah River Tritium Operations, the Y-12 Plant at Oak Ridge, and the Lawrence Livermore National Laboratory were overseen by operations offices that reported to either the Office of Environmental Management or the Office of Science.[11] While the Deputy Secretary of Energy directed in August 1999 that memorandums of agreement be implemented promptly to further define relationships between multiple program offices sharing a single site, the Office of Defense Programs had finalized only two of the three agreements needed as of August 2000.

[11]The Albuquerque Operations Office oversees the Office of Defense Programs' contractors at the Kansas City Plant, the Pantex Plant, the Los Alamos National Laboratory, and the Sandia National Laboratories.

Specifically, for the Oakland Operations Office, the memorandum of agreement between the Office of Defense Programs, the Office of Science, and the Oakland Operations Office defined how the two headquarters program offices would interact with the operations office to oversee operations at the Lawrence Livermore National Laboratory. Both the Office of Defense Programs and the Office of Science fund the Oakland Operations Office. The Office of Defense Programs was assigned landlord responsibilities for Lawrence Livermore, including safety and security functions, although the landlord function is usually filled by the Lead Program Secretarial Office (at that time, the Office of Science). Furthermore, as "cognizant secretarial office," the Office of Defense Programs was accountable only for the infrastructure and construction that support Defense Programs work. However, the Office of Science Programs was responsible for overseeing the programs, facilities, construction, and operations at the lab that served its programs. Finally, the Oakland Operations Office, which reports to the Office of Science, managed the contract with the University of California for operating the Lawrence Livermore National Laboratory. While the overall budget for the Office of Defense Programs has decreased about 31 percent over the last decade, the budget for Defense Programs' work at Lawrence Livermore has risen by about 75 percent to about $746 million for fiscal year 2000 (more than half of the total budget for the lab).[12] Yet, performance expectations for Lawrence Livermore were set by the Oakland Operations Office—not by the Office of Defense Programs. Thus, the April 1999 reorganization perpetuated a structure that made the integration and coordination of the Stockpile Stewardship Program very difficult and diffused accountability for the overall performance and management of a key Office of Defense Programs site.

As we noted in our recent report on the National Ignition Facility, one of the causes of the significant cost and schedule overruns that this key Stockpile Stewardship Program facility experienced was the unclear chain of command between DOE's headquarters and the Oakland Operations Office.[13] While the Office of Defense Programs funded the National Ignition Facility and assigned a project director at headquarters, the day-to-day supervision of the facility was assigned to a project manager in the Oakland

[12]This analysis is based on April 2000 budget data provided by the Office of Defense Programs' Office of Program Analysis and Financial Management.

[13]See *National Ignition Facility: Management and Oversight Failures Caused Major Cost Overruns and Schedule Delays* (GAO/RCED-00-141, Aug. 8, 2000).

Operations Office who reported to the Office of Science—not to the project director in the Office of Defense Programs. Although a 1997 memorandum of understanding on the National Ignition Facility defined the field project manager's responsibilities, it left unchanged the misdirected reporting to the Office of Science rather than to the Office of Defense Programs, which was responsible for the project. Laboratory officials told us they considered DOE's chain of command confusing and really did not know to whom they reported on a day-to-day basis. Since our report was finalized, however, the Office of Defense Programs has begun making improvements designed to strengthen the management and oversight of the National Ignition Facility. For example, the Department has created a new headquarters National Ignition Facility Project Office whose manager is dedicated to the project. These actions are encouraging, but since implementation has only just begun in many areas, an assessment of their ultimate value is premature.

In October 1999, the Congress passed legislation that established the National Nuclear Security Administration.[14] One reason for the agency's creation was to correct the confused lines of authority and responsibility within DOE's nuclear weapons program. However, the plan that DOE prepared to implement the agency laid out an organizational structure that was virtually the same as it was before the new agency was established. The January 2000 implementation plan simply moved the Office of Defense Programs and the field offices that are associated with it to the National Nuclear Security Administration. As a result, the Los Alamos National Laboratory and the Sandia National Laboratories reported through the Albuquerque Operations Office to the Deputy Administrator for Defense Programs, but activities at the Savannah River Tritium Operations, Oak Ridge Y-12 Plant, and Lawrence Livermore National Laboratory continued to report through operations offices that were not part of the agency's field structure.

Effective October 2000, the Deputy Secretary of Energy took further action to reorganize reporting relationships between DOE's headquarters and operations offices. This action complies with congressional direction to eliminate "dual-hatting," that is, staff serving in both DOE and National Nuclear Security Administration positions simultaneously. Under this reorganization, the Oakland Operations Office, which oversees the Lawrence Livermore National Laboratory, will report to the National

[14]National Nuclear Security Administration Act (P.L. 106-65, Title XXXII, Oct. 5, 1999).

Nuclear Security Administration. In addition, a new Area Office reporting to the Office of the Deputy Administrator for Defense Programs will be established in Oak Ridge to oversee the Y-12 Plant. Similarly, a new Area Office in Savannah River will oversee Tritium Operations and other National Nuclear Security Administration operations at that site and report to the National Nuclear Security Administration. However, DOE and National Nuclear Security Administration officials recognize that full implementation of these changes will take some time. For example, it has not yet been decided whether the Savannah River Area Office will report directly to the National Nuclear Security Administration Administrator or another senior National Nuclear Security Administration official. In addition, memorandums of agreement covering coordination between the National Nuclear Security Administration and other DOE program offices that share the Oakland, Savannah River, and Oak Ridge sites will need to be negotiated. Finally, relationships between the new Area Offices at Oak Ridge and Savannah River and the existing Operations Offices at those sites must be defined and agreements implemented.

Leadership Issues Also Remain Unresolved

The President's Foreign Intelligence Advisory Board identified factors that they believe lead to management and programmatic success. The first of these factors is strong leadership to set standards and expectations regarding performance and accountability. For effective leadership, they found that longevity is a key ingredient. DOE's 30-Day Review also found that the program must take a long view that extends decades into the future to be effective, which we believe reinforces the need for a long-term focus and consistent leadership. However, analysis of the senior management positions in the Office of Defense Programs indicates a pattern of instability.[15] The proportion of offices vacant or with acting managers has increased from 17 percent in 1996 to almost 65 percent in 2000. As of January 2000, the Office of Defense Programs had 57 offices, including those headed by directors. Thirty-nine of those offices were headed by officials in an acting capacity, while 6 officials headed multiple offices. Out of 28 offices in the Office of Defense Programs headed by a senior manager, 18 were staffed on an acting basis.

[15]We defined senior management positions as those ranging from the Assistant Secretary for Defense Programs through the directors of the program offices, such as DP-13—the Office of Research, Development, and Testing Facilities.

The lack of consistent management direction was cited by managers at many of the field sites in the nuclear weapons complex, as well as by headquarters officials. As the President's Foreign Intelligence Advisory Board noted, lack of consistent leadership leads to initiatives that, once started, are often changed or dropped when leadership changes. For example, the Secretary proposed establishing the Stockpile Management Integration Council in his June 1997 report to the Congress on actions taken to respond to the 120-Day Study. The Council was to serve as a conflict resolution vehicle for coordination between the various components of the Office of Defense Programs at the field and headquarters levels. According to DOE officials, that council was never fully implemented because one Deputy Assistant Secretary for Military Application and Stockpile Operations retired and the new Deputy Assistant Secretary, seeking a different forum, developed a quarterly program review. This program review, in which the field sites participate, could accomplish the same objectives as the Council. However, some officials told us that these quarterly reviews focus on short-term problems and do not effectively address the longer term needs that are most pressing for their sites.

In a similar vein, the Office of Defense Programs has been aware of long-standing problems caused by the failure to maintain facilities and has been studying infrastructure issues for at least 5 years. However, some sites reported that adequate funding for basic maintenance needs has not been provided for as much as a decade. As a result, the complex now has significant vulnerabilities in its ability to produce the components and materials needed to maintain the weapons in the enduring stockpile. In response, the Office of Defense Programs sought limited supplemental funding for emergency maintenance needs for fiscal year 2000 and—once again—began a new planning effort in May 2000.

Finally, as noted earlier, the Office of Defense Programs has been implementing dozens of specific actions intended to address an array of organizational issues, including responses to recommendations to improve the program's management and leadership in such areas as organization, planning and integration, infrastructure and workforce management, and external relations. We assessed what impact these actions, when fully implemented, were likely to have on the Stockpile Stewardship Program's effectiveness. Overall, we believe that about 47 percent of the proposed actions should improve the program's effectiveness. However, fully 45 percent of the actions proposed do not completely address the problem.[16] In some cases, key management decisions on organization and leadership issues, such as setting priorities for the program, have been deferred for years.

The root cause of the instability in the Office of Defense Programs' leadership is not clear. As noted earlier, the previous Assistant Secretary was generally believed not to have had significant interest in management issues. In addition, the Principal Deputy for Operations believes that the turnover among the Stockpile Stewardship Program's managers was due to the program's organizational problems, which created significant frustration among managers as they jockeyed for turf and left them uncertain about what actions they were authorized to take.

Conclusions

The Stockpile Stewardship Program cannot be effective without an effective organizational structure to carry it out. Numerous analyses, as well as our work, have shown how problems with the organization of the relationships between the Office of Defense Programs, its field offices, and its contractors have led to inefficiencies and conflict within the Stockpile Stewardship Program. However, these analyses have provided the principles that should guide the reorganization of the program, which include clearly defining the roles and responsibilities of headquarters and field officials, moving program management officials as close to the action as possible, and bringing all of the field structure and contractors that carry out the program under one organization. The National Nuclear Security Administration's implementation gives DOE a chance to fundamentally restructure the convoluted organization of the Office of Defense Programs,

[16]Some actions (about 9 percent) were either deferred or limited because of resource constraints, such as the extent of laboratory security upgrades that can be funded. We did not include those actions in this category.

rationalize oversight and reporting relationships, and institute new processes where needed. However, the current realignment of the headquarters and field structure will not succeed without the full support of the new leadership of the National Nuclear Security Administration. Likewise, we believe that the resolution of these issues is necessary for the Stockpile Stewardship Program to be successful.

While all organizations have some turnover in management positions, we believe that the high level of turnover indicated by the predominance of acting managers in the Office of Defense Programs is not healthy and may be contributing to the substantial number of useful management improvements that have been identified but not fully implemented. The implementation of the new National Nuclear Security Administration provides opportunity, as well, for the Office of Defense Programs to identify the reasons for management turnover and address them.

Recommendations for Executive Action

To improve the Stockpile Stewardship Program's management, we recommend that the Administrator of the National Nuclear Security Administration direct the Deputy Administrator for Defense Programs to take the following steps:

- Reorganize the program so that roles and responsibilities between headquarters program offices and between headquarters and field staff are clearly defined and so that program management officials are located as close as possible to the programs they manage.
- Ensure that the October 2000 field structure's reorganization is implemented in a way that ensures clear lines of authority between the Office of Defense Programs and its contractors and that clearly defines and establishes effective relationships between the National Nuclear Security Administration and the DOE program offices that share some of its sites.
- Identify the reasons for the high level of management turnover in the program and take prompt and decisive action to provide greater management consistency and stability for the program.

Agency Comments and Our Evaluation

The National Nuclear Security Administration's Office of Defense Programs agreed that there is a need to resolve organizational ambiguities and to improve the understanding of roles, responsibilities, and accountabilities between headquarters and field elements. The Office also highlighted the

actions it has taken or is planning to take that will address our recommendations. These actions include implementing the October 2000 DOE reorganization; appointing a new Acting Chief Operating Officer, whose function is to provide operational oversight, guidance, and coordination for the nuclear weapons complex; and making permanent personnel assignments as quickly as possible to improve organizational stability. We agree that these actions have the potential to improve management of the Stockpile Stewardship Program. While we have made changes to the report to recognize these initiatives, we believe that it is too soon to determine how effectively they will be implemented and, hence, whether they will lead to substantial improvements. However, we are encouraged by the actions the new leadership of the National Nuclear Security Administration and the Office of Defense Programs have taken to improve the organization and leadership of the Office of Defense Programs, as delineated in their comments on a draft of this report. (See app. III.)

With regard to the issue of the high level of management turnover identified in this report, the National Nuclear Security Administration's Office of Defense Programs agreed that greater organizational stability is desirable but did not consider the level of turnover abnormally high, given the technical nature of the work and the opportunities available to highly educated and skilled personnel. The Office pointed out that the former Assistant Secretary for Defense Programs served for over 6 years and that his Principal Deputy, who served as Acting Assistant Secretary until the Deputy Administrator took office, has been with the Stockpile Stewardship Program since 1996. However, we believe that the increasing level of turnover and the widespread dissatisfaction with the lack of consistent management direction among federal and contractor officials we interviewed are indicative of serious problems. While we are pleased with the new Deputy Administrator's efforts to make permanent personnel appointments, we continue to believe that the Office of Defense Programs should make additional efforts to identify the underlying causes of the management turnover and take appropriate steps to correct those underlying problems.

Management Improvements Needed for the Office of Defense Programs to Conduct Successful Stockpile Life Extensions

The Office of Defense Programs is about to embark on a series of life extensions for the weapons in the nation's nuclear stockpile. To date, only one stockpile life extension has been attempted—the extension of the W87 nuclear warhead. This life extension experienced significant design and production problems that raised its costs by over $300 million and caused schedule delays of about 2 years. Numerous factors contributed to this outcome. The original design to enhance the structural integrity and extend the stockpile life of the W87 did not work as planned. In addition, all of the major production facilities in the nuclear weapons complex experienced significant problems as they attempted to restart an atrophied complex. At the heart of many of the problems was an inadequate Office of Defense Programs management process and unclear leadership, which prevented the Office from adequately anticipating and mitigating the problems that arose. Virtually all of the participants in the W87 life extension recognize that there are important lessons to be learned from their experiences, and some management improvements have been started. However, more action is needed before the Office of Defense Programs begins extending the life of two additional warheads—the W76 and W80—that form a significant portion of the stockpile.

The Office of Defense Programs Has Begun a Major Program to Extend the Life of Nuclear Weapons in the Stockpile

The current U.S. nuclear weapons strategy is to maintain the existing stockpile of weapons indefinitely without underground nuclear testing. However, nuclear warheads, even while in storage, can change over time. For example, radioactive materials may cause decay in metals and corrosion in joints. In addition, plastics and other organic materials change with age and exposure to heat and radiation. Consequently, all warheads in the stockpile are expected to require periodic refurbishment and remanufacturing in order to extend their life. While the Office of Defense Programs is about to embark on a series of life extensions for the weapons in the nation's nuclear stockpile, to date, only one stockpile life extension has been attempted—the extension of the W87 nuclear warhead.

Lawrence Livermore National Laboratory (Livermore) designed the W87 nuclear warhead during the1980s. Currently deployed by the Air Force on the Peacekeeper missile, the W87 was produced from 1986 through 1989 and first deployed in December 1986. During the early 1990s, DOE recognized the need to enhance the structural integrity and extend the stockpile life of the W87. Since accomplishing this required disassembly and refurbishment, DOE, in agreement with the Department of Defense, decided to conduct a life extension program (LEP) to evaluate the

expected lifetime of the components in the W87 and replace the parts needed to extend the life of the W87 for an additional 30 years.

As summarized in table 8, carrying out the W87 LEP has involved the effort of virtually all of the labs and production facilities within the nuclear weapons complex.

Table 8: Nuclear Weapons Complex Facilities That Participated in the W87 LEP

Participant	Role
Lawrence Livermore National Laboratory (Livermore)	Develop and certify design changes to the nuclear portion of the W87.
Los Alamos National Laboratory (Los Alamos)	Peer review the design changes that Livermore proposed. Fabricate detonator parts.
Sandia National Laboratory (Sandia)	Develop and certify changes to the nonnuclear portion of the W87.
Kansas City Plant	Refurbish and fabricate new detonator/arming and safing devices and other nonnuclear parts.
Y-12 Plant	Disassemble and rebuild components of the nuclear portion of the W87.
Pantex Plant	Disassemble the W87, ship parts to Kansas City and Y-12 for refurbishment or replacement, and reassemble the W87 using new or refurbished parts.

Source: GAO's analysis of DOE's data.

The Office of Defense Programs is about to begin several additional stockpile life extension programs for warheads that represent a significant portion of the nation's nuclear arsenal. Specifically, the Office of Defense Programs is in the process of studying how to extend the life of the W76 nuclear warhead—which is carried by the Navy on Trident nuclear submarines—and the W80 nuclear warhead—which is used by both the Air Force and Navy on cruise missiles. The first production unit dates for these weapons are scheduled for later this decade. According to officials in the Office of Defense Programs, the costs for these life extensions promise to be significantly higher than those associated with the W87 LEP.

The Only Life Extension Conducted to Date Experienced Significant Design and Production Problems Due to Management Weaknesses

The W87 LEP experienced both design and production problems as the result of an inadequate management structure and unclear leadership. Consequently, the W87 LEP experienced both schedule delays and cost overruns. With respect to schedule slippage, the W87 LEP was officially begun in September 1994. The first production unit of the refurbished W87 was originally scheduled for the first quarter of fiscal year 1997; however, as a result of the problems discussed below, this date slipped to February 1999. The first production unit was achieved in February 1999. The W87 LEP is currently scheduled for completion in fiscal year 2004. Regarding costs, the estimated cost of the W87 LEP has risen from an original estimate of about $440 million to a current estimate of about $747 million—an increase of almost 70 percent. (Table 9 contains details on the W87 LEP cost estimate.)

Table 9: W87 LEP Cost Estimate Comparison

Dollars in millions

Cost element	Current cost estimate	Original cost estimate	Percent increase
Design	$92	$46	101.7
Production	655	394	66.0
Total	**$747**	**$440**	**69.7**

Source: GAO's analysis of DOE's data.

Design Issues Added to Program Costs

Livermore developed an initial design to enhance the W87's structural integrity and extend its stockpile life and subjected the design to a series of ground and flight tests. After a September 1996 flight test, Livermore decided that a major redesign was required. While the redesign effort did not ultimately affect the slippage of the first production unit date from 1997 to 1999, officials at Livermore and the Office of Defense Programs told us that the redesign effort placed considerable pressure on the labs and production plants and contributed to the increase in costs, particularly with respect to design. According to a program official in the Office of Defense Programs' Office of Stockpile Systems, Livermore's effort to redesign the W87 approximately doubled the design cost of the W87 LEP.

Livermore's initial design was subjected to a peer review by Los Alamos. During a peer review, one nuclear design laboratory reviews the work of

the other design laboratory in order to provide an independent technical assessment of the adequacy of the originating laboratory's work. Peer review has become increasingly important, since underground nuclear tests are no longer available to verify design issues. Peer reviews are required for the development of a new nuclear weapon and were used during the W87 LEP as well.

Production Problems Were Experienced Throughout the Complex

The need to develop a revised design had a major effect on the production complex and the cost of production. To meet Livermore's redesign requirements, the plants had to develop new materials and new production techniques, which added time to the production process. The Office of Defense Programs' cost data are not of sufficient quality to precisely determine to what extent the redesign increased production plant costs; however, program officials acknowledge that it had a major effect. Just as importantly, all of the major production facilities in the nuclear weapons complex—Kansas City Plant, Y-12, and Pantex—have experienced significant production problems during the W87 LEP. These problems, which resulted from such factors as restarting an atrophied production complex and addressing safety and technician training issues, led directly to slippage in the W87 schedule and contributed to the program's increased costs.

Restarting Production Was Difficult

The Kansas City Plant is responsible for the production of nonnuclear components for nuclear weapons, such as radars, timing devices, gas reservoirs, plastic products, and products requiring special technology capabilities. For the W87, Kansas City's major effort was refurbishing and manufacturing detonators. Originally, the W87's detonators were manufactured at the Office of Defense Programs' Mound Plant in Ohio. When Mound was closed in 1990 as part of the consolidation of the nuclear weapons complex, production for the detonators used in the W87 was transferred to the Kansas City Plant and Los Alamos. As part of the W87 LEP, the Office of Defense Programs intended to reuse detonators taken from the W87s that Pantex was disassembling and to manufacture new detonators. Both processes experienced significant restart problems.

With respect to the reuse of existing detonators, Albuquerque Operations Office and Livermore officials assumed that the reacceptance rate of the detonators would be about 80 to 90 percent. However, Livermore developed very strict reacceptance criteria in order to reduce the risk of introducing new problems during the W87 LEP. According to Albuquerque Operations Office and Kansas City Plant officials, this resulted in an actual

reacceptance rate of only about 45 percent, placing considerable pressure on Kansas City to begin new detonator production.

The production of new detonators was fraught with numerous problems, including the following:

- The original production process had not been adequately documented. When Mound was closed, the people who knew how to produce detonators were not retained, resulting in a loss of process knowledge.
- Leftover production material from Mound that Kansas City had planned to reuse had not been adequately stored, rendering it useless.
- The detonator parts that Mound produced were actually built to closer tolerances than the tolerances shown on the drawings; therefore, when Kansas City built the parts to the tolerances in the drawings, they would not work.

These problems did not affect the February 1999 first production unit date; however, they did cause internal schedule slippage. Consequently, according to Kansas City Plant officials, Kansas City had to develop an aggressive and expensive recovery schedule. They estimated that Kansas City's production costs increased from about $4.5 million to $32.4 million.

Safety and Training Issues Contributed to Production Delays

The Y-12 Plant's principal mission involves manufacturing (including refurbishment), disassembly, and surveillance of the secondary stage of nuclear weapons.[1] In September 1994, Y-12 went into a stand-down because of extensive concerns about safety practices at the plant. The contractor had to rework safety procedures and improve technician training on a facility-by-facility basis within the plant, gradually bringing Y-12 back up one function at a time. According to program officials, the stand-down at Y-12 directly contributed to the Office of Defense Programs' decision to slip the first production unit date from the first quarter of 1997 to February 1999. While the facilities necessary to support the W87 LEP were brought up first, the restart is still not complete. This could affect future LEPs.

[1] A nuclear weapon consists of two stages—a primary and a secondary. The primary is the fission stage of a nuclear weapon. Detonated first, the primary produces the extremely high temperatures and pressures required to produce fusion in the weapon's secondary. The secondary, or thermonuclear stage, of a nuclear weapon produces its energy through the fusion of deuterium and tritium nuclei.

Technician training at the Pantex Plant, where the nation's nuclear weapons are disassembled, repaired, and assembled, also affected production. In order to work on any particular nuclear weapon, Pantex technicians must be trained and certified. The technicians who were going to perform the W87 LEP were working on other weapons programs when the LEP began. Similar to the situation at Y-12, some of this training had to do with ensuring that technicians performed operations safely. Consequently, delays occurred while these technicians completed their current workload and then were trained and certified. According to Albuquerque Operations Office officials, while Pantex met the first production unit date of February 1999, problems with technician training caused them to miss the June and July 1999 shipments.

After Pantex fell behind, it went to overtime and double shifts to try to catch up. However, Albuquerque Operations Office officials said that the technicians were not proficient enough to work at the accelerated rate that they were trying to achieve. As a result, the technicians damaged the W87's detonators when they tried to install them on this accelerated schedule. Albuquerque Operations Office officials were able to persuade headquarters officials to stop trying to meet the accelerated schedule and to return to the regular schedule. Once they returned to the regular schedule, the problem stopped. Albuquerque Operations Office officials hope that when the technicians gain more experience, they can make up the deliveries that Pantex missed. This problem also affected detonator production at Kansas City, since the Office of Defense Programs had not assumed that there would be any damage at Pantex when it set up the original production schedule.

Finally, in addition to safety issues, Y-12 experienced problems when production actually began. For example, certain materials needed for the W87 were no longer being manufactured by outside vendors. This required Y-12 to develop production processes in-house or to reuse existing materials. As with the Kansas City Plant, meeting these requirements added to the cost of the effort.

Changing Requirements Caused Conflict Between the Plants and Livermore

Once a design lab has developed the requirements for a redesigned weapon, the production plants must develop and implement production methods. The design lab, in turn, must certify that these methods produce the required part or component. Changing requirements dictated by the design lab—Livermore—contributed to the problems experienced during the production process. As noted earlier, part of these changing requirements resulted from the need for a redesign. However, plant

officials repeatedly told us that Livermore added additional requirements as they went through the production cycle. For example, Livermore required the plants to capture much more data on the parts they were manufacturing than they had in the past. While plant officials conceded that these data should be useful in the future, they felt that these requirements had not been adequately anticipated and budgeted for, putting extra pressure on them during the production process.

Management Weaknesses Contributed to the W87's Problems

A major contributing factor to the problems experienced during the W87 LEP was the Office of Defense Programs' lack of an effective management process and leadership. Without an effective process and leadership, the potential impact of many of the problems encountered was neither anticipated nor effectively mitigated.

While the Office of Defense Programs has historically used a very detailed program management process to design and build new nuclear weapons, the W87 LEP was conducted without such a process, as shown in the following examples:

- The Office of Defense Programs did not develop an overall program plan to manage the entire W87 LEP process. According to a program official, the W87 was begun with a one-line directive in the fiscal year 1995 Production and Planning Directive to "extend the life of the W87." This one-line directive continued to be contained in subsequent Production and Planning Directives and was the only official program guidance given until fiscal year 1999, when detailed production guidance was given to the production plants regarding monthly production and schedule. The Livermore project manager did develop a briefing for the Office of Defense Programs on how the lab intended to proceed with the design; however, the contents of this briefing were never integrated into the Production and Planning Directive in order to create an overarching plan.
- The Office of Defense Programs did not develop an overall cost and schedule baseline to guide the design process. Without a cost baseline, the design process was funded out of Livermore's operating funds, providing little oversight and control over program costs when they escalated.
- The Office of Defense Programs did not develop an overall cost baseline for the entire W87 LEP. As a result, we developed an overall estimate of the W87 LEP for this review from the best available data.

- The Office of Defense Programs did not implement any overall system of change control for the W87 LEP. Consequently, as design and production changes occurred, the Office was not able to effectively oversee the process.

In addition to the lack of an effective management process, the W87 LEP lacked consistent, coherent leadership, as shown below:

- No one person within the Office of Defense Programs was expressly in charge of the W87 LEP. The program official in headquarters responsible for the W87 LEP saw his role as one of being an "integrator" of the views of the different individual program managers at the labs, plants, and Albuquerque Operations Office. In contrast, the Albuquerque Operations Office has clear authority over the production plants; however, its ability to direct the labs is more limited.[2] Moreover, during the course of the W87 LEP, the responsibility for program management at the Albuquerque Operations Office turned over four times.
- Leadership of the program appeared to, in the words of one participant, "move around," depending on which phase the program was in. For example, during the design phase, Livermore program managers led the effort, while during the production phase, Albuquerque Operations Office officials were in charge. During the transition between these phases, many participants felt that who was in charge was not clear. The Director of the Air Force's Office of Nuclear Weapons and Counter Proliferation—the customer for the W87 LEP—told us that the Air Force was often cast in the role of resolving disputes between the labs and the production plants.

In trying to explain why the Office of Defense Programs' management of the program was so weak, the former Associate Deputy Assistant Secretary for Nuclear Weapons Stockpile provided the most comprehensive explanation. He said that, when the Office of Defense Programs was in the regular business of designing and producing weapons, each participant knew his/her role and how to manage the process. Once the Office of Defense Programs got out of the business in the late 1980s, people simply forgot how. He stressed that the more time that passes until the Office of Defense Programs begins full-scale refurbishments, the worse the problem

[2] As a result of the Deputy Secretary's September 26, 2000, memorandum on field restructuring, the Y-12 Plant and the Tritium Operations at the Savannah River Site no longer report to the Albuquerque Operations Office. (See ch. 4 for further discussion.)

of not having people with first-hand program management knowledge will become.

Without a management process and consistent leadership, the Office of Defense Programs was unable to effectively anticipate many of the problems they faced and to effectively resolve areas of disagreement. For example, despite the fact that the Mound production plant had been shut down and the processes moved to Los Alamos and Kansas City, Office of Defense Programs officials assumed that there would be no start-up problems. An Office of Defense Programs official told us that, when they developed cost estimates, they used the same contingency factors they had in the past and did not allow for any start-up problems.

Improved Management Processes Have Been Developed for Future Life Extensions, but More Needs to Be Done

As a direct result of its experience with the W87 LEP, the Office of Defense Programs has developed a specific management process for future life extension programs called the "6.X process." The 6.X process uses the management framework that the Office of Defense Programs employed for over 40 years to successfully design and build the nation's nuclear arsenal and applies it to the refurbishment process. By doing so, the 6.X process requires the use of a management process, such as the development of the plans and cost and schedule estimates, that we found missing in the W87 LEP. However, the development of the 6.X process is not complete. While a joint DOE /DOD version of the 6.X process has been approved, a more detailed Office of Defense Programs version that defines such things as the role of the participants and how and when peer review will be used during the life extension process is still under review. More importantly, on the basis of our review of draft documents and discussions with program officials, the revised 6.X process does not solve the problem of a lack of clear leadership in the Office of Defense Programs throughout the life extension process. Rather, it continues the current practice of multiple program managers at multiple locations.

We identified a relatively new Office of Defense Programs management practice—known as the *multisite performance-based incentive*—which has shown promise for more effectively integrating the actions of the nuclear weapons complex. Specifically, for fiscal year 2000, part of the fee earned by the Kansas City, Y-12, and Pantex Plants is based on their meeting the ultimate delivery schedule to the final user—the Air Force. This incentive requires the three contractors to work closely together because, if one contractor should cause the delivery schedule to be missed, none of the contractors will earn the monthly available fee. During fiscal year 2000, we

found general agreement that the multisite incentive program had met its expected benefit of improving cooperation and communication and meeting production goals. Several participants suggested that this program should be extended to include the labs when they serve as a production plant. For example, as noted earlier, in the case of the W87, Los Alamos produces detonator parts. In addition, it was suggested that linking the design labs into such an incentive program could serve to align the interests of all of the parties throughout the life extension process.

Finally, all of the participants involved in the W87 LEP agree that significant "lessons learned" need to be applied to future life extensions if the W87's problems with cost and schedule are to be avoided. For example, in addition to the need for a more coherent management process, many participants agreed that the weapons complex cannot assume in the future that previously shut-down processes can be easily restarted. However, we found that, to date, there has been no formal effort to catalogue the lessons learned and directly communicate them to managers and participants in the W76 and W80 LEPs. We did find some evidence of informal communication within some organizations; however, while acknowledging its importance, Office of Defense Programs officials said that the formal development and transmission of lessons learned had not been a high priority.

Conclusions

While some of the problems encountered during the W87 LEP were probably unavoidable, an effective management process and clear leadership could have mitigated their impact. All of the participants agreed that important lessons have been learned from the W87 LEP and that the Office of Defense Programs has taken some actions, such as the development of the 6.X process, to make improvements. However, because of the importance of future life extensions to the nation's stockpile, we believe that more needs to be done. Specifically, we believe that the Office of Defense Programs needs to ensure that one overall manager is accountable for each life extension program. This role is critical to ensuring that the many participants in a life extension stay focused on cost and schedule as the life extension moves through the process. In addition, we believe that the Office of Defense Programs needs to actively pursue the use of multisite incentive programs for future life extensions. In doing so, the Office of Defense Programs should explore mechanisms for including the design labs in these incentive programs to ensure that the incentives of all parties are clearly aligned. Finally, we believe that that a W87 lessons learned document, with recommendations for additional management

changes, if necessary, needs to be developed and formally communicated to all participants in the current W76 and W80 life extensions.

Recommendations for Executive Action

To improve the management of the stockpile life extension program, we recommend that the Administrator of the National Nuclear Security Administration direct the Deputy Administrator for Defense Programs to do the following:

- For each life extension, establish a manager who is responsible for and accountable for the entire life extension program.
- Use the multisite incentive approach in future life extensions to align, to the maximum extent possible, the performance incentives of all of the participants, including the design labs and the production plants.
- Develop and transmit a W87 life extension program "lessons learned" report with recommendations for additional program management changes, if needed, to all participants in ongoing and future life extension programs.

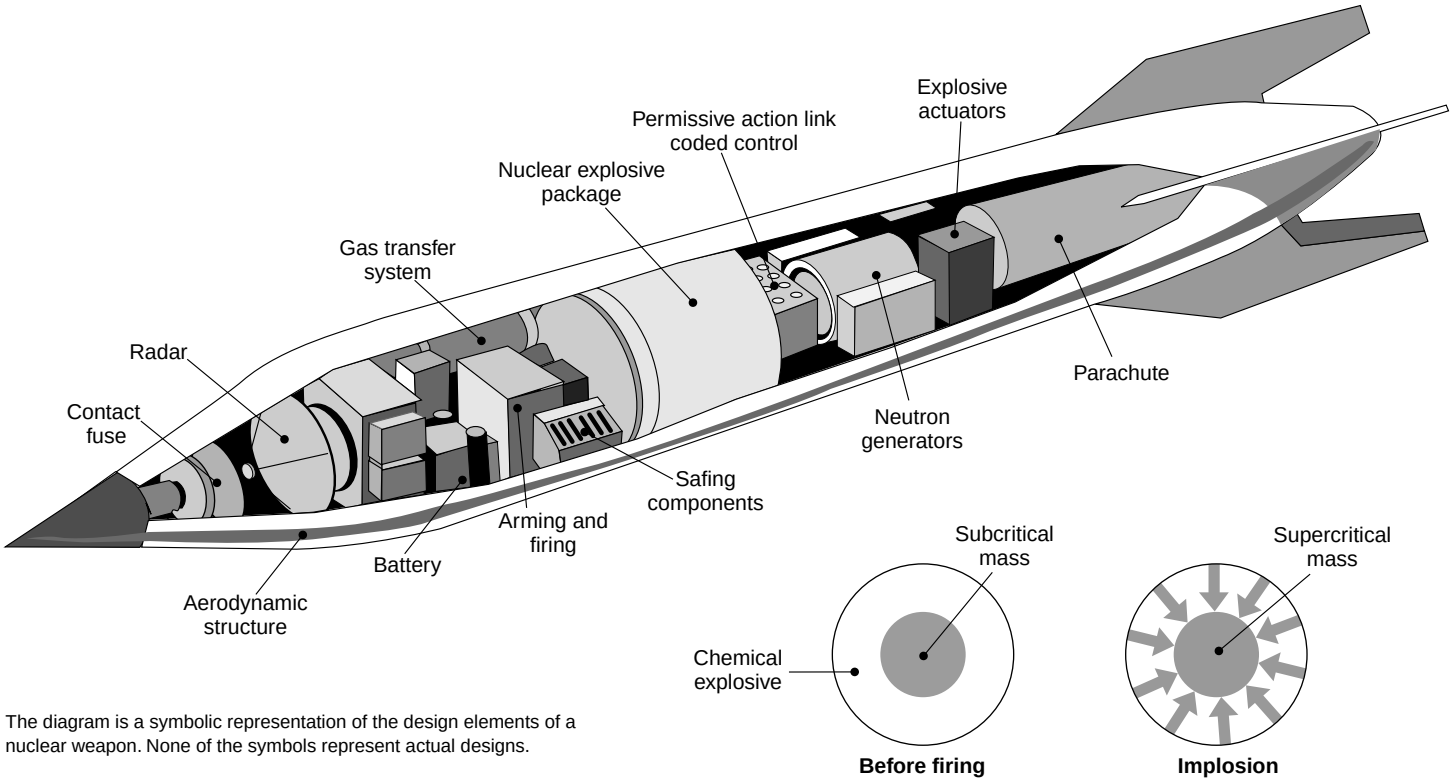
Agency Comments and Our Evaluation

The National Nuclear Security Administration's Office of Defense Programs concurred with our recommendations regarding improving the management of future life extension activities and stated that it was planning to take action on each recommendation. Specifically, the Office stated that it was planning to (1) appoint a "super" program manager for each life extension, (2) link the performance of all sites contributing to the Stockpile Stewardship Program through new management and operating contracts, and (3) require that a "lessons learned" document be immediately produced for the W87. While we support the Office of Defense Program's proposed actions, we are concerned about how it describes the super program manager position. Specifically, in its comments on our report, the Office states that this position will be responsible only for "coordinating" all activities for each life extension program. As we noted in our report, there are already managers who integrate, or coordinate, activities in the program. We believe that each life extension program needs a manager who does more than simply coordinate. In our view, one person who is responsible and accountable for each life extension is needed. Without such a position, the problems experienced on the W87 LEP, such as a lack of focus on cost and schedule, could easily be repeated.

Explanation of How Modern Nuclear Weapons Work

The following simplified explanation of how modern nuclear weapons work is adapted from the Department of Energy's (DOE) *Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* and the Congressional Budget Office report entitled *Preserving the Nuclear Weapons Stockpile Under a Comprehensive Test Ban.*[1,2] Most modern nuclear weapons consist of three sets of components—a primary, a secondary, and a set of nonnuclear components—enclosed in a case. (See fig. 6.)

Figure 6: Simplified Drawing of a Modern Nuclear Weapon



The diagram is a symbolic representation of the design elements of a nuclear weapon. None of the symbols represent actual designs.

Source: *Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management*, DOE, p. S-4.

[1]*Draft Programmatic Environmental Impact Statement for Stockpile Stewardship and Management*, Department of Energy (Dec. 1996), p. S-4.

[2]*Preserving the Nuclear Weapons Stockpile Under a Comprehensive Test Ban*, Congressional Budget Office (CBO Papers, May 1997), pp. 11-15.

The primary stage of the weapon produces large amounts of energy, which is used to ignite the secondary. Most primaries consist of a "pit," or central core surrounded by high explosive. Pits are typically made of an isotope of plutonium.[3] An electrical charge triggers detonators, causing the layer of high explosives to burn and detonate. As shown in the inset in figure 6, this compresses the material in the pit, enough to form a critical mass, that is, one that can sustain a nuclear fission chain reaction.[4] Usually, that reaction is enhanced, or "boosted," by injecting a mixture of tritium and deuterium gases into the pit by a gas transfer system. Those gases are stored in reservoirs until the firing sequence is initiated. The net result of the reactions occurring in the primary stage is the production of large amounts of nuclear particles (neutrons) and energy (X-rays and gamma rays) that are essential for igniting the secondary stage of the weapon.

The secondary contains components that focus the X-rays from the primary-stage explosion onto the fusion cylinder in the weapon, resulting in a radiation-induced implosion that creates the conditions necessary for thermonuclear fusion.[5] The fusion reaction is accompanied by the release of great amounts of energy and fast neutrons and generally takes place only under extreme heat and pressure.

This sequence of events is controlled by the nonnuclear components of the weapon—mechanisms that control the arming and firing of the weapon. All of the components shown in figure 6, except those in the nuclear explosive package, are nonnuclear components. Components for "use control" are included in the weapon to ensure that only authorized persons use the weapon. For example, the permissive action link coded control, shown in the schematic, precludes arming and/or launching the weapon until the insertion of a prescribed code or combination.

[3]Isotopes of an element all have the same number of protons in their nuclei, for example, a plutonium atom has 92 protons, but have different numbers of neutrons. Isotopes usually have nearly identical chemical and physical properties, but they may differ greatly in their nuclear properties.

[4]Fission occurs when the nucleus of an atom is split into two lighter parts and is usually accompanied by the release of neutrons and large amounts of energy.

[5]Fusion occurs when light nuclei are joined, or fused, to form a heavier nucleus.

Scope and Methodology

During the course of our work, we visited seven of the eight facilities currently working for the Office of Defense Programs. These included the Nevada Test Site, the Kansas City Plant (Mo.), the Pantex Plant (Tex.), the Y-12 Plant in Oak Ridge (Tenn.), the Los Alamos National Laboratory (N. Mex.), the Lawrence Livermore National Laboratory (Calif.), and the Sandia National Laboratories (N. Mex. and Calif.). We also met with DOE officials in the Albuquerque Operations Office in New Mexico and the Nevada Operations Office in Nevada, as well as DOE and contractor officials at each of the sites listed, to discuss all of the objectives of the job. We did not visit the Tritium Operations site at Savannah River, South Carolina, because we had recently completed intensive work with that office during our review of DOE's plans to reinstitute the production of tritium, a gas used in nuclear weapons.[1] We also met with officials in the Office of Defense Programs' headquarters offices, including the Principal Deputy for Operations, and numerous officials in the Office of Research, Development, and Simulation and the Office of Military Application and Stockpile Operations to discuss all of the objectives of the job.

Specifically, to determine if the Stockpile Stewardship Program has a comprehensive planning process that effectively integrates its various components, we obtained copies of DOE's Strategic Plan; DOE's annual Stockpile Stewardship Plan; all of the available program and implementation plans for the Campaigns, Directed Stockpile Work, and Readiness in Technical Base and Facilities activities; and the interim Stockpile Life Extension Program plan. We also obtained copies of the relevant site plans, such as Institutional Plans and 10-Year Plans at the national laboratories and the production plants. We assessed the Office of Defense Program's planning efforts against our standards for internal control and assessed the interim Stockpile Life Extension Program plan against the criteria given in the National Defense Authorization Act for Fiscal Year 2000. [2] We also met with officials in the Office of Defense Programs' headquarters planning offices to review the status of the various plans and to discuss their efforts for improving the integration of the plans. Finally, we discussed planning issues with officials at each of the national laboratories, the Nevada Test Site, and the production plants.

[1]See *Nuclear Weapons: Challenges Remain for Successful Implementation of DOE's Tritium Supply Decision* (GAO/RCED-00-24, Jan. 28, 2000).

[2]*Standards for Internal Control in the Federal Government* (GAO/AIMD-00-21, Nov. 15, 1999).

To review the new budget structure proposed by the Office of Defense Programs for fiscal year 2001 and assess if it would help improve the Stockpile Stewardship Program's management, we met with officials in the Office of Defense Programs' Office of Program Analysis and Financial Management, including the director of the latter Office, other senior officials in the former Office, and officials in DOE's Office of the Chief Financial Officer, including the Deputy Controller. We also asked officials at the field offices for details of how they were implementing the new program activity structure and the potential effects of various activity structures on their operational efficiency. Finally, we reviewed the Office of Defense Programs' budget submission for fiscal year 2001 and supporting documentation on the development of the new program activity structure.

To assess if the Office of Defense Programs is organized to effectively carry out the Stockpile Stewardship Program, we reviewed six major studies of the program issued by internal and external reviewers since the program's inception. We selected four of those studies for an in-depth analysis of their findings and recommendations and of DOE's responses to their recommendations. We met with senior DOE officials, including the DOE Under Secretary, and with senior officials in the Office of Defense Programs, including the Principal Deputy for Operations, the Director of the Strategic Planning Staff, the Executive Assistant, the Associate Deputy Assistant Secretary for Operations and Readiness, and officials from the Office of the Deputy Assistant Secretaries for Military Application and Stockpile Operations and the Office of Program Support, to discuss their responses to these studies. We prepared draft matrices of the recommendations, DOE's proposed responses, and the current status of DOE's responses; these matrices were updated by senior Office of Defense Programs officials and reviewed by the Principal Deputy for Operations for accuracy and completeness. We analyzed DOE's responses to the recommendations for effectiveness, basing our analysis on all of the information gathered during our site visits and meetings with DOE and contractor officials. Finally, we analyzed staffing turnover in the Office of Defense Programs by reviewing DOE's listings of senior management personnel, which denote whether an incumbent is in permanent or acting status or whether the position is vacant, and discussed the reasons for the turnover observed with the Principal Deputy for Operations.

To assess if the Office of Defense Programs has an effective management process in place to oversee the life extension programs for weapons in the stockpile, we met with officials in the Office of Defense Programs' headquarters and field offices, including the Associate Deputy Assistant

Secretary for Nuclear Weapons Stockpile and the Director of the Office of Stockpile Systems. We used the ongoing refurbishment of the W87 as a case study of the life extension program process. We reviewed the available data on the estimates of cost and schedule for the W87 life extension program. In addition, we met with the senior officials at each of the field sites responsible for overseeing the life extension program for the W87 and discussed the problems DOE has encountered with that life extension and the reasons for those problems. Finally, we reviewed the Office of Defense Programs' formal documentation of the new 6.X life extension process.

We conducted our review from June 1999 through October 2000 in accordance with generally accepted government auditing standards.

Comments From the Department of Energy's National Nuclear Security Administration

Department of Energy
National Nuclear Security Administration
Washington, DC 20585

November 7, 2000

Ms. Gary L. Jones
Director
Natural Resources and Environment
U.S. General Accounting Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Ms. Jones:

See comment 1.

The National Nuclear Security Administration's Office of Defense Programs (NNSA/DP) appreciates the opportunity to review and comment on the General Accounting Office (GAO) draft report entitled, "Nuclear Weapons: Management Improvements Needed to Effectively Implement the Stockpile Stewardship Program" (GAO/RCED-00-141). Overall, the GAO report presents a balanced perspective on program progress and initiatives, and accurately portrays a number of areas for further improvement and continuing management attention. In fact, many of the GAO team's findings and recommendations are consistent with our own. In addition, as you will see later in our response, some NNSA initiatives were implemented while the GAO draft report was being developed, and have already resulted in management and operational improvements that are in line with the GAO's recommendations. Finally, a meeting was held with your staff on November 1, 2000, to discuss our comments on the draft report and to initiate some consensus over their disposition. We understand that many of our comments have been accepted and will be reflected accordingly when your report is finalized.

See comment 2.

There are, however, two GAO recommendations that are premised on a possible misinterpretation of the fundamental underpinnings of weapons activities and, therefore, we suggest that they be modified. In particular, the GAO report recommends completion of a Stockpile Life Extension Program Plan that contains all of the information required by the National Defense Authorization Act for Fiscal Year 2000, especially information on plant capacity and budget. Stockpile Life Extension *is a Process* rather than a *Program*. The Stockpile Life Extension Process supports the Directed Stockpile Work Program which is a distinct element of the recently revised budget structure approved by Congress for Fiscal Year 2001. The NNSA will comply with the intent of this recommendation by including the requested information in the Directed Stockpile Work Program element in the Fiscal Year 2002 budget request to Congress. I plan to send a letter to the Congress in this regard in the very near future.

See comment 3.

Another GAO finding and related recommendation suggests that DP has failed to meet a goal to separate fixed and variable costs in its new budget structure. The DP budget structure is an output-based (vice input such as overhead) or product-based budget structure. Separation of those costs, therefore, was never an essential element in establishing the new budget structure. The new structure was formulated to reflect program mission, to improve the integration of the

Printed with soy ink on recycled paper

Stockpile Stewardship Program's planning, budget and performance evaluation functions, and to better provide horizontal and vertical integration of the program. The new structure is a significant improvement to program management. The unified budget structure reflects current and future missions, is tied to program plans, and provides substantially enhanced insight to facility operation costs. Existing cost reports, perhaps with some modification, may meet the information needs of the Congress in the area of indirect costs, and we will work with the Congress to provide such information.

See comment 4.

In addition, there are numerous references in the report to instability in DP's past leadership and management. It is important to recognize that the former Assistant Secretary for Defense Programs served in this capacity for over six years. During this period, the Stockpile Stewardship Program (SSP) as it exists today was conceived, developed, and refined. Moreover, Brigadier General Gioconda has been the Principal Deputy since August 1996, and during his over one year tenure as Acting Assistant Secretary for Defense Programs, the revised budget structure was initiated and the 30-day Review was conducted.

I would like to thank the GAO team for acknowledging the hard work and dedicated efforts of the stockpile stewardship team to maintain the safety, security, and reliability of the nuclear weapons stockpile under very challenging circumstances. While we fully support the need to enhance our planning and budgeting processes, resolve organizational ambiguities and improve some facets of the management of the stockpile, it should be acknowledged that many aspects of the SSP are on track and producing results. As the GAO team was advised, the Secretaries of Energy and Defense certified to the President on April 5, 2000, that "the nuclear stockpile has no safety or reliability concerns that require underground nuclear testing at this time." This was the fourth consecutive year in which the President has been so advised.

During the last several months, DP has focused on the planning and budgeting processes, the overall management framework, and the day-to-day operations at Headquarters (HQ), Field Offices, the national laboratories, production plants and the Nevada Test Site (NTS). Both the Congress and the Administrator of the NNSA, General John Gordon, have directed that DP develop a multi-year planning and budgeting process. This should significantly enhance planning and decision making for the Stockpile Life Extension Process and the entire SSP. In addition, General Gordon and I have met with all HQ personnel and have visited DP Field Offices, national laboratories, and production plants to discuss the importance of the SSP mission and the critical need for their continuing assistance and support. We are committed to providing effective leadership and management, and are well aware of those aspects of the SSP that are working and do not require adjustments, as well as those that are not working and require attention. For example, we are making permanent personnel assignments and reducing the number of personnel acting in key positions, demonstrating a much needed sense of organizational stability in DP.

See comment 5.

On September 26, 2000, the Deputy Secretary of Energy directed organizational changes, which took effect on October 1, 2000, that eliminated "dual-hatting" of DOE Field Managers at NNSA sites and should add clarity to the roles, responsibilities and lines of authority for all NNSA activities being carried out at Field Offices, the national laboratories, and production plants. Consistent with the spirit and intent of the September 26, 2000, memorandum, and to improve DP

accountability for the SSP, I recently directed that DP/HQ will assume a greater role in monitoring and evaluating contractor performance. Most importantly, beginning in Fiscal Year 2001, DP/HQ will assume responsibility for approving and signing the final fee awards for DOE contractors. This reflects a commitment by me to become more constructively involved in and accountable for the process of linking contractor appraisals to program performance. This is a significant departure from past practice, and will help signal a fundamental change toward improving the management structure of the SSP.

General Gordon and I plan to convene workshops in November and December to address DP HQ and Field organizational matters, and the current and potential assignment of key DP personnel. Our goals are to ensure that we have the right senior managers in the right assignments, develop a management succession plan, begin the process of clearing up any remaining organizational ambiguities, establish clear lines of authority and accountability, and ensure that the entire DP complex operates in the most effective and efficient manner possible.

The enclosure to this letter provides a detailed response to the recommendations contained in the subject draft report. We appreciate all of your efforts to help improve the overall management of the SSP, and we look forward to working with you as progress is made in the areas all of us have identified as requiring continuing attention.

Sincerely,

Madelyn R. Creedon
Deputy Administrator
for Defense Programs

Enclosure

ENCLOSURE

Comments on the Draft GAO Report,
"NUCLEAR WEAPONS: Management Improvements Needed to Effectively Implement the Stockpile Stewardship Program"

The draft report is fundamentally accurate and in many cases, DP is already implementing the recommendations. Our comments and factual clarifications are discussed below.

Executive Summary

Now on p. 6.

See comment 6.

Page 4: The draft report states, "For example, the Stockpile Stewardship Program seeks to extend the life of nuclear weapons well beyond that for which they were originally designed and to replace testing with simulation based on the results of experiments."
Comment: In the past, nuclear testing and the continuous development and production of new nuclear weapons were essential elements for preserving high confidence in the stockpile. Nuclear weapons were expected to remain deployed in the stockpile, requiring only routine maintenance, for at least 20 years. Evolving capabilities and changing military requirements resulted in most weapons being retired and replaced by safer and more capable weapons well before the end of that expected deployment period.

The stockpile is aging beyond our current experience base, as we move into the 21st century. The DOE has never before had large numbers of 30 to 40 year-old warheads in the stockpile, a situation that could change in the next decade. Until recently, the average age of a stockpile warhead had always been less than 13 years. Today, the average is 17 years, and this trend underpins the importance of the enhanced surveillance efforts to better characterize stockpile changes and anticipate future changes that may affect the stockpile.

With respect to the second part of the GAO sentence, the Stockpile Stewardship Program (SSP) is much more involved and complex than simply replacing testing with simulation. An active program of surveillance, assessment, refurbishment, and continuing certification is the paradigm for stewardship of the stockpile. The Program's success is dependent on a highly integrated and interdependent program of examination, experimentation, simulation, and modeling which, when combined with archived data developed under the nuclear test program, will lead to a detailed understanding of the underlying physical processes within a nuclear weapon. This approach, coupled with advanced surveillance and predictive capabilities for aging phenomena associated with nuclear weapons materials and components, is enabling the DOE to ensure the safety, security, and reliability of the stockpile in the absence of underground nuclear testing.

Now on p. 9.

See comment 5.

Page 7: "In addition, three of the eight contractors performing substantial amounts of work for the weapons program report to other program offices at DOE rather than reporting directly to the Office of Defense Programs, including one of the weapons design laboratories and two of the production facilities."

Comment: This has been changed as of October 1, 2000. The DP function at these sites report directly to NNSA/DP.

Now on p. 9.

Page 7: "In addition, all of the major production facilities in the nuclear weapons complex experienced significant problems as they attempted to restart a previously shut down complex."

See comment 6.

Comment: Sentence is misleading. While disruptions were experienced at the Y-12 Plant that impacted the W87 life extension program (LEP), to say that "all major production facilities" were shut down prior to the W87 refurbishment is not true.

Now on p. 10.

Page 8: "However, additional management improvements, such as establishing a program manager for each life extension, are needed before the Office of Defense Programs begins extending the life of two additional warheads – the W76 and W80 – that form a significant portion of the stockpile."

See comment 7.

Comment: This is being done. DP is currently establishing "super" program manager (PM) positions. These PMs will have overarching responsibility for coordinating all DP activities for each life extension program. The acting PM for the W76 has been assigned and the selection process for the next two PMs, for the W80 and B61-7/11 is underway.

Now on p. 10.

Page 8: "First, the program still does not have firm work requirements, such as decisions on upgrades to major weapon systems and the planned sequencing and timing of the work, …"

See comment 6.

Comment: Incorrect. The planning and sequencing is one of the fundamentals of life extension planning.

Now on p. 14.
See comment 6.

Page 13: "For example, the Office did not develop an overall program plan or cost baseline…"
Comment: An initial cost baseline was developed.

Now on p. 15.

Page 13: "In addition, …, there has been no formal attempt to catalogue the lessons learned from the W87 life extension…"

See comment 7.

Comment: The Phase 6.X process requires a "lessons learned" report, therefore, creation of such a document was always a task that would be completed. However, due to the significant insight such a document can provide to the Program Managers and the planners for the B61, W80, and W76 life extension activities, a formal tasking to immediately produce a W87 lessons-learned document has been prepared for DP release. DP has directed that these "lessons learned" be applied to the W76 LEP.

Chapter 1: Background on DOE's Office of Defense Programs Mission and Structure

Now on p. 17.

Page 16: "The memorandum contains a detailed listing of the nuclear weapons to be included in the stockpile, along with a schedule for production, …"

See comment 6.

Comment: The Nuclear Weapons Stockpile Memorandum does not contain production schedules.

2

Now on p. 21.
See comment 6.

Page 20: "A second treaty (START II) was ratified by the United States and Russia which will further reduce the U.S. strategic stockpile to about..."
Comment: Modify to read, "...reduce the treaty accountable U.S. strategic..." The reason for this insertion is that the stockpile is larger; the numbers in the report only represent treaty accountable numbers. Also, different versions of the START II Treaty were ratified by the U.S. and Russia, and the two countries have yet to resolve these differences. Until these differences are resolved, there is not a "ratified" START II Treaty.

Now on p. 21.
See comment 6.

Page 20: "The lifetimes of the weapons currently in the stockpile will be extended well beyond the life for which they were originally designed - ..."
Comment: Please refer to comment on page 1, re: page 4 of the draft GAO report.

Now on p. 23.
See comment 6.

Page 21: "Campaigns are technically challenging ..."
Comment: Recommend that the definition stated for Campaigns be rewritten as follows: "Campaigns are technically challenging, multiyear, multifunctional efforts conducted across the DP laboratories, the production plants and the Nevada Test Site. They are designed to develop and maintain specific critical capabilities needed to enable continued certification of the stockpile into the foreseeable future, without underground nuclear testing. Campaigns have milestones and specific goals, effectively focusing research and development activities on clearly defined deliverables."

Now on p. 27.
See comment 6.

Page 25: "... and all materials purification and reprocessing was consolidated at the Y-12 Plant."
Comment: For clarification, suggest the phrase be reworded as follows, "... and all uranium purification and reprocessing was consolidated at the Y-12 Plant."

Now on p. 31.
See comment 8.

Page 28: "In contrast, they estimate the average reinvestment in private industry at about 9-11 percent per year."
Comment: DP facility managers are not aware of any studies or documentation that would support that statement as it pertains to capital equipment. Typically, facility managers use the well documented guideline of 3-5 percent of replacement value as a reinvestment goal for facilities.

Chapter 2: Further Improvements Are Needed in the Office of Defense Programs' Planning Process

Now on pp. 43-44.
See comment 2.

Page 41: Recommendations for Executive Action

Recommendation: Complete, as expeditiously as possible, the process of establishing valid program requirements and update the program's plans to reflect requirement changes.

3

The requirements for the nuclear weapons stockpile are developed by the Department of Defense (DoD) in coordination with the Department of Energy (DOE) and are approved by the President. The validation of program requirements between the DoD and DOE, and updating program plans to reflect requirement changes, is ongoing. The DOE Requirements Assessment and Integration Team (RAIT) was established in January 2000 to coordinate and facilitate an ongoing consensus building process within the DP community to review, prioritize and approve program activities for maintaining a safe, secure, and reliable stockpile. The process also serves to identify matters related to requirements that should be resolved and validated in conjunction with DoD under the auspices of the Nuclear Weapons Council (NWC) and its supporting Nuclear Weapons Requirements Working Group (NWRWG), and Nuclear Weapons Council Standing and Safety Committee (NWCSSC) (Enclosure 1).

In addition to the RAIT process, the DOE is currently defining the pace, scope, and schedule for the W80, W76, and B61 stockpile life extensions with the DoD through the regular interface with the military services. Initial agreement was reached on the W80 in the October NWC meeting. The W76 and B61, respectively, will be addressed at the November and December meetings of the NWC.

The DOE, based on its activities in the NWRWG and the RAIT, has developed a draft letter that describes the concerted efforts of the team to enhance the communications of weapons requirements between the DoD and the DOE. These efforts have resulted in an improved DOE Stockpile Stewardship Plan and acknowledgment that, after a thorough Service review, all current DoD weapons requirements are being funded and met by DOE. The DoD recently transmitted to DOE prioritized weapons requirements. The DoD has agreed upon a single list and DOE and DoD will work together to refine this list into one that is more accurate, consistent and complete for both agencies. This list will be refined and presented to the NWC, in a future meeting, as a path forward for the SSP.

See comment 2.

Recommendation: Ensure that the completed Stockpile Life Extension Program plan contains all of the information required by the National Defense Authorization Act for Fiscal Year 2000, especially information on plant capacity and budget.

The information requested by the National Defense Authorization Act for FY 2000 will be provided as part of the Directed Stockpile Work (DSW) plans that will be submitted in the FY 2002 budget request. In contrast to its title, the Stockpile Life Extension Program (SLEP) is a process rather than a program. The SLEP is actually a sub-component of the DSW effort and is integrated (budget, planning, etc.) into this overarching program structure.

Recommendation: Ensure that the planning process is fully integrated with management controls, including that plan milestones are reflected in contractor performance criteria and evaluations, coordinated with the budget planning and formulation process, and an overall

4

planning mechanism is developed that links individual plans with each other across both the science and production segments of the Stockpile Stewardship Program.

See comment 2.

As acknowledged in the draft report, DP's comprehensive planning process, which is focused on continuing progress in incremental steps, includes a number of on-going and new initiatives to improve the overall management of the Stockpile Stewardship Program (SSP).

On June 12, 2000, Secretary Richardson was briefed on the Stockpile Stewardship Plan for FY 2001 and he approved the release of this document to the Congress. He was advised of the incremental progress we are making each year to improve the Plan, and was told that for the FY 2002 Plan, we will describe the program in terms of a five-year planning and budgeting process. On September 29, 2000, Secretary Richardson approved the 2000 DOE Strategic Plan, which included full coverage of the SSP. On October 12, 2000, General Gordon, the NNSA Administrator, directed the NNSA to develop a corporate-level strategic plan, which will include more comprehensive coverage of the SSP (Enclosure 2). The plan will cover the FY 2003–FY 2017 time frame, be based on clearly stated assumptions about the future, include specific, measurable goals, and be consistent with feasible fiscal assumptions. General Gordon has also directed that the NNSA will develop and utilize a 5-year planning and budgeting process. These changes will vastly improve the overall planning, budgeting and management of the SSP by allowing our laboratories and contractors to more readily plan for the longer term. This has been a major issue in that without a focus on the outyears, workload and manpower requirements planning in the past were of little value.

In the area of retaining and recruiting technical expertise required to certify the safety, security, and reliability of the stockpile, a Congressionally-mandated report, "Nuclear Skills Retention Measures Within the DoD and DOE" was signed by the Secretary on November 3, 2000, and transmitted to the Congress. This report lays out DP's path forward to recruit and retain personnel with the critical skills necessary to maintain the stockpile without underground nuclear testing. In this regard, we are establishing metrics to monitor critical nuclear skills generation, retention, and regeneration at our contractor sites, and within our Federal workforce.

The nuclear weapons laboratories, production plants and the Nevada Test Site have developed a baseline of critical nuclear skills, identifying the demographics of people with these skills in their workforces, and plans to ensure their retention during the coming decade. Their inventories include detailed projections of critical skills that are at risk of falling below minimum levels within a decade, as well as identification of new critical skills that will be necessary in the future. These assessments, plans, and implementation activities will be reviewed by DP as part of the annual budget and resource allocation process, to ensure that adequate resources are being devoted to critical skills generation, retention, and regeneration. One of the ten performance targets in the FY 2001 Budget is to ensure the availability of a workforce with the critical skills necessary to meet long term requirements. The contractors' performance in the management of critical skills will be evaluated as part of the contractor performance evaluation and fee determination process for each DP contract. This is another example of DP's efforts to address the issue of long-term

5

program stability and leadership and management, by ensuring that we retain the current cadre of experts, and train and mentor the next generation of stockpile stewards needed in the future.

As noted in the Secretary's 30-Day Review of the SSP, the condition of DP's facilities and infrastructure is declining. For example, over the last five years, DP facilities in the excellent and good categories fell from 57 to 27 percent, a marked decline. Based on these findings, the Secretary directed implementation of specific actions, including the mandate to "develop a plan for the long-term recapitalization of the facilities in the nuclear weapons complex." At the center of this effort is the revision of existing policy to provide clear guidelines to DP managers to restore the condition of the complex to a mission-ready level. The revised policy will also provide for a Facilities and Infrastructure Management Program Plan in 2001.

Consistent with priorities jointly defined with the DoD, the DOE is formalizing and refining its internal implementing program and fiscal guidance, now that the new NNSA is in place. This information is vital to validate program requirements, formulate budgets, and update program plans to reflect requirement changes and budgetary assumptions.

In the development of DP's planning, budgeting, and program management processes for Fiscal Year 2001, tasks are organized according to a streamlined business model for the first time ever in the nuclear weapons program. Budget constraints required that DP demonstrate clearly, that we are taking every step to operate in a cost effective manner. In addition, DP established a rigorous planning process this year that delineates firm programmatic milestones to be achieved within each element of stockpile stewardship. The complete program is now defined by a series of program plans that have a five-year planning horizon, each with an accompanying annual implementation plan. Five-year program plans describe the goals and objectives of program elements, and annual implementation plans provide detailed milestones that allow for accurate program tracking and improved oversight.

As a result of extensive planning activities, DP's budget request is developed and justified on planned performance for the requested funding. It is the outcome of planning processes that focus efforts on specific performance goals and strategies. The cycle of planning, budgeting, program execution, and evaluation is the foundation of DP's program accomplishments and our initiatives to improve management and accountability to the Congress and the public. Planning and budgeting enhancements were achieved on a very compressed schedule and were coordinated with the CFO, the OMB, and the Congress. These changes are incremental steps in a long-range process to improve the overall business practices and management of the SSP.

DP is developing a database to link individual plans with each other across the science and production elements of the SSP. This effort will result in better linkages between the stockpile stewardship plans and the actual work being conducted at the laboratories and plants. This is especially important to the science programs currently underway and planned to facilitate continuing assessments on the safety, security and reliability of the stockpile. Establishing and

6

documenting the linkages between all of the SSP science activities is critical to the future success of the program.

Comprehensive planning is uniquely important in every aspect associated with nuclear weapons science and engineering. There are many parameters and unknowns that influence the performance of nuclear warheads. Even when nuclear weapons testing was permitted, the weapons scientists and engineers were never able to conduct a statistically significant number of nuclear tests of any particular warhead type. In addition, various testing constraints required extrapolations to evaluate full-warhead performance and safety characteristics.

There are many areas of warhead operation that cannot be adequately addressed with existing tools and the current knowledge base of the weapons scientists and engineers. The SSP must support rigorous computational and experimental processes not only to confirm and extend what is known and expected, but also to close gaps in our current understanding. This ability to fill in gaps is especially important in those areas where nuclear testing would have been used to bound the margins of our concerns in the past.

In the absence of nuclear testing, different experiments and tools must be relied on to obtain data relevant to nuclear warhead performance. However, because these older tools were designed to complement nuclear testing, they are not, in and of themselves, sufficient in the absence of nuclear testing. A suite of enhanced capabilities and facilities that will be used to fill in the knowledge gaps and provide data relevant to various stockpile concerns has been identified.

These efforts are principally supported by the Primary Certification Campaign, the Secondary Certification and Nuclear-Systems Margins Campaign, the Certification in Hostile Environments Campaign, the Weapon Systems Engineering Certification Campaign, the Advanced Radiography Campaign, and the Inertial Confinement Fusion (ICF) Ignition & High Yield Campaign.

Now on p. 34.

Page 31: "First, the Office of Defense Programs is still trying to determine some key requirements for the Stockpile Stewardship Program, such as which design lab will be responsible for the W80 nuclear warhead."

See comment 6.

Comment: DOE has refined its proposal to redistribute the W80 workload. The W80-0 and W80-1 will remain at LANL. Design-agency responsibility is for the W80-2 and W80-3 is assigned to LLNL.

Now on p. 34.

Page 31: "…the Stockpile Life Extension Plan – does not contain complete information on such important issues as production plant capacity and budget issues."

See comment 9.

Comment: The planning discussed did look at plant capacity.

Now on p. 38.
See comment 6.

Page 35: Entire page

Comment: See comment for Page 31 above re: decision on W80.

7

Now on pp. 38 and 39.
See comment 6.

Page 36: "…information used in the interim plan regarding plant capacity at Pantex was not current…"
Comment: Plans are always being updated to reflect Pantex capacity. This is an annual part of the DSW planning process.

Now on p. 39
See comment 10.

Page 36: "Although the draft 10-Year Site Plan for Pantex describes these potential shortfalls, the Stockpile Life Extension Program plan does not address them."
Comment: These issues are addressed in the Production and Planning Directive. (Enclosure 3)

Now on p. 39.
See comment 6.

Page 37: "…although the Office has attempted to include budget information for one weapon system, the information is not yet valid and useable."
Comment: This has been completed for two systems. The Weapons Design and Cost Report (WDCR) costs for the W76 and W80 exist. (Enclosure 4)

Now on p. 40.
See comment 6.

Page 37: "For example, the program's overall Stockpile Stewardship Plan–also known as the "Green Book"–historically has not contained detailed budget information." Although program officials told us that the primary customer of the Green Book is the military, the Director of the Air Forces's Office of Nuclear Weapons and Counter Proliferation told us that the Green Book has limited usefulness for him because he cannot tell how much emphasis the Office of Defense Programs is placing on various activities without knowing how much they are spending on the activities."
Comment: The FY 2000 Stockpile Stewardship Plan, which was approved by Secretary Richardson on June 12, 2000, does contain detailed budget information. While the DoD is an important audience for the Stockpile Stewardship Plan, the primary customer for the Plan is the Congress, as it is required to be updated annually by the National Defense Authorization Act for Fiscal Year 1998 (Public Law 105-85). The statement regarding the usefulness of the Plan is somewhat misleading. Early drafts of the Plan did not contain budget data because in the early Fall when the drafts are prepared, the budget data are embargoed. The budget details, however, are provided to the DoD and others, including the Air Force Nuclear Weapons and Counterproliferation Agency, in briefings and in follow-on discussions. Once the budget embargo is lifted, the funding levels for the SSP are included in the draft Stockpile Stewardship Plans. The final version of the Plan contains budget details and is briefed and discussed at length during the annual Executive Review Group (ERG) meetings. The ERG is comprised of Administration officials and all involved Services. At the February 9, 2000, ERG meeting, all members of the ERG, including the Air Force, advised the Under Secretary that they had no objections to the release of the Plan.

Now on p. 42.
See comment 6.

Page 39: "For example, significant and unexpected design changes to weapon Life Extension Options can create problems for the production plants that must produce the designs."
Comment: This should be changed to: "...problems for the production plants that must produce components from designs provided by the weapons laboratories."

Now on p. 44.
See comment 2.

Page 41: "plan milestones are reflected in contractor performance criteria and evaluations,"

8

Comment: DP has provided incentives and evaluates all of its sites as consistently as possible. DP has directed the Field Offices to negotiate contracts that add specific self assessments to the present self-assessment system. These primarily deal with self evaluations of the laboratories' planning and execution processes, based on the accomplishment of implementation plan (IP) milestones. For FY 2001, the IP milestones have been limited to a critical few. Final approval of contractors' annual evaluations and assignment of fees have been pulled back to DP-1 (October 13, 2000, Enclosure 7). DP intends to obtain end-of-year self-assessments of the sites' planning and execution processes, including development of plans and milestones, and the management and accomplishment of the overall processes. The number of milestones achieved may be an indicator of accomplishment, but DP is not allocating fees based solely on the number of milestones achieved. DP is requiring lessons-learned studies that are expected to result in improved planning for the coming years.

Chapter 3: Revised Budget Information Needed to Improve Management of the SSP.

Now on p. 53.

Page 50: Recommendation for Executive Action

See comment 3.

Recommendation: To improve management and oversight of the Stockpile Stewardship Program, we recommend that the Administrator of the National Nuclear Security Administration direct the Deputy Administrator for Defense Programs to develop a method to link its new program activity structure with the cost accounts of its contractors so that fixed and variable costs of the program's activities can be retained and included with the program's annual budget submission.

The FY 2002 SSP appropriations request will be made in a budget structure that is consistent with statutory and regulatory requirements, Congressional direction, tied to the SSP plans, the Department's and Contractor's accounting systems. The Department will work with Congress to provide information on operational and programmatic costs and requirements to make appropriate program and funding decisions.

Now on pp. 8, 11, and 12.
See comment 6.

Pages 6, 10, etc. "...the labs did not include all site overhead costs in the same account."

The report implies that the laboratories failed to make their budget submissions to DP in a manner consistent with the intent of the new structure. The laboratories were instrumental in developing the new budget structure and their submissions were consistent with explicit guidance from DP. The laboratory submissions provided enhanced insight into operational and programmatic costs at the laboratory, while avoiding the statutory and accounting shortfalls of the approach taken by the production elements of DP.

Now on pp. 8, 11, 12, 47, and 48.
See comment 3.

Pages 6, 10, 44, etc. We believe the GAO placed an improper amount of emphasis on fixed/variable costs.

9

GAO places a great deal of emphasis on the fact that proposed budget adjustments would dilute the new budget structure's division of fixed from variable costs, and thus reduce the value of the new budget structure for decision makers. DOE must make it clear that it is obligated to apply cost accounting standards in developing its budget, and that DOE, thus, has no choice but to make adjustments to the budget to be compliant with those standards. The primary purpose of the new budget structure is to provide a single, unified structure for the program that reflects current and future missions, not to distinguish between fixed and variable costs. Therefore, fixed and variable costs were not blurred, as indicated by GAO, as a result of the Department's proposed adjustments to the budget. Providing enhanced insight into the operational costs of the laboratories and plants was one of several important secondary goals of the new structure. Other goals included tying the structure more explicitly to program plans and putting in place a budget structure consistent with anticipated Federal staff alignments (i.e., Headquarter/Field management improvements). At the same time, the budget structure had to comply with Federal accounting statutes and regulations, and provide a common language of budget accounts across the DP-complex.

DP did compromise on some goals of the new structure to accomplish these objectives. Nonetheless, DP considers the new budget structure to be a significant improvement for program management by: (1) achieving a unified budget structure that reflects current and future missions, (2) tying explicitly to program plans, and (3) providing substantially enhanced insight to facility operational costs.

Prior to the implementation of the new budget structure, there was a perception within DP that the cost of operating and maintaining the facilities required by the SSP had been increasing, while funding for facility operations had been under pressure due to increasing programmatic requirements. With no specific data from the Department's accounting system to validate this perception, DP management desired the segregation of operational costs of the stockpile stewardship facilities within the new budget structure. This segregation will allow the cost of the facilities to be tracked over time, and will allow DP management to ensure adequate funding is allocated for their operation and maintenance. Such funding had been included in the Readiness in Technical Base and Facilities (RTBF) – Operation of Facilities activity.

There were a number of options to achieve this goal within the new budget structure, but DP quickly focused on two of them. The "plant-centric" option treats each plant as a single facility, and by loading all indirect costs into a facility account, DP management was able to assess the incremental cost impacts of stockpile workload options at the plants. This is apparently the option that GAO prefers for its purported insight into fixed and variable costs. However, it has a number of shortfalls. By treating each plant as a single facility, it fails to provide insight into the operational cost of individual facilities. It inherently includes a number of variable costs within the "fixed" account. It is not transportable to the multi-program laboratories, and it significantly understates the cost of programs by disassociating direct from indirect costs. Finally, it raises a number of accounting issues as delineated in the audit report.

10

The "laboratory-centric" option for segregating facility operational costs focuses on the DP portion of operating and maintaining specific facilities. Site-wide indirect costs are allocated to the facilities and to the programmatic budget accounts they support. All site users are charged the same indirect rate, consistent with accounting requirements. Thus, this option provides insight into the cost of specific facilities, provides an accounting structure transportable to the plants, maintains the connection between direct and indirect costs of programs, and is consistent with accounting requirements.

DP management considered both of these options to provide, in balance, comparable management benefits. Thus, the decision was made to include both options in the DP budget request to the Congress. However, once the Department determined that the plant option had accounting issues that could not be resolved, a decision was made that the laboratory option would become the unified DP methodology for segregating facility operational costs.

This transition to relying solely on the laboratory option was the basis for the Department proposing technical adjustments to the Fiscal Year 2001 appropriation enacted by Congress. The Fiscal Year 2002 budget has been formulated entirely within the construct of the laboratory option, and will be presented to the Congress accordingly.

Consistent with the GAO recommendation and consistent with information requests from Committee staff, the additional information on the cost elements in the budget request will be available to Congress as it reviews and acts upon our Fiscal Year 2002 request. Our concurrence with the GAO recommendation is made with the understanding that the Department will not change its method of cost accounting, thereby maintaining compliance with the accounting statutes and regulations cited in the report.

Now on pp. 47 and 48.

See comment 11.

Page 44: We disagree with the conclusion that including all the overhead (indirect costs) in RTBF would result in RTBF encompassing the fixed costs of the program. This is because all indirect costs are not fixed. Rather, indirect costs can vary with activity levels. For example, as activity levels increase it will be necessary to increase supervisory staff, office supplies, computing charges, stores issues, utilities and office space. In fact, all costs eventually become variable as activity levels increase or decrease significantly.

RTBF represents a base level or minimum level of activity. We believe that this should include the indirect costs required to support this level of activity. Similarly, Campaigns and Directed Stockpile Work should include the costs, direct and indirect, which will change as a result of new tasks or elimination of existing tasks.

Now on p. 50.

See comment 12.

Page 46: The discussion relating the inclusion of facility and overhead (indirect) costs in RTBF with the functional cost report information on general and mission support at DP facilities is confusing. It appears that the report assumes fixed cost is related to functional cost. We are not convinced there is any relationship. Functional cost is determined without regard to direct or indirect cost and without regard to fixed and variable cost. Functional cost represents the cost of

11

providing support before allocations of indirect costs. These costs may be allocated or charged directly. The functional cost reports relate only the mission costs as a measure of activity level. Lastly, it should be noted that functional costs, as a percentage of total costs at DP sites for Fiscal Year 2001, are projected to be about 37 percent. This differs from the 40 percent rate cited in the audit report.

Now on p. 52.
See comment 6.

Page 48: It should be noted that the Department did not submit a Budget Amendment to the Congress for the purpose of making the accounting and definitional adjustments required to properly execute the budget in Fiscal Year 2001. Rather, these technical adjustments were recently finalized and provided to and discussed with cognizant Appropriations and Authorizations Committee staff. Due to the passage of time and completion of the proposed accounting and definitional adjustments, the information presented in Table 6 of the report is no longer accurate. Consequently, it is recommended that GAO insert the enclosed updated table based on final Congressional action (Enclosure 5).

Now on p. 52.
See comment 6.

Page 49: This page references a discussion with representatives of the Office of Chief Financial Officer regarding determining the program's fixed and variable costs. We acknowledge the conversation, but would characterize it differently. The CFO representations in that discussion should be characterized as follows: "Officials in the Office of Chief Financial Officer, including the Deputy Controller, indicated that understanding the relationship between cost and activity levels was necessary, and that fixed and variable costing was one method of accomplishing this. They felt that a spreadsheet could be developed that delineated fixed and variable costs."

Chapter 4: Fundamental Organizational and Leadership Changes Needed for Successful Implementation of the Office of Defense Programs' New Mission

Now on p. 73.

Page 67: Recommendations for Executive Action

Recommendation: Reorganize the program so that the roles and responsibilities between headquarters program offices and between headquarters and field staff are clearly defined and program management officials are located as close as possible to the programs they manage.

See comment 13.

As appropriately discussed in your report, the roles, responsibilities and accountabilities between Headquarters and the field elements are in need of improvement. Consistent with the intent of the establishment of the NNSA, the Deputy Secretary, by memorandum dated September 26, 2000, directed organizational adjustments in the DOE operations offices (Enclosure 6). These adjustments strive for clear, unambiguous lines of authority on activities pertaining to the NNSA/DP, and significantly enhance the management structure for the SSP.

12

Consistent with the spirit and intent of the September 26, 2000 memorandum, and to improve DP accountability for the SSP, DP will assume a greater role in monitoring and evaluating contractor performance (Enclosure 7). Most importantly, beginning in Fiscal Year 2001, DP will assume the responsibility for approving and signing the final fee awards for its contractors. This reflects a commitment by the Deputy Administrator for Defense Programs (DP-1) to become more constructively involved in and accountable for the process of linking contractor appraisals to program performance. This is a significant departure from past practices and should go a long way toward improving the management structure of the SSP.

The DP-1 is also committed to the concept that DP is a line organization within the NNSA, and that it is to be run in accordance with the principles of line management. To that end, DP-1 expects to take a series of organizational and management initiatives that will reinforce both the concept and its clear execution.

The DP-1 recently appointed a new Acting Chief Operating Officer (DP-3) to provide day-to-day operational oversight, guidance and coordination of the nuclear weapons complex (Enclosure 8). This individual is also responsible for assuring effective and efficient performance of the field elements that manage DP activities, and for coordinating with other Lead Program Secretarial Officers whose field organizations include activities that support the DP mission. The focus of this individual is to ensure greater line accountability, responsibility, and communication between DOE's primary programs and field organizations, laboratories, and contractors, consistent with the Deputy Secretary's September 26, 2000, direction discussed above, and to implement state-of-the-art business practices throughout the DP complex. Finally, we are developing a Stockpile Stewardship Program Management Plan, which will provide the overall structure and top-level direction for accomplishing the SSP. The functions, responsibilities, and relationships of the major organizations involved in the SSP are delineated. A structure of management and planning documents is defined, and the management processes for accomplishing the SSP are detailed.

See comment 4.

Recommendation: Identify the reasons for the high level of management turnover in the program and take prompt and decisive action to provide greater management consistency and stability for the program.

Given the technical nature of the work in the SSP and recognition of the opportunities for highly educated and skilled personnel, DP does not consider the turnover rate to be abnormally high. The former ASDP served for over seven years, and many of the personnel he placed in key positions are still in place. The key SSP personnel in the field offices, laboratories and plants have, for the most part, remained in place as well. However, this is not to say that DP is not concerned about this issue. Over the last several months, DP has focused on the overall management framework for the SSP, including personnel turnover and the number of managers serving in an acting capacity. DP is making permanent personnel assignments as quickly as possible that will lead to an environment of organizational stability. NNSA management plans to convene workshops later this Fall address organizational and management issues. The goal is to ensure that the correct senior managers are in the correct assignments, and to develop a

13

management succession plan. We are also implementing the recommendations of the Chiles Commission, which is focusing attention on providing a challenging workplace, where the staff recognizes the importance of the SSP and its importance to national security.

Now on p. 67.

See comment 5.

Page 61: "…while the Albuquerque and Nevada Operations Office (and their contractors) report directly to the Office of Defense Programs, contractors operating the Savannah River Tritium Operations, the Y-12 Plant at Oak Ridge, and the Lawrence Livermore National Laboratory are overseen by operations offices that report to either the Office of Environmental Management or the Office of Science."
Comment: This was changed with the Deputy Secretary's September 26, 2000, memorandum (Enclosure 6).

Now on p. 67.

See comment 5.

Page 62: "…the two agreements that have been signed may require changes to reflect the implementation of the National Nuclear Security Administration and the congressional prohibition against "dual hatting,…"
Comment: This was changed with the Deputy Secretary's September 26, 2000, memorandum (Enclosure 6).

Now on p. 69.

See comment 5.

Page 63: " Laboratory officials told us they considered DOE's chain of command confusing and really did not know to whom they reported on a day-to-day-basis."
Comment: The chain of command discussion leaves the impression that the National Ignition Facility (NIF) Field Project Manager did not have a clear understanding of his reporting relationship to the sponsoring DP Program Office. This is incorrect. The NIF Field Project Manager reported to HQ DP on a regular basis, and DP provided direct input to the evaluation of his performance with respect to NIF. The reference to comments by laboratory officials should be put in the proper context. The fact that the officials "considered DOE's chain of command confusing and really did not know to whom they reported on a day-to-day-basis" had nothing to do with the issue of reporting to the Office of Science rather than DP.

Now on pp. 69 and 70.

See comment 5.

Page 63: "…activities at the Savannah River Tritium Operations, the Y-12 Plant, and Lawrence Livermore National Laboratory continue to report through operations offices that are not part of the Administration's field structure."
Comment: This was changed with the Deputy Secretary's September 26, 2000, memorandum (Enclosure 6).

Now on p. 73.

See comment 13.

Page 67: "…we recommend that the Secretary of Energy formalize organizational control of all contractors operating nuclear weapons complex facilities so that they are directly answerable to the National Nuclear Security Administration's..."
Comment: This was done with the Deputy Secretary's September 26, 2000, memorandum and DP-1's memorandum of October 11, 2000 (Enclosures 6 and 7, respectively).

14

Chapter 5: Management Improvements Needed for the Office of Defense Programs to Conduct Successful Stockpile Life Extensions

Now on p. 85.

Page 79: Recommendations for Executive Action

See comment 7.

Recommendation: Establish a manager for each life extension who is responsible for and accountable for the entire life extension program.
DP is currently establishing "super" program manager (PM) positions. These PMs will have overarching responsibility for coordinating all DP activities for each life extension program. The acting PM for the W76 has been assigned, and the selection process for the next two PMs, the W80 and B61-7/11, respectively, is underway.

Recommendation: Use the multisite incentive approach in future life extensions to align, to the maximum extent possible, the performance incentives of all of the participants, including the design labs and the production plants.

See comment 7.

DP understands the value of linking the performance of all sites contributing to the SSP. We are incorporating such strategies into the new Management and Operating contracts, as well as enforcing such activities through the new initiative of DP approving and signing the final performance evaluation reports and laboratory appraisal reports, and for approving and signing the final fee awards for our contractors.

Recommendation: Develop and transmit a W87 life extension program "lessons learned" report, with recommendations for additional program management changes, if needed, to all participants in ongoing and future life extension programs.

See comment 7.

The Phase 6.X requires a "lessons learned" report, therefore, creation of such a document was always a task that would be completed. However, due to the significant insight such a document can provide to the Program Managers and the planners for the B61, W80, and W76 life extension activities, a formal tasking to immediately produce a W87 "lessons learned" has been prepared for DP release.

Now on p. 78.
See comment 6.

Page 71: "Although peer reviews are required for the development of a new nuclear weapon, a peer review was not originally planned for the W87…"
Comment: Peer reviews were planned from the start and documented in LEP plans.

Now on pp. 78 and 79.
See comment 6.

Page 72: "... this resulted in an actual reacceptance rate of only about 30 percent, ..."
Comment: The number of 30 percent is not comparable to the original estimate. The estimate of 80-90 percent rebuild success included units dedicated to destructive testing. The Kansas City Plant attained an initial acceptance rate of 45 percent on rebuilt units. The 45 percent can be broken into two parts: 30 percent to be built into weapons, plus 15 percent to be destructively tested. To be comparable to the original estimate of 80-90 percent, the correct number is 45

15

percent. Additionally, it should be noted that LLNL subsequently developed improved acceptance procedures that increased the yield to 65 percent.

Now on p. 81.
See comment 6.

Page 75: "This was the only official program guidance given until fiscal year 1999..."
Comment: The numbers were in Production Control Documents (PCD) since at least 1995-96 and also have been covered in other correspondence.

Now on p. 82.
See comment 5.

Page 76: "In contrast, Albuquerque Operations Office has clear authority over the production plants..."
Comment: This should be reworded to reflect the Deputy Secretary's September 26, 2000, memorandum regarding field restructuring. The Y-12 Plant and the Savannah River Site do not report to the Albuquerque Operations Office.

Enclosures:

Enclosure 1- August 31, 2000, letter from NNSA Administrator re: Nuclear Weapons Council
Enclosure 2 - October 12, 2000, memo from NNSA Administrator re: NNSA planning
Enclosure 3 - Extract from P&PD 2000-0, October 1, 1999
Enclosure 4 - Extracts from W76 and W80 WDCRs
Enclosure 5 - Revised Budget Table 6
Enclosure 6 - September 26, 2000, memo from Deputy Secretary re: Field Restructuring
Enclosure 7 - October 11, 2000, memo from DADP re: Contractor Performance
Enclosure 8 - October 13, 2000, memo from DADP re: Appointment of Acting COO

16

The following are GAO's comments on the National Nuclear Security Administration's letter dated November 7, 2000.

GAO's Comments

1. The report referenced is now numbered GAO-01-48.

2. Our reply to the National Nuclear Security Administration's concern about our planning recommendation appears at the end of chapter 2.

3. Our reply to the National Nuclear Security Administration's concerns about our budget recommendation appears at the end of chapter 3.

4. Our reply to the National Nuclear Security Administration's concern about instability in the Office of Defense Programs' leadership and management appears at the end of chapter 4.

5. Changes have been made to the text where appropriate to incorporate information on changes being developed and/or implemented by the National Nuclear Security Administration.

6. We concur with this comment, and changes have been made to the text where appropriate.

7. Our reply to the National Nuclear Security Administration's comments on our recommendations to improve the stockpile life extension process appears at the end of chapter 5.

8. The purpose of including the comments of the contractor officials in the background chapter was to establish that the production complex is currently being undercapitalized, not to determine the exact extent of the undercapitalization. Nevertheless, we have also included the Office of Defense Programs' estimate of the appropriate level of capitalization in our report.

9. We do not concur with this comment. The interim Stockpile Life Extension Program Plan does not contain complete information on plant capacity. Specifically, as stated in the report, the Y-12 Plant's capacity estimates for producing certain weapons components at that site are not available because the Y-12 Plant does not have a current, validated model for estimating plant capacity.

10. We do not concur with this comment. We, again, reviewed the Production and Planning Directive (provided by the National Nuclear Security Administration with its comments) and found only references to the fact that studies will be performed to address the potential capacity shortfalls at Pantex. However, the document did not provide specific plans for addressing the issues, such as establishing activities or making firm commitments to modify facilities or hire and train additional staff to prevent impacts to the schedule.

11. We have used the definition of fixed and variable costs contained in DOE's 30-Day Review. We believe that this definition makes clear that the Readiness in Technical Base and Facilities category represents, in essence, the fixed costs of the program.

12. We believe that functional costs do represent a reasonable surrogate for the fixed costs of the program. However, we have made changes to the report to make clearer the time frame of the functional cost data that we cite.

13. Our response recognizes organizational changes made by DOE and the National Nuclear Security Administration. The recommendation has been redirected to the Administrator of the National Nuclear Security Administration and refocused on the effective implementation of the recent organizational changes that took effect October 1, 2000.

Ordering Information

The first copy of each GAO report is free. Additional copies of reports are $2 each. A check or money order should be made out to the Superintendent of Documents. VISA and MasterCard credit cards are accepted, also.

Orders for 100 or more copies to be mailed to a single address are discounted 25 percent.

Orders by mail:
U.S. General Accounting Office
P.O. Box 37050
Washington, DC 20013

Orders by visiting:
Room 1100
700 4th St. NW (corner of 4th and G Sts. NW)
U.S. General Accounting Office
Washington, DC

Orders by phone:
(202) 512-6000
fax: (202) 512-6061
TDD (202) 512-2537

Each day, GAO issues a list of newly available reports and testimony. To receive facsimile copies of the daily list or any list from the past 30 days, please call (202) 512-6000 using a touchtone phone. A recorded menu will provide information on how to obtain these lists.

Orders by Internet:
For information on how to access GAO reports on the Internet, send an e-mail message with "info" in the body to:

info@www.gao.gov

or visit GAO's World Wide Web home page at:

http://www.gao.gov

To Report Fraud, Waste, or Abuse in Federal Programs

Contact one:

- **Web site: http://www.gao.gov/fraudnet/fraudnet.htm**
- **e-mail: fraudnet@gao.gov**
- **1-800-424-5454 (automated answering system)**

PRINTED ON RECYCLED PAPER

United States
General Accounting Office
Washington, D.C. 20548-0001

Official Business
Penalty for Private Use $300

Address Correction Requested

Bulk Rate
Postage & Fees Paid
GAO
Permit No. GI00