Nuclear Skills Retention Measures within the Department of Defense and the Department of Energy

Submitted to Congress by the Secretary of Defense and the Secretary of Energy

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November 3, 2000

AUG 2 5 2000

Honorable Floyd Spence
Chairman, Committee on Armed Services
House of Representatives
Washington, DC 20515-6035

Dear Mr. Chairman:

Enclosed is the joint Department of Energy – Department of Defense Report on Nuclear Expertise Retention Measures. Because of the different nuclear skill requirements for the two departments, this is a joint submission of the Department of Energy and the Department of Defense, divided into two department-specific sections, joined by a common Executive Summary.

We believe our staffs have done a commendable job of examining the issues identified by subsection 3163(e) of the National Defense Authorization Act for Fiscal Year 2000.

A similar letter has been sent to the Chairman, Senate Committee on Armed Services.

Sincerely,

William S. Cohen
Secretary of Defense

Bill Richardson
Secretary of Energy

Enclosure

cc:
Honorable Ike Skelton
Ranking Democrat

AUG 2 5 2000

Honorable John Warner
Chairman, Committee on Armed Services
United States Senate
Washington, DC 20510-6050

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William S. Cohen
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cc:
Honorable Carl Levin
Ranking Democrat

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FOREWORD

Since the founding of the Republic, the United States has embraced several fundamental and enduring goals: to maintain the sovereignty, political freedom, and independence of the United States with its values, institutions, and territory intact; to protect the lives and personal safety of Americans, both at home and abroad; and to provide for the well-being and prosperity of the Nation and its people.

The U.S. strategy for achieving these goals includes shaping the international environment through an effective deterrent posture and military engagement programs responding to the full spectrum of crises by providing ready and mobile forces that are appropriately sized and positioned; and preparing now for an uncertain future by pursuing a focused modernization effort that maintains U.S. superiority in key warfare areas. The United States nuclear deterrent remains a supreme national interest of the United States. One of our most important objectives is to ensure that the United States nuclear stockpile remains safe, secure, and reliable without nuclear testing.

The Department of Defense in partnership with the Department of Energy maintains our Nation's nuclear deterrent. The end of the Cold War produced a changing of the Nation's nuclear mission, which in turn resulted in a reduction in our nuclear forces, infrastructure, and personnel. However, both Departments were able to reduce their respective nuclear missions without experiencing an excessive loss of personnel with the necessary scientific, engineering, and technical skills needed to manage our nuclear programs. However, as this relatively large pool shrinks through Service drawdowns and natural attrition, recruiting and managing essential expertise remain critical to maintaining the Nation's nuclear deterrent.

We will continue to maintain United States nuclear weapons through the Stockpile Stewardship Program. This program rests on developing an unprecedented set of scientific tools to better understand nuclear weapons, on significantly enhancing our stockpile surveillance capabilities, and on completing a significant refurbishment program needed to extend the life of our nuclear weapons. Utilizing the capabilities of the Stockpile Stewardship Program, we have successfully certified the nuclear stockpile for the last four years – most recently, on April 5, 2000.

This success is a tribute to the scientists, engineers, and other dedicated employees in both Departments and at our laboratories, test site, and production plants, and we have commended them for their hard work and dedication to our national security.

As evidenced by the concerns we have expressed and the plans described in this report, we will continue to ensure that we are placing priority attention on the recruitment and retention of the best scientists and engineers in our Nation to meet the challenge of maintaining our nuclear stockpile without testing, indefinitely.

PREFACE

Section 3163(e)(2) of the National Defense Authorization Act for Fiscal Year 2000 (P.L. 106-65) requires the Secretaries of Energy and Defense to present "a joint plan setting forth the actions that the Secretaries consider necessary to retain core scientific, engineering, and technical skills and capabilities within the Department of Energy (DOE), the Department of Defense (DoD), and the contractors of those departments in order to maintain the United States nuclear deterrent force indefinitely."

Specifically, the Law requires the plan to address the following elements:

1. A baseline of current skills and capabilities by location.
2. A statement of the skills or capabilities that are at risk of being lost within the next ten years.
3. A statement of measures that will be taken to retain such skills and capabilities.
4. A proposal for recruitment measures to address the loss of such skills or capabilities.
5. A proposal for the training and evaluation of personnel with core scientific, engineering, and technical skills and capabilities.
6. A statement of the additional advanced manufacturing programs and process engineering programs that are required to maintain the nuclear deterrent force indefinitely.
7. An assessment of the desirability of establishing a nuclear weapons workforce reserve to ensure the availability of the skills and capabilities of present and former employees of the DOE, the DoD, and the contractors of those departments in the event of an urgent future need for such skills and capabilities.

This report presents the joint DoD-DOE response to Congress.

NUCLEAR SKILLS RETENTION MEASURES WITHIN THE DEPARTMENT OF DEFENSE AND THE DEPARTMENT OF ENERGY

EXECUTIVE SUMMARY

Subsection 3163(e)(2) of the National Defense Authorization Act for Fiscal Year 2000 requires the Secretaries of Energy and Defense to present "a joint plan setting forth the actions that the Secretaries consider necessary to retain core scientific, engineering, and technical skills and capabilities within the Department of Energy (DOE), the Department of Defense (DoD), and the contractors of those departments in order to maintain the U.S. nuclear deterrent force indefinitely." This requirement was prompted by the shrinking and changing of the Nation's nuclear mission since the end of the Cold War.

Although this report is a joint submission of the DoD and the DOE, it is divided into two parts that are department specific. This is due to the different nuclear skills requirements of the two Departments. Within DoD both military and civilian government employees fill the vast majority of job requirements. As such, DoD conducts its personnel planning within the framework of Title 10, U.S.C. Under Title 10 each of the Services is responsible for its individual personnel planning. Therefore, the DoD portion of this plan focuses specifically on the efforts of each of the Services to retain critical nuclear skills. DOE, on the other hand, finds the vast majority of its critical nuclear skills requirements residing at its contractors' sites. The issues of maintaining and regenerating critical skills vary from site to site. Therefore, the DOE portion of this plan is a dynamic process by which the Office of the Deputy Administrator for Defense Programs, within the National Nuclear Security Administration, will require and monitor efforts on the part of the DOE laboratories, test site, and production plants to continue the maintenance and retention of critical nuclear skills.

* * *

At this time DoD does not consider it necessary to set forth specific actions to retain military core scientific, engineering, and technical skills within the Department. Each of the Services has done a fine job identifying its changing requirements since the end of the Cold War. DoD continues to recruit, train, and retain the personnel necessary to meet its requirements for nuclear expertise. DoD should request the Office of Personnel Management to develop and maintain a national database of civilian nuclear-related positions. While the operational side has been deemed beyond the scope of this report, DoD will expand the emphasis it deserves in future revisions of the Nuclear Mission Management Plan (NMMP).

There has been significant progress in DoD's nuclear weapons systems programs. New strategic requirements have been defined. A force structure appropriate to the requirements has been configured. On March 17, 2000 DoD completed its first Nuclear Mission Management Plan (NMMP). The NMMP is DoD's first attempt at a comprehensive overview of the current and predicted state of U.S. nuclear forces, the policies and plans that direct them, and the infrastructure available to sustain and support them. The NMMP contains a chapter dedicated to Personnel Programs, which is included as an enclosure to this report. Future updates of the NMMP will present measures to evaluate DoD's critical nuclear personnel and to ensure DoD maintains the right-sized, trained cadre of personnel necessary to meet its national defense requirements. It is particularly important for DoD civilian engineers and scientists working nuclear issues that DoD continues career path development and identification. The survey DoD used to obtain its personnel data is included as an appendix to this report.

* * *

Within DOE, the Office of Defense Programs (DP) has established metrics to track critical nuclear skills generation, retention, and regeneration at its contractor sites, and within its federal workforce. The nuclear weapons laboratories, test site, and production plants 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. 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.

The plans developed by the defense laboratories, test site, and the production plants identify the urgency and seriousness of the critical-skills retention problem, which DP believes can be managed with the application of appropriate attention and resources. The situation can be summarized as follows:

- Many critical skills are at risk in the Nuclear Weapons Complex, both at the contractor sites and within the federal workforce.

- The Office of Defense Programs has established a planning process for critical skills generation, retention, and regeneration.

- Overall hiring among the DP contractors in 1999 was, at most, half the level needed to refill the pipeline of employees with critical skills.

The defense laboratories, test site, and the production plants have accomplished a significant step in putting together their initial critical-skills generation, retention, and regeneration plans. This has focused DOE and site management attention on these issues. While the situations of the individual laboratories and plants vary significantly, DP believes that the value of having the plans tailored to the needs of each site, respectively, with each site being accountable for its implementation activities, outweighs the value of a centralized approach. However, DP is considering Complex-wide strategies for some functions, such as recruitment that may benefit from joint approaches. The site management teams believe they can meet the challenge of critical skills generation, retention, and regeneration if adequate resources are forthcoming, and if they receive help in dealing with such impediments as program and funding instability, unnecessarily onerous security restrictions on professional activity, and limitations on and delays in obtaining security clearances.

PART I: DoD NUCLEAR SKILLS RETENTION MEASURES

REQUIREMENT

Section 3163. (Maintenance of Nuclear Weapons Expertise in the Department of Defense (DoD) and Department of Energy (DOE)) part (e) Nuclear Expertise Retention Measures, of the FY 2000 National Defense Authorization Act requires the Secretary of Defense and the Secretary of Energy to report to Congress setting forth the actions that the Secretaries consider necessary to retain core scientific, engineering, and technical skills and capabilities within the DoD, the DOE, and the contractors of these Departments to maintain the United States nuclear deterrent indefinitely.

BOTTOM LINE

At this time, DoD does not consider it necessary to consolidate or mandate ongoing Service efforts to retain core scientific, engineering, and technical skills within the Department. DoD conducts its personnel planning within the framework of Title 10, U.S.C. As such, each of the Services is responsible for its individual personnel planning. Each of the Services is actively engaged in identifying and addressing its changing requirements since the end of the Cold War.

BACKGROUND

At the conclusion of the Cold War, there were both Department-wide and Service-specific appraisals of organizations and procedures for accomplishment of nuclear weapons programs given the new missions, force structure, and budgetary changes. Conclusions were that existing systems and organizations could be adapted to respond to the new requirements. This involved establishment of new focal points and consolidation of nuclear activities.

Public law, notably the Atomic Energy Acts of 1946 and 1954, as amended, assigns responsibility for the national nuclear capabilities to the DOE and the DoD. DOE has responsibility for the design, production, and end-of-service-life disposition of nuclear warheads. DoD is responsible for the other facets of national nuclear capability, including definition of military requirements for warheads, delivery systems, operational deployment of forces, and the ensemble of end-to-end capabilities needed for the planning and conduct of operations by nuclear forces. Stated in simpler terms, DOE provides stewardship for nuclear warheads, and DoD is responsible for everything else.

National policy decisions resulting in the termination of nuclear testing and the end of development work on new nuclear weapons had far reaching impacts on the weapons system

programs and infrastructure. Wide scale restructuring and down sizing has occurred throughout the industry.

DoD's objective during this period of transition is to ensure that sufficient numbers of qualified personnel, military and civilian, are available to accomplish nuclear weapons systems-related missions. During the Cold War, nuclear weapons had priority in the DoD. Since significant numbers of new systems were in constant development, the industrial base did not require conscious management by DoD.

In the 1997 DoD report on Nuclear Weapons Systems Sustainment Programs, the following points were made regarding sustainment of personnel:

- This is a transitional period; with significant downsizing, more personnel are potentially available than would normally be the case, given the size and character of the market for their specialized skills. However, preliminary indications from portions of the industrial base give cause for concern. An informal survey of some major Defense Special Weapons Agency (now Defense Threat Reduction Agency (DTRA)) contractors found that, over the past five years these firms had hired almost no new junior technical personnel. While senior staff are still available and are working on current requirements, their replacements are not coming on board nor being trained.

- Appraisal of options for acquiring, assigning, and retaining sufficient numbers of personnel with requisite qualifications should not be unnecessarily constrained by past approaches. For example, if past practice were to assign officers with technical degrees to perform certain functions, and insufficient numbers of qualified officers were available, a number of options, including use of civilian government personnel to perform the function and contracting with industry can be considered. If the only option were to have officers perform the function, DoD would fund graduate study by military personnel or otherwise meet the requirements, but the need must be revalidated.

DISCUSSION

The nuclear deterrent has worked for 50 years. Since the end of the Cold War, our forces have been reduced and our attention became more focused on broader force issues. There are many potential adversaries remaining capable of disrupting the prosperous peace of the last 50 years. DoD must remain cognizant of these adversaries, and through effective communication and consensus, ensure the United States has the right people, force, and infrastructure necessary to respond to the threat for the next 50 years.

With Dr. Hamre's signature on March 17, 2000, DoD completed its first Nuclear Mission Management Plan (NMMP). NMMP is DoD's first attempt at a comprehensive overview of the current and predicted state of U.S. nuclear forces, the policies and plans that direct them, and the infrastructure available to sustain and support them. The NMMP contains a chapter dedicated to Personnel Programs

(Appendix A). The NMMP is a living document. The focus of the FY 2001 NMMP will be on development of potential events (political, economic, and social) which could require the U.S. to respond in a manner that affects the future of our nuclear deterrent. It will also include several programmed studies on infrastructure and personnel issues. The trigger events and study results will generate discussion of the key issues at the highest levels within DoD.

During the Cold War years, while the U.S. was procuring and testing nuclear weapons, DoD and the rest of the Government were permeated with people having some level of nuclear experience. The moratorium on nuclear weapons testing, the dramatic reduction in nuclear research, systems development and procurement actions, and the Services' refocusing priorities to meet the changing threat of the post-Cold War world, have led to a situation where there are fewer nuclear-trained personnel throughout government.

Given that personnel are tied to money and that the percentage of the DoD budget spent on nuclear forces has dropped from ten percent in 1985 to just three percent in FY 2000, it can be reasonably extrapolated that the aggregate number of personnel associated with strategic systems would decrease by similar amounts. This is exacerbated even more so in the procurement and scientific fields where the decreasing budget has been more dramatic.

The unintended consequence of the change in the Nation's nuclear posture is that DoD no longer has the luxury of placing personnel with nuclear experience into as many key positions throughout Government as it could have in the past.

Despite the change in demographics, DoD seeks to recruit, train, and retain military personnel necessary to meet requirements for our nuclear expertise today. DoD also continues to look at ways to improve the management of both civilian and contractor personnel.

As part of this requirement DoD conducted a Nuclear Expertise Retention Survey to answer some of the questions posed by the legislation. A copy of the survey is provided (Appendix B). A brief discussion on the Services responses is listed below.

ARMY RESPONSE

The Army has an approved and implemented plan for managing its military personnel requirements. The Army Functional Area 52 (FA52), Nuclear Research and Operations, provides the Army with 301 commissioned officers, in the grades of Captain through Colonel, qualified to support the Army and DoD with nuclear expertise. The Director, U.S. Army Nuclear and Chemical Agency is the personnel proponent for FA52, and as such, has the responsibility for the life cycle management of FA52, including recruiting, training, and retention. These officers normally serve for 20 to 30 years. The management process is continuous with a requirement to replace retiring officers annually. FA52 officers who retire are heavily recruited by nuclear-related civilian firms.

FA52 officers have the opportunity to obtain advanced civilian education in nuclear-related fields. This is a strong inducement for officers to select the Nuclear Research and Operations Officer functional area over other Army specialties. As part of the screening process for functional area designations, officers possessing the prerequisite academic background in mathematics, science, and engineering are provided information on potential opportunities in the FA52 functional area. Officers selected to be instructors in the Department of Physics, U.S. Military Academy are encouraged to choose FA52, to provide them the opportunity to use their nuclear related advanced degrees in support of Army requirements.

Officers assigned to FA52 positions are evaluated using the existing Officer Evaluation Reporting System that provides supervisory comments on both performance and potential in nuclear research and operations skills. On October 1, 1998, the Army implemented a new officer professional management system, OPMS XXI. It provides the Army a mechanism to recruit, train, and retain officers who possess critical nuclear skills. By individually managing nuclear skills, in a career field separate from the Operations Career Field, the Army has provided the professional stability required to retain nuclear skills.

Army FA52 officers normally attend the Nuclear Research and Operations Officer Course (NROOC), conducted at the Defense Nuclear Weapons School (DNWS), Kirtland Air Force Base, New Mexico, enroute to their initial FA52 assignment. FA52 officers are encouraged to enroll in additional training courses offered at DNWS or other nuclear community facilities.

From 1953 until 1998, Army officers were authorized to serve as Military Research Associates at the DOE National Laboratories to improve their core nuclear knowledge. In FY 1999, the Army Acquisition Executive Support Activity, an activity under the Deputy Assistant Secretary of the Army for Research and Technology, Assistant Secretary of the Army for Acquisition, Logistics, and Technology, eliminated the authorizations for FA52 Military Research Associates as part of a downsizing of the Army Acquisition Corps. The elimination of these authorizations has limited the opportunity for Army FA52 officers to serve at the DOE in weapons design, weapons effects and counterproliferation. If reinstated this type of program could provide FA52 officers opportunities to improve core nuclear knowledge.

The Army does not use nor recommend use of advanced manufacturing and engineering programs to support the maintenance of the nuclear deterrent force for their Service. The Army does not have a workforce reserve to draw upon for nuclear skills.

NAVY RESPONSE

The Navy has had an effective program to manage its nuclear skilled personnel for some time. The nuclear deterrent force personnel are managed through the Navy's Strategic Systems Program (SSP) office.

The Navy has developed a unique program to integrate a team of DoD, DOE government, and DOE contractor organizations. This team is managed by SSP headquarters and includes support from Navy shore facilities, such as, the Strategic Weapons Facility Atlantic and Strategic Weapons Facility Pacific, and SSP program management offices at all the major hardware contractors, such as missile and reentry developers. The DOE members of the team include government personnel from DOE Headquarters and DOE/Albuquerque Operations office supported by Los Alamos National Laboratory, Sandia National Laboratories (SNL), and Lawrence Livermore National Laboratory for selected programs.

The Navy SSP team has the responsibility of managing requirements for all Submarine Launched Ballistic Missile (SLBM) weapons systems from initial concept through development, deployment, and retirement. It has consistently supported all systems ensuring continuity, smooth integration of efforts, and preservation of the personnel base. A primary objective is to avoid duplication while using the strengths of each member. The team has remained substantially intact across all SLBM weapon systems with few changes, allowing maintenance of technologies, personnel expertise, and working relationships.

The Naval Postgraduate School offers courses in physics and in weapons effects. These course include nuclear physics and nuclear weapons effects, respectively. Typically four to five students attend each course per year.

The Navy maintains an intern program for newly graduated engineers. The program assigns graduates to an SSP field activity or an SSP contractor to learn the design, maintenance, logistics support, and operational use of fleet ballistic missile systems. At the completion of the program, the individuals are assigned to SSP headquarters with a complete understanding of the mission and function of the organization. The Navy is not considering establishing a nuclear-weapons workforce reserve.

The foregoing is not to say that there are no issues within Navy programs managing personnel with nuclear weapons skills. One of the consequences of the continuing downsizing of strategic force structure and its supporting infrastructure has been episodic shortages of personnel with scientific, engineering, and technical skills. Some specific examples highlighted this concern and its implications for the attrition of nuclear-related work skills. Navy has experienced large increases in timelines needed to recruit new technical and engineering personnel, resulting in longer gaps in specific nuclear-related positions. The loss of contractor engineering and technical skills is a continuing concern in Strategic Weapons Systems production support due to the growing number of contractors going out of business. Despite recent increases in retention and recruitment of Sailors, some nuclear-related technical ratings, such as Missile Technicians (MT), are experiencing less than 80 percent manning at shore bases (at sea billets are 100 percent manned). None of the cases cited are insurmountable, and Navy is working to mitigate these and other issues with the

attrition of nuclear weapons skills. The Navy is not considering establishing a nuclear weapons workforce reserve.

AIR FORCE RESPONSE

The Air Force does not have a specific retention program for personnel with nuclear experience. All retention issues are aimed at the Air Force as a whole. The Air Staff has been involved in several initiatives to track, manage, and increase its nuclear personnel resource pool. Efforts involve creation of an Air Force-wide nuclear skills identification system that creates easy management of existing nuclear experienced personnel, both military and civilian.

In an effort to retain and train nuclear skilled personnel, the Air Force annually sponsors three personnel to attend an intern program at SNL. This nuclear weapon intern program was identified by the Chiles' commission as a key program to ensure the U.S. has a future generation of nuclear weapons experts.

The Air Force has a number of recruiting measures it employs with colleges and universities to improve recruitment. These programs, while not nuclear-specific, are tailored to attract technical expertise. Approximately 75 percent of the Air Force Reserve Officer Training Corps Scholarship Program recipients are technical academic majors. The Air Force provides extra incentives to its recruiters who successfully recruit personnel with a technical background. Goals for all Air Force accessions, including those in nuclear-related fields, are set via the Line Officer Accession Plan.

In June 1999, the Air Force initiated a plan to identify federal civilian employees with nuclear experience. The current Defense Civilian Personnel Data System (DCPDS) skill code sets for identifying nuclear experience were not adequate for Air Force requirements. Approximately 60 new skill code sets were added to DCPDS in October 1999. Field personnel agencies within the Air Force were provided retrieval information to identify current position records that should be reviewed to possibly add the new skills. They were also tasked to survey and update employee experience history records with the new skill codes. This task is near completion. This is the Air Force's first step towards development of a civilian recruitment and retention plan.

The Principal Deputy Secretary of the Air Force for Acquisition established a strategic plan for the scientific and engineering career fields within the Air Force. The plan is periodically evaluated and revised by the Scientist and Engineer Career Program Office and the plan can be found at:

HTTP://www.afpc.randolph.af.mil/cp/docs/secp%20strategic%20plan.doc

Historically, the career development and management for civilian personnel has been decentralized. Local Air Force commands manage their individual requirements. Several tools are available to aid local commands, such as the Scientist and Engineer Career Program, the PALACE Acquire Intern Program, and the Civilian Training and Development Guide.

DoD Agencies, and Staff Offices of the Secretary of Defense

The various agencies and the staff offices of the Secretary manage their personnel through the Joint Manpower Management System. It provides a means to identify requirements for military personnel and the skills required by each organization. None of the agencies or staffs expressed a concern regarding military personnel management or their ability to obtain quality personnel from the Services. The career paths of government civilian personnel are intermingled with those of other scientists and engineers within the Office of Personnel Management system for identifying civil service personnel.

Each of the agencies and staff offices tended to use the same training mechanism established by the Services. The Defense Threat Reduction Agency is the only agency that is sending some of its military personnel for assignments at the DOE laboratories to maintain their technical proficiency.

It was generally believed that the only workforce reserve available to DoD is found in the number of civilian contractors with nuclear skills that responding to DoD requirements for technical support, when DoD agencies cannot conduct the work in-house. This contractor base requirement is undefined and DoD does not manage its future status.

RECOMMENDATION

DoD is effectively managing its military personnel. DoD needs to strengthen its ability to track civilian and contractor personnel. DoD is considering requesting the Office of Personnel Management to develop a national database of civilian nuclear-related positions. The database would define which organizations are responsible for filling the nuclear related positions. Finally the database would be a living document that is updated periodically to handle changes in organizational requirements.

CONCLUSION

There has been significant progress in DoD's nuclear weapons systems programs. New strategic requirements have been defined. A force structure appropriate to the requirements has been configured.

The changing procurement priorities within the DoD and the shifting resources associated with it left some key nuclear issues without visibility at the highest levels of DoD. Great strides have been taken to improve that situation. The revitalization of the Nuclear Weapons Council and signing of the Nuclear Mission Management Plan are both recent and important improvements.

DoD will continue the NMMP development process. The communication it generates within DoD is as important as the document itself. The Nuclear Mission Management Plan will be DoD's catalyst for maintaining visibility and discussion of nuclear issues. Future updates of the Nuclear Mission Management Plan will present measures to evaluate DoD's critical nuclear

personnel and to ensure DoD maintains the right-sized, trained cadre of personnel necessary to meet its national defense requirements.

DoD continues to give priority to ensuring the required numbers of qualified personnel are available to support the nuclear deterrent. It is particularly important for DoD engineers and scientists working nuclear issues that DoD continue career path development and identification. The Nuclear Mission Management Plan with its periodic updating is an important tool DoD will use to continue improving this vital area of interest.

PART II: DOE NUCLEAR SKILLS RETENTION MEASURES

1

CHAPTER 1

INTRODUCTION

At the heart of the Stockpile Stewardship Program (SSP) is the issue of confidence. Confidence is achieved through the capabilities and the expert judgment of people – the stockpile stewards who maintain and assess the condition of the stockpile. The Secretaries of Energy and Defense are required annually to certify the safety, security, and reliability of the U.S. nuclear weapons stockpile to the President. The fourth Annual Certification, which was completed on April 5, 2000, concluded that no nuclear testing is needed at this time. Future certifications of the safety and reliability of the stockpile will rely on informed judgments by new SSP- trained experts.

Within the workforce at the laboratories, test site, and production plants, there is a subset of employees who possess certain *critical skills*, i.e., skills that, if lost, could impair or even preclude the ability to maintain the safety, security, and reliability of the nuclear weapons stockpile. In recognition of the consequences of this possibility, the Office of Defense Programs (DP) tasked its Management and Operations (M&O) contractors to develop a baseline of their employees who possess critical skills, and to develop plans to ensure that requisite critical skills are preserved through the coming decade. This report documents the critical-skills baseline and contractor and federal plans to assure the health and vitality of the nuclear weapons workforce.

To provide high-level management focus on critical-skills generation, retention, and regeneration, a new goal has been defined as one of the key DP performance measures included with the Fiscal Year (FY) 2001 budget submission to Congress:

"Ensure the availability of a workforce with the critical skills necessary to meet long-term mission requirements."

Performance against this objective will be assessed in the performance evaluation and fee determination process for each contract.

1.1 BACKGROUND

The fall of the Berlin Wall on November 9, 1989 signaled the ending of the Cold War, and with President Bush's decision to unilaterally reduce the stockpile and terminate several weapons development programs on September 27, 1991, the Cold War ended for the Department of Energy (DOE). These events initiated a profound, and continuing, transition in the Nuclear Weapons Complex (NWC).

In 1993, President Clinton continued the moratorium on nuclear explosives testing and initiated the Stockpile

Stewardship Program, challenging the DOE and the Department of Defense (DoD) "to explore other means of maintaining our confidence in the safety, reliability, and performance of our weapons." Congress supported the initiative through passage of the FY 1994 National Defense Authorization Act, which directed the Secretary of Energy "to establish a stewardship program to ensure the preservation of the core intellectual and technical competencies of the United States in nuclear weapons."

During the intervening years, the President has reaffirmed his confidence in the ability of the DOE and DoD to maintain the safety and reliability of the nuclear weapons stockpile without underground nuclear testing. Most recently, on October 13, 1999, President Clinton continued the U.S. moratorium on testing, following the vote by the Senate not to ratify the Comprehensive Test Ban Treaty.

30-Day Review of the Stockpile Stewardship Program

Last fall, at the direction of Secretary Richardson, Under Secretary of Energy Ernest Moniz conducted an intensive "30-Day Review" of the SSP with the help of technical advisors and representatives from the Nuclear Weapons Complex. While concluding that a science-based SSP was the right structure and that the program was on track, the review noted concerns about the ability to attract and retain key people. These concerns include the following:

- **Major program investment funding instability** at the weapons laboratories, production plants, and the Nevada Test Site (NTS) and the possibility of employment reductions at the plants. Such instability could result in intellectual loss in the Nuclear Weapons Complex as younger employees – the foundation of tomorrow's weapons complex – seek more lucrative and stable employment elsewhere.

- **The FY 2000 reduction in Laboratory Directed Research and Development (LDRD) funds** at the laboratories has reduced the ability of laboratory personnel to conduct the types of exploratory research that often results in long-term program benefits. This research is also a large contributor to the laboratories' scientific vitality and ability to attract and retain personnel. LDRD reductions threaten the funding of post-doctoral scientists who are an important recruiting pipeline for permanent employees.

- **Increasingly intrusive security arrangements**, as documented in both the 30-Day Review and more recent discussions with the laboratories, that adversely affect retention and recruitment of key personnel. The security arrangements include polygraph testing, increased cyber-security, limitations on scientific interchange with foreign nationals concerning sensitive unclassified technical information, as well as delays in clearing new employees, which precludes their timely access to challenging, meaningful work on the SSP.

One of the key challenges facing the SSP is the aging cadre of stockpile stewards. The current workforce is considerably older than the national average of scientific, engineering, and technical personnel engaged in high-technology endeavors. Many of the scientists and engineers with critical skills in the areas of weapons' design, production, and testing already have retired. Many more

will retire during the next decade. A new generation of weapons scientists and engineers must be equipped with these critical skills and have their competence validated before the current generation leaves the workforce.

1.2 THE CHILES COMMISSION REPORT

An important guide to DP's recent activities to preserve critical nuclear skills was the report by the Commission on Maintaining United States Nuclear Weapons Expertise (the Chiles Commission) that was prescribed by the National Defense Authorization Act of FY 1997. The Congressional requirements addressed in this report relate closely to four of the twelve recommendations contained in the March 1999 Chiles Commission Report (see Appendix A for a complete summary) on preserving nuclear expertise:

- **Recommendation Seven** noted that "Large numbers of workers are reaching retirement and a new generation of workers must be hired and trained in order to preserve essential skills." This recommendation urged that "DOE and its nuclear weapons program contractors should, on a priority basis, develop and implement a detailed and long-term site-specific and complex-wide plan for replenishing the essential scientific, engineering, and technical nuclear weapons workforce."

- **Recommendation Eight** addressed current restrictions on personnel practices, specifically that "DOE needs to modify its contract structure with its nuclear weapons program contractors to give them greater latitude in personnel practices so they can compete more effectively in today's market for scientific and technical personnel."

- **Recommendation Nine** underlined the need for new approaches to career planning and training within the laboratories, production plants, and the Nevada Test Site, stating "Training the new workforce and validating the effectiveness of training must be among the highest priorities of the Nuclear Weapons Complex."

- **Recommendation Ten** urged that in order to be able to reconstitute the nuclear workforce at some point in the future, "DOE should institute a small, select Nuclear Weapons Workers Reserve from those with key skills who have left the nuclear weapons program, to maintain the ability to increase experienced staff rapidly, when and if required." It also recommended the expanded use of former employees of the nuclear weapons program to train new personnel, to participate in peer review, and as a reserve in case requirements were to expand rapidly.

Following the publication of the Chiles Commission Report, DP developed a point-by-point action plan to address the twelve recommendations. One of the key actions was to identify the subset of the workforce possessing critical skills and to begin planning for their regeneration and retention into the future.

1.3 DEFINITION OF CRITICAL SKILLS

The eight NWC sites (Los Alamos National Laboratory [LANL], Lawrence Livermore National Laboratory [LLNL], Sandia National Laboratories [SNL], the Nevada Test Site [NTS], the Y-12 Plant, the Kansas City Plant [KCP], the Pantex Plant, and the Savannah River Site [SRS]) use slightly different definitions of the critical-skills workforce, as is appropriate to facilitate the implementation of their workforce generation, retention, and regeneration plans. In general, critical-skills employees are defined as those with specialized skills essential to the nuclear weapons program that are not readily available in the labor market. An often-used operational criterion for these specialized skills is whether it would take two to three years of training and on-the-job experience for someone to perform a job proficiently.

A broader definition of the current critical-skills workforce includes those scientists, engineers, and technicians in the Complex today who have skills that are special to the weapons program and who would be difficult to replace. Another definition of critical skills focuses on the ability to perform

Examples of Critical Skills Definitions at the Production Plants

The Y-12 site developed a particularly clear set of definitions, perhaps as a result of a previously-conducted "core competency" review during the Plant's substantial downsizing in the 1990s. Y-12 distinguishes among essential employees, critical-skills employees, and a minimum critical-skills workforce as follows:

- While the entire workforce is essential for Y-12's mission and workload, the "critical skills" embody the core capabilities that must be protected.
- Critical Skill: A knowledge-base or skill, specific to Y-12, that must be retained to meet DP mission requirements, and that requires greater than 2-3 years of work experience at Y-12 to develop, in addition to any formal educational requirements.
- Minimum Number: The minimum number of personnel that must be retained for a given critical skill to maintain the capability to meet DP requirements. In general, the minimum number should be independent of workload but be able to support a minimal production rate and ramp up to full production within a three-year time period.

The Pantex site defined critical and at risk skills somewhat more simply:

- Critical-skills positions are in the science, engineering, and technical fields, and generally need three-plus years of experience within the Nuclear Weapons Complex to attain proficient knowledge in their respective area of expertise.
- At risk skills are those that are difficult to recruit due to high demand in the job market and the high level of specialization required from a limited candidate pool.

proficiently in the SSP, specifically in direct work on stockpiled weapons. This definition encompasses all those employees needed to execute the program who are not immediately replaceable from the labor market, and generally will be more expansive than the definitions used by Y-12 and Pantex.

Which definition is most appropriate will depend on the situation being addressed. Sites that are concerned with their ability to meet programmatic requirements will find relatively broad definitions appropriate. Statistics based on these broad definitions may, however, mask critical deficiencies in particular critical skills – especially those that may not be necessary to execute this year's program, but that will be essential to maintain competence for future work. In some specialized skill categories, some sites already are down to a few or even single individuals with key expertise or knowledge. If these skills are lost, the effect could be irreversible. DP and its contractors will continue to focus on appropriate definitions of critical skills, as they conduct critical-skills workforce planning in FY 2000 and beyond.

Once the SSP reaches a steady state, retention and regeneration of critical skills may no longer need explicit centralized attention, except in such areas as underground test readiness that will not be exercised routinely. Presently, careful planning is needed to provide meaningful ways to prevent the atrophy and loss of critical skills not exercised due to the absence of current weapon design and production, and to introduce new skills needed for stewardship.

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CHAPTER 2

CRITICAL-SKILLS WORKFORCE BASELINE

2

This chapter presents the DP-funded baseline of the contractor critical-skills workforce that is at risk at the three nuclear weapons laboratories, the test site, the production plants, and within the DP federal workforce.

2.1 OVERVIEW OF M&O CONTRACTOR WORKFORCE DEMOGRAPHICS

Overall, the DP contractor workforce has fallen from 51,838 in FY 1992 to 24,598 in FY 2000. Not all of these employees have left DOE sites, because many moved into the Environmental Management program. The sites' employment histories, since 1992, are shown in Figure 2-1. Since employment at the contractor sites became more stable in 1996, three sites have increased in employment (LANL, LLNL, and SRS), and five sites have decreased (SNL, NTS, KCP, Pantex, and Y-12). Data for changes in employment at the contractor sites are shown in Figure 2-2.

During FY 2000, each DP contractor site has prepared a baseline inventory of critically skilled employees, and initial generation, retention and regeneration plans. DP believes that the value of having the plans tailored to the needs of each site, with each site being responsible for its implementation, outweighs the value of increased standardization.

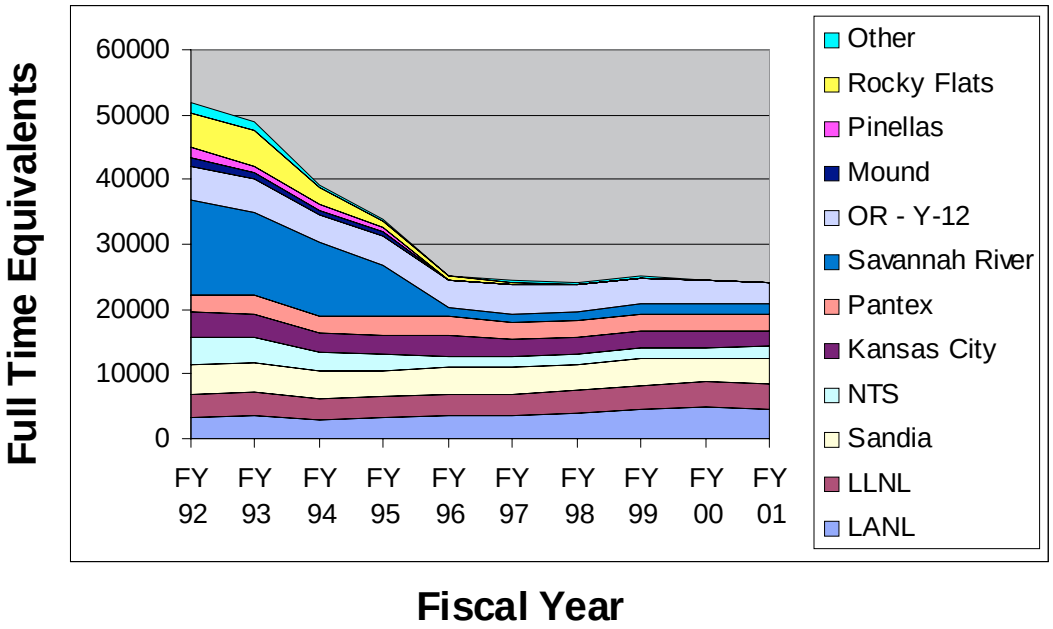

Figure 2-1. Employment in full-time equivalents at the DP sites, since 1992.

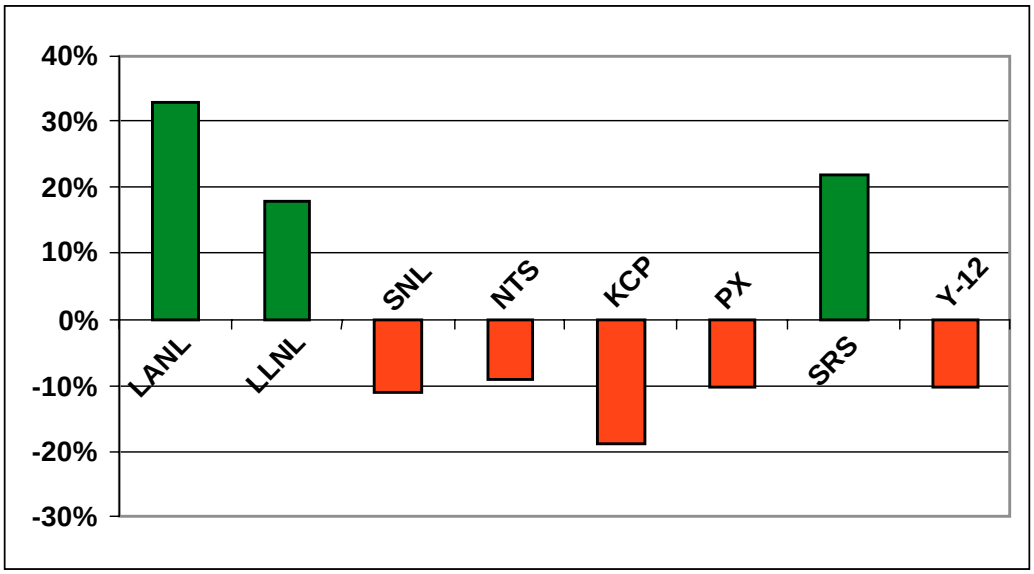

Figure 2-2. Employment changes at the DP sites (percent) since 1996.

In aggregate, site management defines 61 percent of the employees at LANL, LLNL, and SNL as critically skilled, as opposed to 27 percent at the production sites and 27 percent at NTS. Management at the laboratories views most DP-funded scientists and engineers as critical, and also believes that scientists and engineers funded by programs other than DP are important to the maintenance of critical skills in the future. DP anticipates that the laboratories will develop a more comprehensive taxonomy of critical skills as their plans toward generation, retention, and regeneration evolve. It should be noted that LANL and SNL also play a significant role in production activities.

Tables 2-1 - 2-3 present and discuss consolidated data on both the critical-skills workforce across the NWC and important demographic data. Key attributes include

- M&O contractors identified approximately one-half the workforce as critically skilled;
- The average age of critically skilled employees is 47 years;
- Scientists, engineers, and technicians make up 75 percent of critically skilled employees;
- The average time to retirement for these employees is 14 years;
- Only 3 percent of the critically skilled employees are less than 30 years old;
- More than one third of all critically skilled employees are more than 50 years old; and
- Sixty-one percent of all critically skilled employees in the NWC could retire by 2010.

Table 2-1 displays data for the sites by employment category. Table 2-2 displays age demographics for critically skilled employees for each site. Table 2-3 displays cumulative, retirement eligible, critical-skills employees as a percentage of the total critical-skills workforce at each site.

Table 2-1. Critically Skilled Employment by Category.

Site	General Managers	Engineers	Scientists	Professional Admin	General Admin	Technicians	Craftspeople	Operators	Total CS	Total DP	Total CS % of Total DP
LANL	393	391	490	4	0	432	52	75	**1,837**	**3,442**	**53%**
LLNL	239	590	400	17	0	735	0	0	**1,981**	**2,828**	**70%**
SNL	142	696	787	51	0	467	73	32	**2,248**	**3,777**	**60%**
NTS	19	57	38	0	0	100	0	2	**216**	**800**	**27%**
KCP	112	413	107	40	12	113	9	73	**879**	**2,836**	**31%**
PX	203	180	110	40	0	235	0	254	**1,022**	**2,691**	**38%**
SRS	0	31	14	0	0	6	0	0	**51**	**521**	**10%**
Y-12	113	297	62	65	0	113	189	90	**929**	**3,340**	**28%**
Total	**1,221**	**2,655**	**2,008**	**217**	**12**	**2,201**	**323**	**526**	**9,163**	**20,235**	**45%**
% of Total	**13%**	**29%**	**22%**	**2%**	**0%**	**24%**	**4%**	**6%**	**100%**		

Table 2-1 presents baseline data on critical skills at the eight DP sites. It lists the total DP employment (i.e., not FTEs) at the eight sites, and identifies the number of critically skilled employees. These employees are categorized using the DP-wide Common Occupational Classification System (COCS). The COCS provides a picture of the relative role these employees play at each site and those categories comprising the greatest number of critically skilled workers. The total

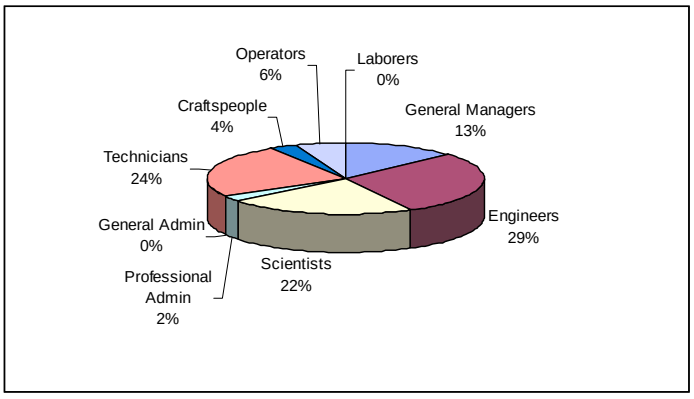

Figure 2-3. Critically skilled employment by category (percent).

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number of employees wholly or partly funded by DP, across the eight sites, is 20,235, ranging from a high of 3,777 at SNL to a low of 521 at SRS. The number of critically skilled employees at the sites is 9,163, ranging from 2,248 at SNL to 51 at Savannah River. Approximately half of the DP contractor employees possess critical skills. SNL and LLNL have the highest percentage of DP employees considered to possess critical skills, with 60 and 70 percent, respectively, of their current DP population considered critical.

As shown at right, of the nine COCS categories identified, engineers (29 percent of total critical-skills employees), technicians (24 percent) and scientists (22 percent) comprise the highest fractions of critically skilled employees – together accounting for more than three-quarters of the total critical-skills workforce. Thirteen percent of the positions considered critical are general management positions.

Table 2-2. Critically Skilled Employees by Age Group.

Site	< 30	30 - 40	41 - 50	51 - 55	> 55	Average Age (CS employees)	Average Retirement Age	Average Years to Retirement
LANL	3	27	35	18	17	**46**	**58**	**12**
LLNL	2	24	40	18	19	**47**	**60**	**13**
SNL	3	25	40	16	16	**46**	**62**	**15**
NTS	3	13	33	19	32	**50**	**63**	**13**
KCP	3	21	40	20	15	**48**	**62**	**17**
PX	4	30	38	13	15	**46**	**65**	**19**
SRS	<1	31	53	4	12	**44**	**58**	**14**
Y-12	<1	18	42	22	18	**49**	**58**	**10**
Complex Average						**47**	**61**	**14**
% of Total (1)	3%	23%	39%	17%	17%			

Table 2-2 displays the critical-skills populations at each of the sites by age group, average age, and average years to retirement. These data indicate the urgency associated with retention of current critical-skills employees and the need to transfer existing knowledge to other or new employees. The average age of critically skilled employees across the Complex is 47 years, with 14 years to retirement. Notice that the average age of retirement varies across the sites. While the 41-50 age group has the greatest number of employees, the

overall age distribution is skewed towards older employees, with 35 percent of the critical skills workforce over the age of 50. This group of experienced, critically skilled employees will become eligible for retirement during the next 10 to 15 years (see Table 2-3).

Of particular concern is the fact that such a small number of the critical-skills workforce is under the age of 40 (only 26 percent). This suggest that too few employees are entering the critical-skills workforce at younger ages.

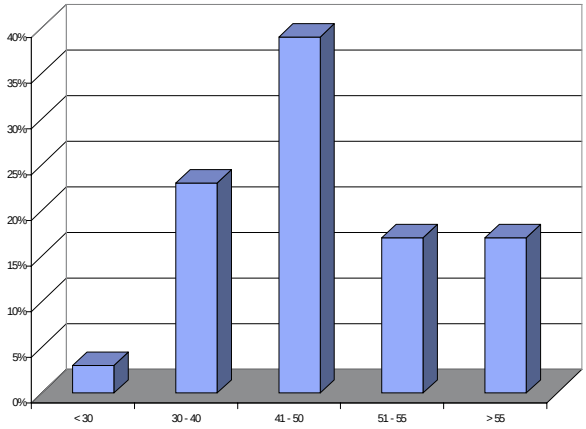

Figure 2-4. Complex-wide critical-skills employees by age group (percent of total).

Table 2-3. Percentage of Baseline (2000) Critical Skills (CS) Employees "Retirement Eligible" by Year (Cumulative)

Site	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
LANL	10%	13%	17%	20%	22%	27%	31%	35%	38%	42%	45%
LLNL	9%	12%	15%	19%	22%	24%	28%	33%	37%	40%	44%
SNL	13%	23%	33%	43%	54%	67%	67%	67%	67%	67%	67%
NTS	35%	36%	41%	46%	51%	54%	56%	60%	65%	68%	71%
KCP	29%	31%	37%	41%	46%	53%	61%	69%	79%	89%	97%
PX	14%	15%	16%	17%	20%	23%	24%	26%	29%	30%	31%
SRS	2%	2%	2%	6%	6%	6%	10%	16%	18%	22%	22%
Y-12	18%	22%	25%	28%	33%	38%	45%	49%	57%	61%	65%
% of CS (FY00)	11%	16%	21%	26%	32%	39%	43%	47%	51%	56%	61%

Unless this trend is reversed, the DP workforce will continue to be older, on average, than U.S. high-technology industries.

The NWC loses critically skilled employees in a variety of ways. Current employees may seek better compensation or more secure employment elsewhere, or, once eligible, they may choose to retire. Death or disability also can occur. Retirement is perhaps the most predictable cause of the loss of critically skilled employees.

Table 2-3 presents the percentage of critically skilled employees, by site, who are presently in the workforce and who

will reach retirement age by 2010. These data underscore the importance of concerted critical-skills retention measures and succession planning. The data in this table are cumulative – the percentage numbers provided for a given year and site indicate the total percentage of the current critical-skills workforce that will be retirement eligible at that time. Eleven percent of current critically skilled employees will be eligible for retirement by the end of the current fiscal year. Within five years, another cumulative 28 percent will be retirement eligible, totaling nearly 40 percent of critically skilled personnel.

These data should not be misread to suggest that all those who are eligible will retire, even though the data in Table 2-3 reflects average retirement age rather than initial eligibility. In fact, the sizeable fraction currently eligible to retire is an indication that many critically skilled personnel stay on after becoming retirement eligible. Nevertheless, it is reasonable for the sites to treat retirement-eligible employees as at risk of leaving the active DP workforce, and to target specific replacement planning on the key skills and individuals within this category.

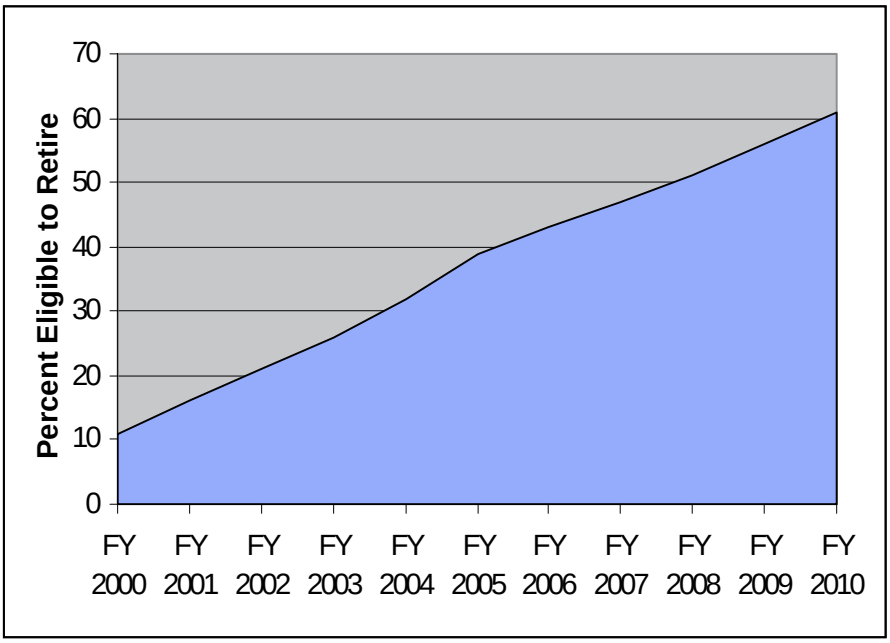

Figure 2-5. Cumulative percent eligible to retire FY 2000-2010.

2.2 OVERVIEW OF FEDERAL WORKFORCE DEMOGRAPHICS

A total of 1,250 federal employees were included in this analysis and 438, or 35 percent, were identified as having critical skills. Less than 30 of these employees are under the age of thirty. That is a startlingly small percentage (two percent) given that many of these are non-technical employees. Moreover, *only one federal employee under the age of 30 was identified in a critical-skill position*, which is 0.2 percent of the federal critical-skills workforce, compared to 3 percent of the contractor critical-skills workforce at the weapons laboratories and production plants.

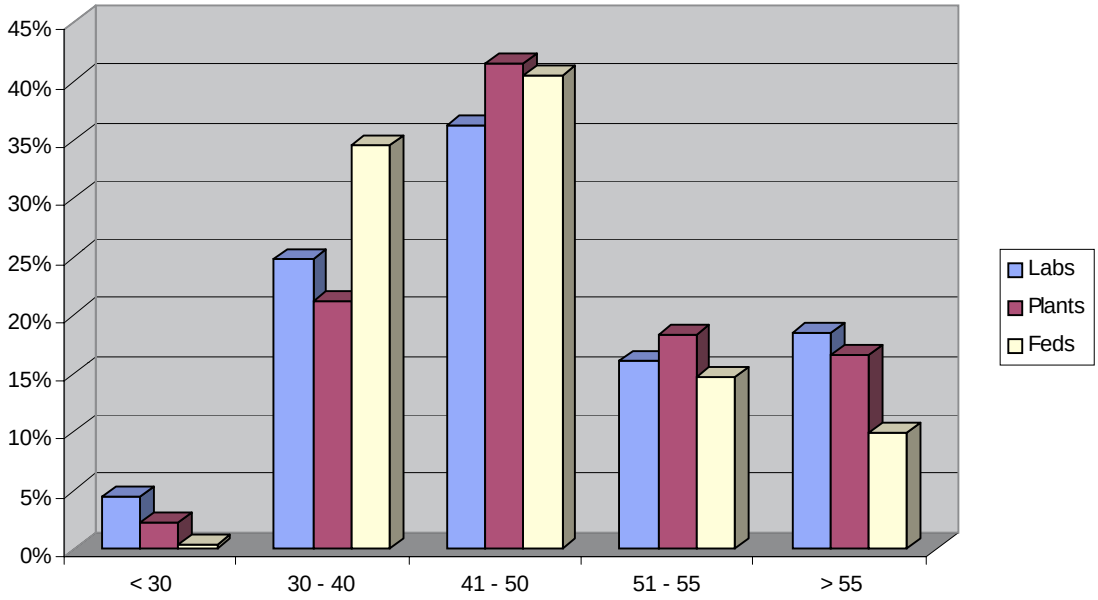

Figure 2-6. Age demographics of the DP critically skilled workforce.

At the other end of the age spectrum, federal employees have received incentives during the past several years to leave federal service at the earliest opportunity. Consequently, less than 25 percent of federal employees in critical-skills positions are over the age of 50, compared to 35 percent at the M&O contractor sites. Unlike the contractors, the federal employment system limits the ability of senior critical-skills personnel to train their replacements before retiring.

A noticeable difference exists between federal and contractor workforce skill categories. Sixty-five percent of federal critical-skills positions require an engineering discipline, more than twice the percentage reported by the weapons laboratories and production plants. These data are consistent with federal responsibilities for overseeing operations and facility safety, rather than performing R&D, and show that DP has to find more engineers than scientists in its critical-skills hiring efforts. However, it also highlights the disproportionate difficulty DP organizations have in recruiting and retaining highly qualified engineers in today's competitive markets. Another noticeable difference is that federal employees have less job diversity and tend to become specialized earlier in

their careers. This has both advantages and disadvantages. Federal employees tend to be less mobile and do not change jobs as frequently, which results in a more stable workforce with improved continuity of operations.

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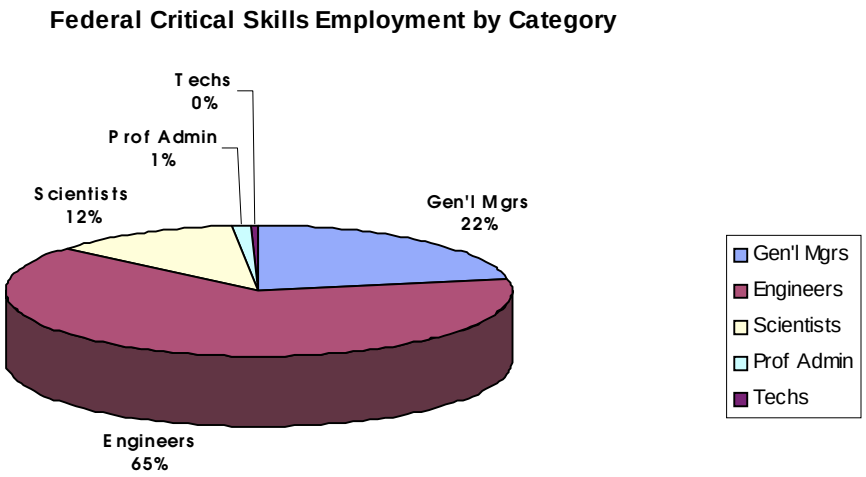

Figure 2-7. Distribution of federal critically skilled employees by job category.

CHAPTER 3

CRITICAL-SKILLS WORKFORCE CHALLENGES

This chapter discusses critical-skills challenges faced at the M&O contractor sites and within the federal workforce.

3.1 CHALLENGES AT THE LABORATORIES, TEST SITE AND PRODUCTION PLANTS

An accurate assessment of the challenges faced at each site, in recruiting and retaining critical-skills personnel, is an essential prerequisite to planning effective measures to assure adequate critical-skills inventories in the future. While many of the challenges are site specific, there are common themes that generally echo the findings of the 30-Day Review. Many of the sites discussed the relative unattractiveness of nuclear weapons work to young people today, the difficulty of attracting and retaining information technology personnel in the context of very attractive compensation packages offered by commercial competitors, recent Congressional restrictions on contractor travel, which reduces opportunities of key staff to attend scientific meetings, and the drawbacks of working in aging facilities that no longer meet the expectations of today's technical workers.

In the 1970s and 1980s, the laboratories, test site, and production plants were seen as excellent places to establish careers for professional, technical workers. They offered competitive salaries, nuclear weapons development was viewed as necessary by the public and, for scientific disciplines, they possessed many of the best facilities in existence, enabling them to attract the best possible people.

Today, there is intense competition for people with technical skills, especially those related to information science and technology. This competition has led to difficulties at the sites in recruiting and subsequently retaining people with these skills. This challenge is particularly noteworthy in the San Francisco Bay Area, where competition with companies in Silicon Valley is a major factor in hiring and retaining scientists and engineers at LLNL and at Sandia's California site.

Dealing with this marketplace has aptly been described as a "war for talent." The number of college students, especially those who are U.S. citizens, in many of the scientific and engineering fields relevant to nuclear weapons work is shrinking. Furthermore, success of the SSP will depend on the ability to build a workforce with greater scientific knowledge and expertise expertise, as the SSP shifts away from away from nuclear testing. At the production plants, there is increasing emphasis on computer and network-based design tools and advanced manufacturing techniques. These changes in skills mix represent major recruitment and retention challenges for the NWC. The situation is exacerbated further because these transitions are occurring in the context of a booming economy, where the

requisite technical disciplines are recruited aggressively and are well-compensated by the private sector.

Because of program instabilities and budget uncertainties, hiring has been curtailed and sometimes eliminated at various sites during the past decade. Recruitment of critically skilled employees is, in a way, a critical skill itself. Without exercise, the skill atrophies, and some sites, notably the Y-12 Plant, are facing significant challenges in resuming recruitment of critically skilled personnel.

Table 3-1 summarizes the various challenges reported by sites in their plans. Note that the production plants presently do not have Laboratory Directed Research and Development (LDRD) programs. In FY 2001, an analog program – entitled the Plant Managers Research, Development, and Demonstration program – is proposed in the President's Budget.

Table 3-1: Current Challenges Reported By Sites

	LANL	LLNL	SNL	NTS	KCP	PX	SRS	Y-12
Aging workforce/little recruitment last decade		✓	✓		✓	✓	✓	✓
Current hiring restrictions (budgets)	✓	✓	✓	✓	✓			✓
Increasing quits pre-retirement			✓		✓		✓	
Uncertain future budgets/program stability		✓	✓	✓	✓			✓
Recruiting difficulties	✓	✓	✓	✓	✓	✓	✓	✓
Compensation/benefits				✓	✓	✓	✓	
Competition for in-demand technical skills		✓	✓		✓	✓	✓	✓
Unattractiveness of nuclear image			✓					✓
Limits on/delays in security clearances	✓	✓	✓	✓	✓	✓		✓
Remote/unattractive location				✓		✓		
Less attractive work environment	✓	✓	✓	✓		✓		✓
Old facilities					✓	✓		✓
Restricted travel	✓	✓						
LDRD reduction	✓	✓	✓					
Increased security requirements		✓	✓	✓		✓		✓

3.2 CHALLENGES IN THE FEDERAL WORKFORCE

The federal workforce faces different challenges than the contractor workforce, in large part because the role of federal officials has substantially changed since the early 1990s. The transition of defense facilities and staff to the Department's Environmental Management (EM) Program, the downsizing of the nuclear weapons production complex, and the implementation of science-based stockpile stewardship and contract reform initiatives have all had impacts on federal employment levels within DP. However, today's federal workforce has been largely shaped by two factors: the need to increase technical safety oversight of contractors and a congressionally mandated reduction in budgets that fund federal field positions.

3.2.1 BACKGROUND

The background, training, and workforce needed to address technical-safety oversight has been one of the greatest drivers behind federal hiring during the decade. Today, the majority of federal critical-skills positions are associated with safety and oversight, and a significant number of federal technical personnel position descriptions are written to specifically address skills and competencies required by Defense Nuclear Facilities Safety Board (DNFSB) recommendations.

During the past decade, the DP field sites and Headquarters have alternated between hiring freezes or highly restricted external hiring, primarily to fill critical-skills positions in safety basis authorization and contractor oversight functions. At the same time, under the Strategic Alignment Initiative (SAI), the Department has utilized incentives to encourage a general reduction in federal employment levels and set target employment levels for each DOE organization. DP achieved its SAI target levels primarily through attrition and by providing incentives to induce the separation of retirement-eligible and non-technical personnel. While this created some imbalances in skills mix, it avoided the extraordinary disruption that would have been caused by a general involuntary Reduction-in-Force (RIF). In particular, it allowed the organization to continue to hire and retain new critically skilled employees who, under the federal system, are the most at risk in a RIF.

This orderly downsizing process continued until 1997, when Congress began to reduce substantially funding for the federal DP workforce, while directing greater emphasis on safety, security, and project management. Meeting this challenge necessitated a small RIF in 1998. While only 17 employees[1] were separated involuntarily – none of whom was critically skilled – the impact was severe. Many younger and mid-career employees, feeling the uncertainty brought about by the impending RIF, quickly found positions outside DP. Many left the Department altogether. Senior technical employees,

1. The DP employees RIF'd during 1998 were from HQ organization, and represented approximately six percent of the HQ total. While the reductions in funding applied to both Field and HQ, the Field was able to avoid a RIF because they were already below SAI targets and had the ability to shift certain positions and personnel from DP to vacancies within their EM organizations.

secure in their positions because of seniority, were left without the resources needed to perform some of their functions. Productivity was diminished by the constant flux in personnel assignments as organizations adjusted to the unplanned departure of so many employees.

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3.2.2 The Situation Today

Most recently, Congress prescribed a reduction in positions at the Field organizations (operations and area offices), placing at risk the newly created weapons internship programs and the filling of critical-skills positions at the DP Field sites. The mandated Field reductions have been achieved without an involuntary RIF. However, the continual drive to reduce the federal workforce through buyout programs and threatened RIFs has created a workforce imbalance.

This recruitment of employees with safety and operations oversight ability is faced with increasing competition from the private sector, as well as the DOE contractor community. In particular, the Department's EM operations have similar needs in addressing DNFSB recommendations. In the presence of hiring freezes, critical vacancies often are filled from within the existing pool of qualified federal candidates that can cause "grade creep" for a given critical-skill position. Grade creep occurs as managers competing for the most qualified staff within the pool offer promotions in lieu of other incentives. Unlike the weapons laboratories and production plants, federal managers have almost no incentives to entice an employee to change positions other than through promotion. Similarly, it is often difficult to recruit and retain critical-skills employees in high cost-of-living areas such as Los Alamos, NM, the San Francisco Bay Area, and Washington, DC without offering higher-graded positions to address salary needs. An increased use of Excepted Service positions has ameliorated this problem somewhat, but clearly a more fundamental restructuring will be required, as a greater emphasis is placed on having senior technical and safety personnel located at the Area and Site offices.

CHAPTER 4

CRITICAL-SKILLS PATH FORWARD FOR DP M&O CONTRACTORS

This chapter describes plans and activities at the laboratories, test site, and production plants to ensure that necessary critical-skills personnel are in place during the next decade to sustain confidence in the nuclear weapons stockpile. A discussion of the federal workforce path forward is contained in Chapter 7.

Critical-skills management includes three key tasks: generation, retention, and regeneration. Critical-skills generation encompasses the range of activities necessary to identify and acquire, or train, the individuals required to ensure that the NWC can meet the demands of the present and future. Critical-skills retention involves activities and programs at DP and its facilities ranging from ensuring that salaries and benefits remain competitive with the private sector, to involving critically skilled personnel in a variety of scientifically and technically challenging programs and activities. Regeneration completes the cycle and comprises a suite of activities designed to replace critical skills when their loss is anticipated (i.e., through retirement) or unanticipated (i.e., through voluntary termination). Regeneration activities may overlap with critical-skills generation activities, such as personnel acquisition, education, and other training activities. Management of critical skills also includes adjusting skills mix at a given site to meet changing requirements of the stockpile stewardship mission. As new production technologies become available and research objectives change, contractors must have the flexibility to reduce employment in surplus labor categories and retrain or hire workers to meet the new challenges.

4.1 PROGRAM CHALLENGES FORM THE MOST IMPORTANT INCENTIVE FOR ACHIEVING WORK FORCE OBJECTIVES

The Chiles Commission recognized that many factors aside from site-specific retention, recruitment, and training measures will affect the ability of the DP's nuclear weapons laboratories, test site, and production plants to attract, develop, and retain the skilled people needed to achieve the goals of the SSP. From its inception, a key consideration of the SSP has been to provide cutting-edge facilities and a challenging programmatic environment to promote the recruitment and retention of world-class scientists and engineers, by providing the instruments for intellectual challenge, as well as the new tools and capabilities needed to assess and certify the stockpile. Another aspect of the program has been to transform the high-volume production complex that had been built up during World War II and the Cold War into a lean, science-based, 21st-century manufacturing capability that will support the SSP and provide an improved working

environment that better facilitates the recruitment and retention of critically skilled employees. A coherent and executable, well-managed program, with adequate stable funding and a strong sense of purpose, reinforced with appropriate statements of national commitment, are important elements in providing an environment that will attract and allow the retention of key personnel. Effective approaches for physical, cyber, and personnel security that do not unduly restrict needed scientific interchange or degrade the work environment at sites within the Complex are also important.

DP has taken steps starting in FY 2000 to establish a process among its contractors to track critical skills at the contractor sites. The contractors have developed initial plans for the recruitment, retention, and development and training of critically skilled employees to assure the success of the SSP into the future. DP, working with a world-class consulting firm, has identified key metrics to allow evaluation of the contractors' performance in the management of critical skills, and plans to incorporate the evaluations in the award-fee process of M&O contracts as they are renewed or competed in the future.

4.2 SUMMARY OF SITE CRITICAL-SKILLS MANAGEMENT ACTIVITIES

Table 4-1 lists specific activities that are underway at the laboratories, test site, and production plants, as documented in their individual site plans.

Table 4-1. Current Critical-skills Retention And Regeneration Activities.

	LANL	LLNL	SNL	NTS	KCP	PX	SRS	Y-12
Fellowships		✓			✓		✓	✓
University Cooperative programs	✓	✓	✓	✓	✓	✓	✓	✓
Intra-NWC Exchange Programs						✓	✓	✓
Salary Adjustments		✓	✓	✓	✓	✓	✓	✓
Recognition Programs		✓			✓	✓	✓	✓
Quality of Work Life Programs			✓		✓			
Continuing Education		✓	✓	✓	✓	✓	✓	✓
ADAPT/Enhanced Surveillance Campaigns			✓		✓	✓	✓	✓
Knowledge Archiving	✓	✓	✓	✓		✓		✓
Intra-facility Personnel Transfers	✓	✓			✓		✓	

Critical-skills workforce planning must start from some understanding of future capabilities that will be needed across the Complex. From this starting point, the sites can define the skills that are critical to achieving the SSP mission. The degree to which these critical skills are "fragile" or "at risk" of falling below some minimum level can be assessed by a detailed examination of anticipated stockpile retirements and attrition. This expected attrition in critical skills over time can then be addressed in a variety of ways, including providing focused retention incentives, detailed succession planning, cross-training existing personnel, recruiting replacement workers and transferring the skills, or a combination of all of these approaches.

The site-specific critical-skills retention and regeneration planning processes will allow advance warning of impending problems, and thus, a more efficient administration of resources to forestall the loss of critical skills by providing for the timely recruitment or retraining of technical personnel. Detailed assessments and inventories of critical skills and knowledge will allow the consolidation of critical-skills positions through cross-training and other mechanisms that manage worker's skills and knowledge.

While the sites will be accountable for developing and implementing their critical-skills recruitment, retention, and regeneration plans, which are summarized in Chapter 8, they will be doing so with budgets and authorities provided by the Congress and Administration. Additional funding may be necessary to allow overlaps between current critical-skills personnel and their replacements, to allow needed knowledge transfer to take place, or to provide competitive salaries and other incentives where needed.

4.3 CRITICAL-SKILLS RETENTION

DP recognizes that a key element in retaining needed scientific and engineering talent is the provision of state-of-the-art research tools and challenging technical work. Starting in FY 2000, DP has introduced "Campaigns," which are technically challenging, multi-year, multi-functional efforts conducted across the laboratories, production plants, and test site. Campaigns are designed to provide the essential basis for confidence in the safety, security, and reliability of the stockpile without nuclear testing. At the same time, they provide challenging technical work and program management experience for scientists and engineers who have critical skills that would be needed for the design of new weapons types, should that be required in the future.

Similarly, advanced manufacturing and process engineering activities, such as the Advanced Design and Production Technologies (ADAPT) Campaign, are useful in capturing knowledge and developing reliable, science-based, production techniques. In some cases, these activities are important in exercising the skills of key personnel, in anticipation of weapon refurbishments anticipated during this decade. Even more of a challenge is the resurrection of capabilities that are no longer available in the workforce. For example, starting plutonium pit production at LANL would have been a difficult task without

the expertise of former Rocky Flats Plant personnel.

In addition to providing meaningful and challenging technical work, the contractors recognize the value of financial rewards and incentives, quality of work life initiatives, such as flexible working hours, and career development planning to aid in the retention of critical skills. Another means of job enrichment is the opportunity to rotate to other parts of the NWC. Many of the sites intend to use their critical-skills workforce and succession planning to focus incentives on retaining key individuals long enough to train their successors. The opportunity to train a successor in a mentoring relationship may in itself provide the type of meaningful work that will induce a retirement-eligible employee to stay longer.

4.4 RECRUITMENT

When a skill is recognized as being at-risk, recruitment is a natural response to ensure that the skill is not lost. Often the skill can be cross-trained within a particular site, or site personnel currently surplus in one skill can be given an opportunity, e.g., through a "worker mobility" program, to transfer into the at-risk area. Sites often find that they can recruit needed talent from other DP facilities or from the pool of former DP workers now employed elsewhere.

Due to the unique nature of many of the critical skills within the NWC, recruiting new workers directly from educational institutions is a necessary and cost-effective approach to filling critical-skills needs. To be competitive in recruiting a high technology workforce, the sites need to be able to match private-sector compensation packages, rapidly make binding offers to outstanding candidates, and reduce security clearance delays so that new employees can begin meaningful work without delay. Many of the sites have devised mechanisms to provide hiring bonuses or pay flexibility so that they can recruit more successfully.

The sites also make use of collaborative programs with educational institutions to help maintain a pipeline of potential new employees. Special programs, such as internships, post-doctoral fellowships, and summer hiring also enlarge the pool of potential new employees, when managed with critical skills in mind.

4.5 TRAINING AND KNOWLEDGE TRANSFER

The contractors have instituted a variety of programs to document existing knowledge and transfer it to others through archiving and formal training. In addition, mentoring and cross-training activities serve to broaden the base of skills at various sites. Training and education programs serve the dual purpose of preparing needed capabilities for the future and providing the career advancement and challenge that is important in retention of critically skilled personnel. Many of the sites enlist retirees in these training and knowledge transfer functions. The sites generally accept as adequate the existing Retiree Corps Program that permits retirees to retain security clearances and to work up to half time.

Additionally, DOE has conducted extensive knowledge-capture interviews with NWC retirees and continues to interview personnel scheduled to retire. Results of these interviews are archived for future use. The interview program was established in response to DNFSB Recommendation 93-6, "Maintaining Access to Nuclear Weapons Expertise."

4.6 NUCLEAR WEAPONS WORK-FORCE RESERVE

Notwithstanding the Chiles Commission recommendation, the contractors do not advocate the creation of a "reserve" component analogous to the military National Guard and military reserve forces as a response to providing specialized skills or surge capacity within the NWC. In general, the contractors report that they meet this need satisfactorily by using the DOE Nuclear Weapons Retiree Corps Program, mentioned in Section 4.5.

CHAPTER 5

CRITICAL-SKILLS WORKFORCE ACCOMPLISHMENTS

DP and the Clinton Administration are effecting changes within the SSP that will help ensure critical-skills retention at the contractor sites and within the federal workforce. Examples include

- In FY 2000, a restructured budgeting approach was put in place for the SSP that clearly delineates: (1) the fixed costs required to maintain the NWC infrastructure (referred to as Readiness in Technical Base and Facilities [RTBF] Operations & Maintenance and Construction); (2) the incremental funding necessary to assess the health of the stockpile, develop stockpile options, and perform needed work on the stockpile (referred to as Directed Stockpile Work [DSW]); and (3) the concerted efforts to develop necessary new capabilities to assess, maintain, and improve the stockpile in the future (referred to as Science, Engineering, and Production Readiness Campaigns). Together with other management improvements within DP, this new business model will facilitate earlier identification of key program tradeoffs and more effective management and integration of program resources.

- The President's FY 2001 Budget Request of $4.6 billion for weapons activities is 6.3 percent above the FY 2000 Appropriation, on a comparable basis. It provides a budget structure that is integrated with the SSP and includes DP's performance plan, clearly linking the budget to performance objectives and measures. One of the key performance measures is the availability of a workforce with the critical skills necessary to meet long-term requirements.

- A new activity developed in response to the 30-Day Review, the Plant Managers Research, Development, and Demonstration initiative, is being proposed for FY 2001 to provide the production plants with a program that is analogous to Laboratory Directed Research and Development (LDRD) at the laboratories, which has proven successful in attracting new, key talent.

- The Accelerated Strategic Computing Initiative (ASCI) that has been developed that provides an unequalled capability to simulate the operation of nuclear weapons with sufficient resolution and physics to assess their performance, predict their safety and reliability, and certify their functionality without nuclear testing. The preeminence of these simulation tools is attracting many of the best scientists and engineers to the DP laboratories.

- The NWC presently occupies about one-third of the square feet that it occupied at the end of the Cold War, and will be reduced by approximately another third by 2005. Addi-

tionally, the capability to produce key components such as neutron generators and developmental pits has been restored, and a plan is in place to restart tritium production.

- The Production Readiness Campaigns have been defined and a disciplined Stockpile Life Extension Program (SLEP) has been implemented that will allow the identification of clear personnel requirements in the future, which will help provide program stability. The SLEP schedule has undergone several planning iterations, exercising new tools that have helped DP management to better understand the workload implications of alternative plans for routine weapon maintenance, dismantlement, and refurbishment.

- A disciplined "6.X Process" has been defined in cooperation with DoD to ensure that needed changes to the stockpile are rigorously evaluated in the context of overall program objectives and military needs. It also ensures that design and manufacturing activities are conducted in such a way as to produce refurbished weapons that fully meet military requirements.

The sections below highlight specific actions taken by M&O contractors to address three key challenges – retention, recruitment, and training – and discuss the role of university relationships and M&O flexibility in critical-skills management.

5.1 RETENTION

Retention of critical-skills employees has many facets, including serving as an essential precursor to recruitment. Important to retention are competitive salaries and benefits, challenging and stimulating work, access to state-of-the-art facilities, a sense of national imperative, and effective leadership. Example activities at the M&O sites include

- As stated in the LLNL plan, salary management is an important aspect of retention of critical-skills employees. As with most sites, salary proposals are developed locally each year by the laboratory's salary committees for professional, technical, and administrative personnel. Their goal is salary parity with comparable organizations in the various discipline areas. When discrepancies have developed, special salary actions targeted at particular specialty fields have been taken. Beginning in FY 2000, DOE has specially authorized such "adjustment" increases to help address market-related pressures in critical-skills areas.

- Kansas City has made selective pay adjustments for workers in areas essential to its business. However, they consider that more adjustments will be necessary to keep wages competitive with those in the commercial market place.

- At Kansas City, part of the reward and recognition program designed to attract and retain critically skilled employees is the Significant Technical Achievement Reward and Recognition program, which annually recognizes and rewards employees for technical excellence. On average,

ten employees receive the award each year, totaling approximately $20,000 for each employee.

- Kansas City has established Science Based Manufacturing (SBM) as an advanced manufacturing focus that beneficially impacts attraction and retention of employees who possess critical technical skills. This program couples advanced model-based manufacturing and the use of supercomputers to simulate and model processes and products early in the product realization life cycle. The simulation/modeling activities use ASCI, commercial and internal KCP-developed software for product analysis. An organization has been established to manage this activity, and comprises approximately 100 associates with responsibility for KCP technology development through Campaigns; product and process analysis using supercomputers; product definition configuration management; and tool design and software development. This investment in cutting edge manufacturing is highly attractive to present and future technical staff members.

- Honeywell has developed internship and new-hire programs, that greatly contribute to the overall retention of critically skilled personnel. Each associate receives forty hours of training, and has the opportunity to provide ongoing feedback to management and respond to an annual associate satisfaction survey, which is benchmarked against industry.

- Of the college graduates surveyed, 76 to 80 percent responded that they would stay three years or less with their first employer. As a result of these developing trends, Honeywell is developing additional tools and programs to promote the retention of critically skilled personnel. Several additional retention programs are being prepared to present a business case to DOE for additional support to address this growing problem. Some of the proposed programs include retention incentives, critical skill performance incentives, bonus and variable pay, enhanced benefits, and reward and recognition programs.

- One of the retention strategies used by NTS is to design their retirement package to be mildly back-end loaded to encourage seasoned employees to remain employed until they reach their maximum retirement age. For example, employees retiring between the ages of 62 and 65 receive a greater annual increase than employees retiring between the ages of 55 to 61.

- For the past two years, Y-12 has spent approximately $2 million in its critical skills retention program. Salary adjustments are provided on an annual basis to employees identified in the critical-skills needs analysis. Y-12 intends to expand this program in FY 2001.

5.2 RECRUITMENT

Recruitment is an essential element of generating critical-skills personnel. It is inherently a labor intensive process, and many different recruitment techniques are required to be successful. In the case of campus recruiting, it also requires

maintaining campus connections over the long-term. Examples include

- LLNL has implemented several strategies to increase the effectiveness of their recruiting program. For example, they created the prestigious postdoctoral Lawrence Fellowship Program, which pays a salary of $6,000 per month. This program attracted more than 400 applicants in 1999. Another recruiting strategy used by LLNL is to provide "on-the-spot" job offers in certain competitive fields.

- LANL's Postdoctoral Program is the largest feeder for Ph.D. scientists for their weapons program. Of the 644 Ph.D. scientist and engineers in critical-skills positions at LANL today, 187 completed postdoctoral appointments at the Laboratory between 1997 and 1999.

- As part of their overall recruiting effort, SNL implemented its Science and Technology Outreach Student Internship Program which targets academic achievers from science and engineering university programs who conduct research in relevant DP areas. The internship program actively recruits candidates from historically underrepresented groups, encouraging students of African-American, Asian-American, Native-American and Hispanic backgrounds, as well as other eligible students to apply. This program has contributed 22 percent of the entire technical minority hiring at SNL during the past three years.

- Honeywell Federal Manufacturing and Technologies (FM&T) identifies and hires new college graduates who will develop into leaders and continuously drive the organization toward being a premier company in the weapons complex. Honeywell has targeted thirty six of the world's best universities for recruiting. These universities are selected based on National Business & Engineering Rankings, past recruitment yield, diversity enrollment and industry and geographic considerations. FM&T is active on the Honeywell University Relations Council and has access to the corporation's electronic data base of all Honeywell university relations candidates. The council has extensive networking available to FM&T for university hiring needs. The corporate university relations hiring goal is 30 percent diverse and 30 percent female.

- FM&T identifies and hires highly motivated, qualified, technically experienced individuals by leveraging the Honeywell reputation and corporate resources. FM&T is active on the Honeywell Sourcing & Staffing Council, which has oversight responsibility for the Honeywell Integrated Requisition & Employment Systems (HIRES). HIRES allows all Honeywell business units to share electronic resumes generated from "help wanted" advertising. Additionally, this web-based application provides a powerful tool for corporate-wide job postings. Extensive corporate networking is available to FM&T to assist in identifying experienced candidates to support the nuclear-weapons mission.

- At Pantex, when critical, funded job vacancies cannot be filled by a qualified, internal candidate, they are advertised on the DOE JOBBS web site to attract former employees of the NWC who have been affected by downsizing activities. Pantex also partners with universities that specialize in critical skills needed for future missions. These partnerships provide Pantex Recruiters with an important pipeline in recruiting new graduates and alumni.

- As technology continues to advance, Pantex utilizes more creative, efficient, and cost effective ways to recruit critical skills, including expanded use of the Internet for candidate searches, and a toll free number and web site to provide candidates with job vacancy information. Pantex also uses student work programs for Interns and Co-ops that focus on promoting Pantex relationships with universities and students in fields of study that will support future Pantex missions.

- At Pantex, a prime method of recruiting critical skills is through networking with professional organizations, job fairs, and employee referrals. Pantex continues to promote networking as a means of attracting critical skills.

- Partnerships between SRS and Universities are actively used to enhance recruitment. Recruitment continues to be focused on females and minorities (80 percent of hires in FY 1998 and 1999), and salary increase adjustments of two percent have been granted to junior and mid-career engineering to aid in retention.

- At Y-12, technical staff is being added in FY 2000 via campus recruiting – this is the first campus recruiting for Y-12 in approximately ten years.

- At Y-12, the University Co-op Program, which was strong in the past but has been dormant for the past few years, has been resumed. Summer Interns are being employed, approximately 80 percent of whom come from Historically Black Colleges and Universities, and a Technical Fellowship Program that sponsors employees to obtain advanced technical degrees, both beginning in 1998-1999. The plan and funding for ensuring critical skills at Y-12 is included in the Secondary Readiness Campaign Plan now being drafted for submission to DOE Headquarters.

- The Y-12 Plant has experienced a successful first year in its return to campus recruiting. Late in FY 1999, Y-12 identified the need for additional engineers in mechanical, metallurgical, electrical, nuclear, chemical, and software engineering to begin the process of meeting critical-skill needs. Several Ph.D. positions were also identified. To support the return to campus recruiting, a core team of recruiters was trained and sent to selected colleges. During FY 2000, more than 50 new college graduates will be invited for site visits. To date, more than 85 percent have accepted the invitations. More than 50 percent of those students were offered full-time

positions and, currently, twelve have accepted employment at Y-12. As a result of this success, relationships are being built with the selected engineering schools.

- Y-12 is using a Summer Intern program as a possible feeder for long-term employment. For FY 2000, eleven summer students from a variety of colleges, including several Historically Black Colleges and Universities, are filling these summer positions. All eleven summer students are in engineering disciplines. The long-term strategy is to obtain security clearances for several of these students anticipating that they may accept full-time employment with Y-12 upon graduation.

5.3 TRAINING

Training is an essential ingredient in critical-skills workforce generation and regeneration. In most instances, recruited employees require special training to become prepared for the unique activities in the development, maintenance, and refurbishment of nuclear weapons. In other instances, employees experienced in a given area receive training to move into a new area, or to become cross-trained for multiple areas. All sites have programs in place to ensure that individuals in critical-skills positions have the skills necessary to safely and effectively perform the assigned tasks. Examples include

- At Pantex, the Qual Card program which requires that employees demonstrate proficiency on the job relative to qualification/certification requirements. Certification may be granted only after assuring that the respective qualification requirements have been satisfactorily completed.

- To build critical skills while providing a financial incentive to remain at the site, the SRS implemented their DP Fellowship Program in 1998. This program provides funding for qualified personnel to obtain advanced degrees. It requires a commitment from the individuals to remain at SRS for three years in exchange for every year of educational assistance they receive.

- Los Alamos National Laboratory has two nuclear-related training programs aimed at new designers and engineers. The Theoretical Institute of Thermonuclear and Nuclear Studies (TITANS) program is designed to utilize and pass on the knowledge and expertise of veteran nuclear weapon designers to those new to a given critical function. The Joint Nuclear Explosive Training Facility uses a "hands-on" approach to weapons system training and relies heavily on direct interactions with experienced weapons designers and engineers.

- NTS has a mentoring program that targets employees at critical points in their careers and pairs them with appropriate partners to provide professional development opportunities and guidance. One area of special interest for mentoring is the transfer of critical skills, particularly those relevant to weapons testing and data acquisition.

- Y-12 has created a Technical Fellowship Program which enables full-time employees to attend graduate school while being paid full salaries. Five employees have participated in the program during the last two years. Two have graduated and returned to fill critical positions. For FY 2001, another three "employee-students" will be identified.

5.4 UNIVERSITY RELATIONSHIPS

As stated in the SNL plan, most critical skills needed are best found in recent, advanced-degree graduates. Sites must have an ongoing relationship with universities throughout the country. SNL has a University Collaborations Program, which strengthens the relationships among SNL and the Nation's leading research universities through a variety of strategies.

However, the workforce restructuring that has taken place in the Complex has taken a toll on university recruiting efforts at various sites. For instance, the Y-12 workforce has been downsizing since the Cold War ended in 1991. Since that time, the number of employees dedicated to DP work has decreased by approximately 2,000. One technique used to effectively manage this reduction in workforce was to limit the number of new hires at the site. When Y-12 found that it needed to replenish its critical-skills workforce, they faced the special challenge of recruiting highly technical people after a decade-long absence from college and university recruiting. They discovered that they no longer had the reputation and the relationships at the campuses that were necessary to recruit successfully. They are experiencing an uphill battle to reestablish themselves as a significant competitor in the market for highly qualified students.

Another complication with university recruiting was the FY 2000 restriction on travel funding. LANL has reported that travel restrictions impeded their ability to sustain university recruiting efforts. Travel was tightly constrained during FY 2000 to ensure that travel budgets were not consumed, which would have precluded essential programmatic travel. Technical staff members who serve as recruiters for LANL have been forced to make tradeoffs between recruiting travel or programmatic travel, which has resulted in a reduction of recruiting trips. Not having a regular presence at universities results in loss of name recognition and important connections with faculty.

The Academic Strategic Alliances Program (ASAP) is an important element of SSP's ASCI. Its goal is to engage the best minds of the U.S. academic community to accelerate the emergence of new unclassified simulation science and methodology and associated supporting technology for high-performance computer modeling and simulation. ASAP fosters exchange programs that bring top academic researchers directly into the laboratories while allowing laboratory personnel to expand their experience base into universities. ASAP is an important activity for developing the next generation of simulation scientists to fill critical-skills positions in the NWC.

Research projects in ASAP are implemented in three levels.

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1. Level One Strategic Alliances has established, through open competition, centers at five universities, funded at approximately $3.7 million per year:

   - California Institute of Technology – Center for Simulating Dynamic Response to Materials,
   - Stanford University – Center for Integrated Turbulence Simulation,
   - University of Chicago – Center for Astrophysics Flash Phenomena,
   - University of Illinois – Center for Simulation of Advanced Rockets, and
   - University of Utah – Center for Simulation of Accident and Fire Environments.

2. Level Two Strategic Investigations has established, through open competition, smaller computer science and computational mathematics projects identified as critical to the success of ASCI. In FY 1999, fourteen Strategic Investigations were established, with annual funding ranging from $200 thousand to $600 thousand.

3. Level Three Individual Collaborations establish focused projects initiated by individual ASCI researchers working on near-term ASCI-related problems. These typically are funded in the $50 thousand to $100 thousand per year range, out of laboratory ASCI budgets.

ASCI Institutes. To further engage U.S. universities in support of the ASCI program, each of the DP laboratories has established an institute to attract university scientists to work with laboratory staff in areas of high-performance computing science. Each institute provides a central facility to support extended visits by faculty and students and to serve as a focal point for interaction with laboratory scientists. Recognizing the paucity of U.S. citizens enrolling to earn advanced degrees in these fields, the LANL Computer Science ASCI Institute and LLNL ASCI Institute for Terascale Simulation have established Computer Science Graduate Fellowships[1] administered by the Krell Institute, beginning in the fall of 2000, modeled after the Computational Science Graduate Fellowship[1] described below. The program is open to highly qualified U.S. citizens who are senior undergraduates, or are in their first or second year of graduate study at U.S. universities. Applicants must be pursuing or be planning to pursue a Ph.D. in computer science with an emphasis on high-performance computing. In addition to receiving a year-round stipend, equipment, and travel funds, students spend at least one practicum (research assignment), for an extended period working, with researchers at the sponsoring DP laboratory. The time spent working at the DP laboratory provides students with an opportunity to discover why DP

1. Pursuant to section 3162, PL 106-65.

laboratories have traditionally had a high employee retention rate.

Computational Science Graduate Fellowships. The Computer Science Graduate Fellowships program sponsored by the DP laboratories complements the Computational Science Graduate Fellowships, which is jointly funded by the DOE's Offices of Science and Defense Programs. The program, administered by the Krell Institute, was established in 1993 by the Office of Science to support highly capable individuals pursuing doctoral degrees in U.S. universities in applied science or engineering disciplines with applications in high-performance computing. The fellowship program requires completion of a program of study that provides a solid background in three areas: 1) a scientific or engineering discipline, 2) computer science, and 3) applied mathematics. A fellow's major field must fall into one of these categories, and the program of study must demonstrate breadth through substantial academic achievement in the other two. Like the Computer Science Graduate Fellowships, a practicum working with researchers at a DOE laboratory is required of every fellow for at least one three-month period during the term of the fellowship. DP laboratories have been very successful in recruiting computational scientists from this program. Of the 84 fellows who have completed the program, 15 have been hired by DOE laboratories, with all but three to DP laboratories. Of the 15 fellows with practica at DOE laboratories in the summer of 2000, 12 were at the DP laboratories. These laboratories also will vigorously recruit computational scientists into the ASCI program from among the twenty U.S. citizens that were selected for fellowships in FY2000.

Defense Programs Education Program. DP has a small education program that supports projects that address critical-skill needs at each of the DP laboratories. These projects, although customized to meet specific needs, have a number of characteristics in common. Each is 1) driven by critical-skill needs identified by DP-laboratory line management, 2) funded jointly with the DP program receiving benefit, 3) designed with well-defined objectives and measurable evaluation criteria, 4) limited to U.S. citizens, and 5) structured so that students spend an extended period working at a DP laboratory. The final requirement yields a cadre of prospective employees who are much more likely to be recruited successfully for laboratory positions, even in the face of strong competition from the private sector. Also, by giving U.S. students the opportunity to experience the challenges and stimulation that is integral to research, many are motivated to pursue the advanced degrees required for most of the scientific and technical positions at DP laboratories. As a consequence, the DP laboratories have been successful in guiding science and engineering students into research careers, thereby increasing the pool of well-qualified U.S. citizens, including those traditionally under-represented, for technical positions at the laboratories.

Examples of DP Education projects funded in FY00 are described briefly below:

- **Nuclear Science Education for the 21st Century: Modern f-Element Chemistry.** This project is coordinated by the Seaborg Institute for Transactinium Science in Los Alamos. It offers an undergraduate/graduate-level course on molecular chemistry of actinide elements that is fully accredited by the University of New Mexico. The course features a fully subscribed lecture series taught by laboratory experts and is attended by student participants and many laboratory technical and professional staff members who never had the opportunity to take a formal course in actinide chemistry. In addition to the course work, the program supports six summer research fellowships that provide nationally selected fellows with opportunities to perform independent laboratory research in actinide molecular science while working under the guidance of one or more Los Alamos technical staff members. The project serves as a national resource for the teaching of nuclear sciences, supports recruitment of the next generation of nuclear scientists, and transfers critical skills within the existing DP workforce.

- **Engineering Sciences Summer Institute.** Graduate students and faculty participate in an SNL summer research experience to gain experience in real-world applications of applied mechanics. Their summer experience culminates with a one-week symposium featuring SNL technical staff and university faculty experts from around the nation. Within a year of this program's inception, the first student was hired, in constrast to previously unsuccessful attempts in the three previous years.

- **Internships in Terascale Simulation Technology.** The Internships in Terascale Simulation Technology are designed to recruit qualified students to seek employment at LLNL as computational scientists and to reduce the training time of new Ph.D. graduates hired. Students are mentored by expert computational scientists and provided hands-on experience with massively parallel processing systems, as well as specialized instruction in computational mathematics and scientific visualization techniques. Dedicated Livermore computing training staff, scholars, and special guests, including prominent Institute for Terascale Simulation scientists contribute to student experiences.

- **Physics Summer School.** This eight-week summer program, conducted jointly between LANL and the University of New Mexico, is designed to attract the best undergraduate and graduate students to LANL to work in the fields of science and mathematics. The goals of the program are to teach basic-physics skills not usually addressed in a university curriculum, introduce high-performance computing and its applications in physics problems, and influence these students to pursue advanced degrees in the fields of science and mathematics. There are

approximately 20 participants each year.

- **Microsystems Engineering Institute.** At SNL, multidisciplinary engineering students, both at the undergraduate and graduate levels, are provided educational and research opportunities over a 12-week summer internship within the Microsystems & Engineering Sciences Application (MESA) program. Under the guidance of SNL scientists and engineers, students actively work on research projects in disciplines critical to revolutionizing the engineering process for refurbishing weapons in cost- and time-efficient ways. The program is establishing vital connections with U.S. universities and attracts well-educated students into permanent positions at SNL.

- **Cyber College Computer Defenders.** High school, undergraduate, and graduate students work summer or part-time during the year on cyber security activities at SNL. Students develop capabilities in information technologies, information protection and distributed computing. This includes how to protect electronic information and defend computer systems and networks, capabilities critical to the DP laboratories. The first student to be hired at SNL was identified soon after the program's inception.

- **Nuclear Science Education for the 21st Century: Nuclear and Radiochemistry.** This project provides a unique undergraduate/graduate-level course on nuclear and radiochemistry, fully-accredited by three New Mexico universities. The course is being made available to two New Mexico university campuses via distance learning technology. Upon successful completion, students will understand the nature of radioactivity, the quantitative measurement and treatment of radioactivity in a variety of sample types, the application of radioactive material in research, and the behavior of radiation in matter. Because virtually all Los Alamos new hires over the past twenty years lack formal training in nuclear and radiochemistry, they will also have access to this course. With former leaders in weapon diagnostics of underground testing as senior instructors, the course serves to preserve and transfer critical skills within the existing workforce, as well as to educate and recruit new talent.

- **Radiation Sensors Technology Program**. This program involves a collaboration of SNL with Fisk University, offering graduate and undergraduate physics and engineering students research opportunities in cadmium zinc telluride (CZT) radiation sensor technology. Past successes of this program such as the SNL/Fisk 1998 R&D 100 Award and recognition by Discover magazine has allowed Fisk University to attract new under-represented students to their science departments and to provide SNL with a pool of potential employees well prepared to contribute to the national security mission requirements for safeguarding weapons pits and contributing to strategic surety.

5.5 CONTRACTOR HUMAN RESOURCES MANAGEMENT FLEXIBILITY

DP has taken several actions in response to Recommendation Eight from the Chiles Commission Report, which addressed the need for DOE to change its personnel policy allowing contractors greater latitude in personnel practices so that they can compete more effectively in the market for scientific and technical personnel.

DP is leading a DOE-Contractor Working Group which examined the findings associated with this recommendation and did its own research on DOE's personnel policy. Prior to DOE's Contract Reform initiatives of 1994 and 1995, DOE utilized a "Personnel Appendix" in each of its contracts, which prescribed strict controls and multiple approvals on management of human resources by its contractors. Under Contract Reform, DOE established a goal of reducing and ultimately eliminating government transactional approvals, and shifting to an approach that holds contractors accountable for their performance of human resource management without excessive DOE oversight. The new approach required government approval of the contractors' major human resource management systems and major expenditures, such as retirement and benefits packages and annual salary increase budgets, but it eliminated most or all of the transactional approvals that characterized the previous practice and used an Advanced Understanding on Personnel Costs to provide reasonable cost control. The Working Group concluded that the use of Advanced Understandings on personnel costs does not impede the ability of contractors to provide competitive compensation, benefits, and reward and recognition programs that are needed to recruit and retain critically skilled employees. However, the Working Group also determined that there are issues associated with local implementation of DOE's policies on contractor personnel costs that may be hindering the ability of some contractors to recruit and retain employees with needed technical expertise. The Task Force is implementing an action plan aimed at identifying and resolving specific problems.

In conjunction with the recently completed 30-Day Review of the SSP that was led by Under Secretary Moniz, DP was tasked to hire a "world-class" consulting firm to examine DOE's approach to contractor human resources management and to recommend appropriate alternatives that do not impede the ability of its contractors to attract and retain the best qualified individuals in today's competitive marketplace. KPMG Consulting reviewed DP policy, discussed its practices with DOE Headquarters, Field and contractor personnel, and recommended alternatives. Their discussions with contractor personnel included both human resources staff and line management. KPMG concluded that DOE's policy, in terms of its directive on contractor human resources management and the Advanced Understanding on Personnel Costs or Personnel Appendix that is included in DOE's contracts, does not impact negatively on the contractors' ability to recruit and retain critically skilled employees. However, while the policy and practices actively promote

competitive compensation, KPMG found them to be neutral with respect to other best practices in recruiting and retention. They recommended seven alternatives for DOE consideration that would help maintain an approach of continuous improvement with regard to contractor human resources management and to recruitment and retention of employees with critical skills in particular. In follow-up, the DOE-Contractor Working Group will incorporate KPMG's findings and recommendations into its action plan.

As a more immediate action to help ensure that DOE's policy does not inhibit contractor initiatives to recruit and retain critically skilled employees, DOE has developed a new contract clause that is being included in the three production plant contracts that are being re-competed during 2000: Pantex Plant, Y-12 Plant, and Kansas City Plant. The new clause makes it clear that DOE's goal is to provide the flexibility needed by its contractors to effectively recruit and retain employees with critical technical expertise, and instructs the contractors to notify the DOE contracting officer whenever they believe they do not have sufficient flexibility. The new clause will also be included in the Savannah River Site contract that will be negotiated following a decision this year whether to compete or to exercise an option for a five-year extension.

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CHAPTER 6

STATUS OF IMPLEMENTATION

The contractors have taken a significant step in assembling their initial critical-skills generation, retention, and regeneration plans. In general, those sites that have undergone significant downsizing have had more experience in conceptualizing and implementing a critical-skills workforce planning process. Both the laboratories and the production plants have vigorous programs for the documentation and transfer of knowledge possessed by personnel approaching retirement. For the laboratories and for key processes within the production plants, personnel quality is a serious concern for the future.

Several of the contractor management teams appear confident that they can meet the challenge of critical-skills generation, retention, and regeneration, provided that adequate resources are available, and if they receive help in dealing with the challenges summarized in Chapter 3 of this report.

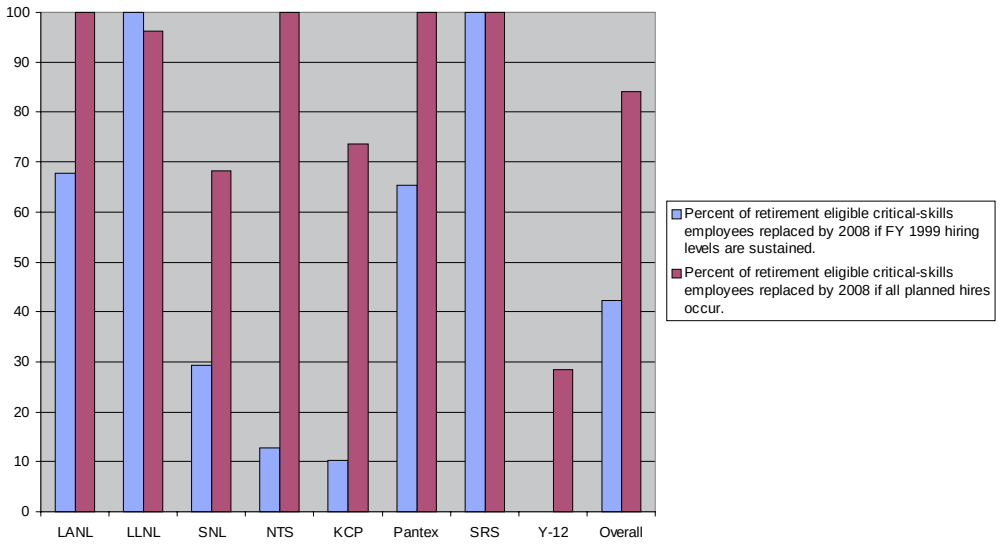


Figure 6-1. Critical-skills hiring at the contractor sites based on FY 1999 projections and current plans.

To understand the scale of the challenges faced at the laboratories, test site, and production plants, consider two scenarios for Complex-wide critical-skills employment in FY 2008. Because it can take up to three years of on-site experience to attain critical-skills proficiency, it is necessary to employ the requisite personnel by FY 2005 to be ready in FY 2008. The first scenario is

to project a critical-skills hiring level for FY 2000 through 2005, based on actual FY 1999 hiring data, the last year for which data are available. The second scenario is to project planned critical-skills hiring for that period, based on the sites' individual plans. These two scenarios are shown in Figure 6-1.

From these data, two key points can be made. First, based on past hiring experience (Scenario 1), there is cause for concern. If FY 1999 hiring levels were sustained for FY 2000 to 2005, all but two sites (LLNL and SRS) would have significant shortfalls in the number of critically skilled employees. In the cases of SNL, NTS, KCP, and Y-12, the shortfalls would be serious, and could prove to be unrecoverable. Second, based on planned critical-skills hiring, SNL, KCP, and Y-12, would still face significant shortfalls. Y-12, based on plan data, would retain only 28.5 percent of its critical-skills workforce. Clearly, management attention and focus is required in this area; however, because of the timely focus on this problem, DP believes that these critical-skills issues can be resolved in time, with appropriate support by the Administration and Congress.

6.1 PLANNED AND ESTIMATED RESOURCES FOR IMPLEMENTATION

Tables 6-1 and 6-2 summarize resources presently programmed for critical-skills recruitment, retention, and training activities in FYs 2000 and 2001, respectively. These data, obtained from the contractors, do not include program funding for other activities, such as ADAPT Campaign and university partnerships. These data should be considered preliminary, because they are based on the sites' initial evaluation of critical-skills retention needs. They will be refined as the sites begin implementation of the Chiles Commission recommendations during FY 2000.

Table 6-1. Resources budgeted at the sites for critical-skills recruitment, retention, and training during FY 2000.
(dollars in thousands)

Site	Recruitment	Retention	Training	Total
LANL	$5,191	$580	$2,500	$8,271
LLNL	$5,898	$2,213	$8,180	$16,291
SNL	$7,300	$800	$5,300	$13,400
NTS	$100	$700	$400	$1,200
KCP	$800	$400	$1,752	$2,952
PX	$416	$2,303	$589	$3,308
SRS	$525	$330	$20	$875
Y-12	$125	$1,275	$1,400	$2,800
Total	$20,355	$8,601	$20,141	$49,097

In aggregate, the sites have identified approximately $59 million in their FY 2001 plans for recruitment, retention, and training of critically skilled employees (see Table 6-2). These resource plans are based on the President's FY 2001 budget request, which was formulated prior to formalization of critical-skills retention measures at the contractor sites. Figure 6-1. Critical-skills hiring at the contractor sites based on FY 1999 projections and current plans.

Table 6-2. Resources planned at the sites for critical-skills recruitment, retention, and training during FY 2001.
(dollars in thousands)

Site	Recruitment	Retention	Training	Total
LANL	$6,254	$370	$2,600	$9,224
LLNL	$6,162	$2,273	$8,374	$16,809
SNL	$9,100	$800	$6,100	$16,000
NTS	$450	$3,950	$1,000	$5,400
KCP	$1,500	$600	$1,927	$4,027
PX	$434	$857	$616	$1,907
SRS	$552	$347	$21	$920
Y-12	$300	$1,250	$2,730	$4,280
Total	$24,752	$10,447	$23,368	$58,567

FY 2002 is the first year for which full planning and budgeting is possible for Chiles-related activities. The FY 2002 budget is being formulated presently, and will be released with the President's budget submission in the January-February 2001 timeframe.

6

CHAPTER 7

PATH FORWARD FOR THE FEDERAL WORKFORCE

A number of efforts are being taken to realign the federal DP workforce imbalance described in Section 3.2.1. These include

1. *Realigning critical-skills Headquarters and Field Office staff.*

At Headquarters, DP initiated a concerted critical-skills hiring program in the Spring of 1999. Thirty-four critical-skills position were identified and recruitment is underway. Of these positions, 31 are for personnel with technical or technical management skills. Only three are for DNFSB-related oversight, which is primarily a Field Office need. Specifically targeted are physicists, physical scientists, computer scientists, and computer engineers, who are expected to improve significantly the ability of the federal staff to oversee the highly technical stewardship activities at the contractor sites. As of July 12, 2000, eight positions have been filled.

DP is in the process of realigning its staffing structure to put people as close as possible to the activities they oversee. This includes shifting resources from Headquarters and Field Offices to the Area and Site offices to enhance their capabilities in performing safety assessments and technical oversight. Over time, the majority of critical-skills positions throughout the Complex will be located in the Area and Site Offices. DP intends to focus much of its succession planning efforts on maintaining a cadre of qualified federal personnel in these locations.

2. *Recruit and train a new generation, and retrain the existing generation, of weapons program managers and safety specialists.*

Last year, the Albuquerque Operations Office recruited six recent graduates to form a new weapons intern class, the first such class in nearly ten years. DP is taking actions to increase the number of interns by an additional nineteen positions during FY 2000 through recruitment under the Technical Development Leadership Program. These interns will be hired as a class but distributed among the DP sites. Also, a formal training program has been developed to retrain existing personnel that will include rotational assignments throughout the Weapons Complex.

3. *Increased collaborative training with the DP contractor community.*

Most of the laboratories and production plants possess formalized training programs for mid-level employees, as well as senior managers involved in the weapons programs. These programs can last between 12 and 36 months, and are used to nurture the cadre of contractor critical-skills employees. Currently, there are eight federal critical-skills personnel who are participating in these programs. Of those eight, two have been given a two-year detail assignment to work and train alongside laboratory

weapons employees. DP will expand its participation in these programs and work with the laboratories and production plants to develop integrated mid- and senior-level training programs for critical-skills positions.

4. ***Expanded use of Excepted Service and other incentives.***

At Headquarters, DP is expanding its use of Excepted Service positions in the recruitment of critically skilled scientists and technical managers, as described under point 1, above. Of the 34 critical-skills positions that have been approved, eighteen are Excepted Service, and two are Senior Executive Service.

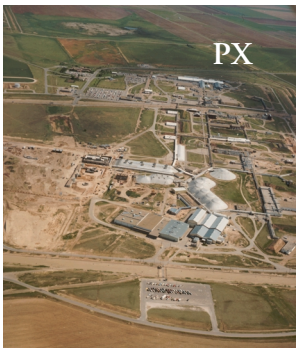
To compete with industry for new graduates and to be able to retain existing critical-skills employees, DP may need to expand its use of Excepted Service positions, as well as use incentives such as retention allowances and recruitment bonuses. In addition, DP is reviewing actions taken by other technical federal agencies, such as the National Institute of Standards and Technology and the National Aeronautics and Space Administration, faced with similar recruitment and retention problems, to determine if additional measures could be taken to correct DP's critical-skills workforce imbalance.

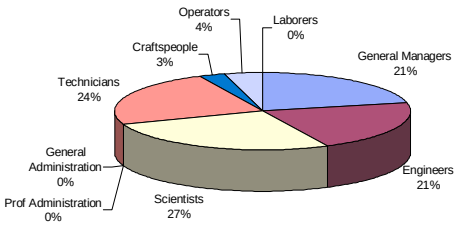
5. ***Institute a DP Federal Technical Fellowship Program***

The use of a DP Federal Technical Fellowship Program would allow for recruitment and training of new hires and retraining of the current workforce to enhance their skills in their respective scientific and technological fields. This would provide an intellectual stimulus and would help to keep federal technical staff on par with the M&O contractor technical staff.

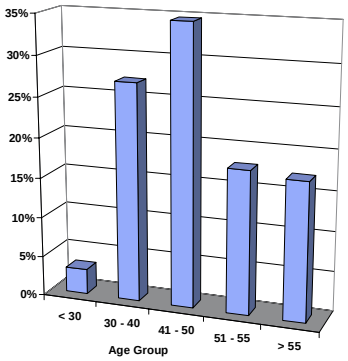
Chapter 8

SUMMARIES OF SITE PLANS





LANL Critical Skills Employment by Category



LANL Critical Skills Employees by Age Group

8.1.1 The Challenge

Employment in the five nuclear weapons divisions at LANL dropped from 8,075 in FY 1992 to a low of 6,590 in FY 1996. It then rebounded 14 percent to the current level of 7,495. This level is now funding constrained, so that further hiring is under tight administrative limitation. Planning for the future is based on a workforce maintained at the current level with hiring numbers that, at a maximum, allow replacement of those employees lost by attrition, including both retirement and termination. Within programmatic and budgetary constraints, LANL will bring in new employees for training prior to the retirement of experienced people from training-intensive necessary capability areas. However, difficulty in obtaining an adequate number of clearances to support a healthy number of apprentices, students and post-doctoral appointees in the critical-skills pipeline remains a roadblock to critical-skills regeneration at LANL.

8.1.2 Critical-Skills Workforce Planning

LANL is developing a Laboratory-wide Workforce Plan that will track annual hires in categories that represent critical capabilities for the nuclear weapons program and that will strategically plan for future recruitment, training, and redirection of the workforce to ensure maintenance of an adequate pool of employees with critical skills. It is also establishing a less cumbersome, more effective mechanism for the transfer of employees with needed skills within the existing laboratory population. Changing program directions and budgets have left some organizations with skills-mix problems and/or unfilled positions. The Workforce Mobility Initiative will develop more effective ways to promote movement of staff, as necessary, to address changing technical priorities and to ensure that LANL will have the best technical resources applied to the most critical technical problems.

LANL defines a critical-skills position as one in which a new employee requires more than three years to reach a reasonable, although not expert, level of proficiency. Of LANL's 3,442 DP-funded employees, 53 percent (1,837)

are critically skilled employees. LANL hired 79 people for critical-skills positions in the weapons program in FY 1999 and has budget-constrained plans to hire about twice as many in FY 2001 and later. This level of hiring will be great enough to offset expected losses of LANL critically skilled personnel, although perhaps not always in time to retain the same level of proficiency.

8.1.3 Critical-Skills Retention and Regeneration

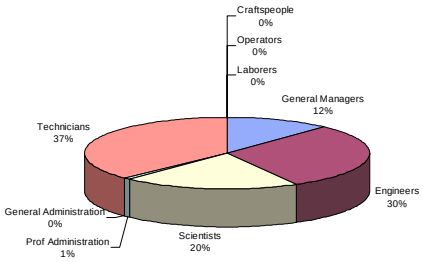
The LANL Institutional Recruiting Program currently focuses on entry-level technical staff and students. In FY 1999, the Nuclear Weapons Divisions hired 36 employees (regular, limited-term, and students) as a result of these recruiting efforts. LANL has fostered active recruiting relationships with a number of the Nation's best universities, including the California Institute of Technology, Cornell University, the Massachusetts Institute of Technology, Princeton University, Stanford University, the University of Illinois, and the University of California, Berkeley. LANL does not presently use targeted incentives either to retain or recruit key personnel, but incentives and salary differentials are under consideration by Laboratory management.

LANL has established two formal knowledge transfer programs, the Theoretical Institute of Thermonuclear and Nuclear Studies (TITANS) and the Joint Nuclear Explosives Training Facility (JNETF), to preserve and transfer the expertise of the nuclear test era into the indefinite future.

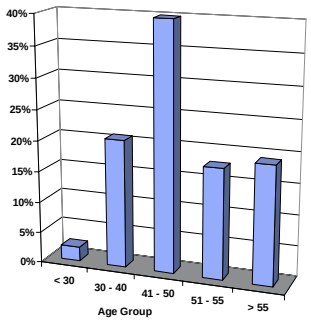
LANL makes use of a substantial local pool of retirees as consultants, contractors, and guest scientists. These experienced individuals work on specific issues of special interest, mentor new and less experienced scientists and engineers, and provide a strong element of continuity with the Laboratory's past technical activities.

8.1.4 Implementation Status and Cost

Although LANL's training programs are well established, its workforce planning efforts are newer. LANL now plans to implement its critical-skills hiring only as attrition and budgets permit. However, substantial additional resources could be required if current studies of salary differentials and other incentives produce a recommendation to use economic incentives in the service of critical-skills retention and recruitment.



LLNL Critical Skills Employment by Category



LLNL Critical Skills Employees by Age Group

8.2.1 The Challenge

Lawrence Livermore National Laboratory staffing is at a level about 10 percent below where it was at the end of the Cold War. LLNL traditionally has relied on its reputation for cutting-edge research, a non-bureaucratic working environment, an ability for scientists to interact with their peers through travel and professional publication, and the connection with the University of California that promises academic freedom and a generous benefits package to aid in recruitment and retention. LLNL employees and management, however, fear the loss of some of their laboratory's hiring advantages as a result of DP-wide decisions that have affected the workplace environment and restrictions on LDRD funding. Additionally, the booming Silicon Valley economy's impact is felt across the entire San Francisco Bay Area, resulting in a significant increase in attrition in certain technical specialties and a tighter labor market overall. Because of highly publicized security concerns in the weapons laboratories, foreign nationals, particularly those from Asian countries, appear to be less interested in employment at LLNL. Cancellation of the Laser Isotope Separation program and concerns over the budget impact of technical and project management problems at the National Ignition Facility have led to restrictions on current hiring.

8.2.2 Critical-Skills Workforce Planning

LLNL projects its 10-year loss of technical employees by assuming a retirement age of sixty and a two percent per year rate of non-retirement separation. Based on these assumptions, only 32 percent of current scientists and engineers would remain after ten years. The disciplines most vulnerable to retirements include chemistry, the life sciences, mathematics, and physics. Computer scientists are a particular concern given demand for such individuals in the San Francisco Bay Area job market. Of LLNL's total population of 8,190 employees, 2,828 contributed a month or more of effort to a DP program in FY 1999. Of these, 2,497 are career employees, of whom 1,981 are critically skilled scientists, engineers, technicians, and their first-line managers.

LLNL annually updates its workforce planning based on programmatic needs,

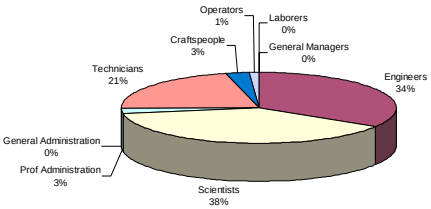
producing near-and mid-term guidance to functional organizations for staffing needs. LLNL has developed a stockpile stewardship skills database for use in conjunction with demographic information to identify long-term replacement needs. LLNL's matrix organization facilitates mobility across programs.

8.2.3 Critical-Skills Retention and Regeneration

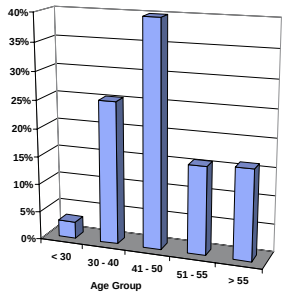
LLNL recently has implemented new programs that provide industry-competitive salary increases and major Directorate awards to help retain key personnel. Recruitment is facilitated through post-doctoral fellowships at the Laboratory, on-the spot offers, signing bonuses, and efforts to reduce clearance delays. LLNL has developed a variety of techniques for preserving nuclear weapons information and making it available to newer employees. These techniques include an extensive computer database, videotaping of individuals presenting both archival and newly-developed information, historical documentation of major projects, and specially created courses. LLNL retirees make important contributions to archiving and training. For example, in FY 1998, 78 retirees provided 14 FTEs of effort in these areas through projects organized by individual program managers. The limitation on obtaining clearances is an obstacle to building critically skilled individuals.

8.2.4 Implementation Status and Cost

Only recently has LLNL identified its critical-skills population. Associated costs will be included in subsequent reports. Preexisting activities during FY 1999 for recruiting, supporting undergraduate and graduate education, and for archiving and making nuclear weapons design information available within the laboratory totaled $9.5 million.



SNL Critical Skills Employment by Category



SNL Critical Skills Employees by Age Group

8.3.1 The Challenge

Sandia National Laboratories is responsible for the design and evaluation of key nonnuclear components of stockpiled weapons. This mission requires critical skills in information systems, engineering sciences, electronic and electromechanical engineering, physics, mechanical engineering, and specialized production techniques. Many of these skills are also in high demand in today's booming high-technology economy. Since 1990, the overall number of workers at SNL has declined 12 percent. Limited hiring focused on special skills has caused the average age of the technical staff to rise during the last four years to over 45, today. Budgetary restrictions and uncertainties, and a perception of a lessened national commitment to nuclear weapons, has made future employment security at SNL seem uncertain, leading to difficulties in recruiting and retraining critically skilled employees. Mandated polygraph testing, travel restrictions, and delays in security clearances have also contributed to recruitment and retention problems. Voluntary separations of technical staff have increased dramatically over the past few years, especially among those younger than 35. For these reasons, SNL management states that "many of the concerns identified by the Chiles Commission … cannot be addressed in the current environment."

8.3.2 Critical-Skills Workforce Planning

SNL defines 61 percent (2,248) of its 3,777 DP-funded employees as critically skilled. SNL's critical-skills workforce planning process utilizes a bottom-up, long-range personnel planning process. Hiring needs for critical skills are determined by line-organizations' assessment of gaps in technical capability, based on programmatic requirements and existing skills, and taking into account likely turnover and retirements. This planning does not identify a minimum level of critical skills, as distinguished from the level needed to meet the expected capacity needs. Only 15 percent of SNL's hiring needs for FY 2000 can be achieved at the level of resources devoted this fiscal year. Additionally, the 1,003 hires SNL proposes over the next five years is significantly greater than the 100 annual hiring opportunities that SNL expects to arise from natural attrition, so the tightness in resources could impact their

ability to address the skills mix issues. Given sufficient resources, SNL would institute a more aggressive hiring program that would ensure maintenance of critical skills. SNL's formal succession planning occurs as part of its Knowledge Management Program for all levels of weapons personnel (staff through vice president), and executive-level succession planning has been practiced since 1993.

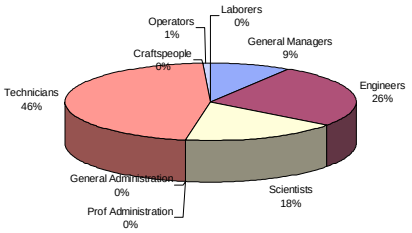
8.3.3 Critical-Skills Retention and Regeneration

Because of the specialized nature of its work, SNL relies on a core of knowledge that is not generally available in other institutions. Demographic analyses at SNL show that a generation of the most experienced engineers has left or is leaving, the current generation has less experience and knowledge, and the next generation has not yet been hired. Reduced hiring and a decade without the development of a new, full-scale nuclear weapon system have impeded the normal processes for knowledge transfer. Through the Knowledge Management Program, Sandia has developed an extensive set of formal knowledge preservation and transfer programs, such as the Knowledge Preservation Program and the Weapons Intern Program, to document existing knowledge and make it more readily available to present and future employees. These programs, established in 1997, make concerted use of the Retiree Corps. Sandia recognizes the usefulness of maintaining a larger nuclear "reserve" force for surge capacity, but other programs are deemed to have greater value.

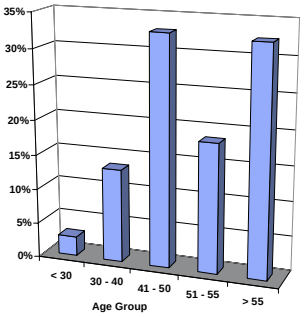
SNL relies heavily on partnerships with colleges and universities to provide a pipeline of potential new hires at various levels of technical proficiency. It has significant in-service education and quality of work life programs, as well as salary flexibility, that contribute to retention. SNL views advanced manufacturing and process engineering programs as useful mechanisms to stimulate recruitment of individuals with needed technical skills.

8.3.4 Implementation Status and Cost

SNL estimates that it will spend $13.4 million in FY 2000 in the program areas targeted at recruitment and retention measures, including administrative and educational programs, direct and indirect compensation, technical training, and competitive compensation. This estimate is based on current program costs, in a limited hiring program, operating within current budget constraints.



NTS Critical Skills Employment by Category



NTS Critical Skills Employees by Age Group

8.4.1 The Challenge

DOE Nevada Operations Office (DOE/NV) has contracted with Bechtel Nevada (BN) to operate the Nevada Test Site (NTS). NTS provides support for a variety of experiments, including those utilizing special nuclear materials that are crucial to maintaining stockpile confidence, as well as supporting the readiness to resume underground nuclear testing. BN also plays an active role in providing technical support in nuclear emergencies and non-proliferation and treaty support activities. These activities, especially the active program of experimentation, are important for stockpile stewardship, and are instrumental in maintaining readiness for underground testing. Without the experimentation program, recruiting for, and maintaining, underground nuclear testing skills would be considerably more difficult and would be a largely non-productive expense to NNSA. However, it appears that the current experimental program is not adequate to exercise all of the critical skills and capabilities needed for underground test readiness. Greater funding may be needed to adequately preserve test readiness, while undertaking a robust experimental program in support of stockpile stewardship.

The NTS workforce was reduced by 75 percent from 1992 to 1997 following the cessation of nuclear testing. In FY 2000, about 20 percent (461 individuals) of the former workforce with underground nuclear test expertise remains. BN is responding with a concerted program that manages personnel skills and seeks new hires to match the different skill mix associated with its current non-UGT activities. From FY 1996 through FY 1999, BN was able to hire 29 critically skilled employees, but lost at least half that number to attrition. BN has recently experienced additional attrition in the information technology services area that supports the DP NTS-based mission.

BN's hiring program is attempting to overcome the following impediments to recruitment and retention:

- Inability to offer development opportunities (i.e., equivalent of Plant Manager RD&D) as an inducement to hiring, rather than

hiring focused solely on responding to immediate, project-specific needs;

- Unstable NNSA NTS-based budget resulting in an unwillingness of managers to risk hiring staff not fully funded;
- Challenge of recruiting for five separate locations;
- Challenge of reporting to a remote work location requiring significant daily commuting;
- Cost, number limitations, and delays in obtaining security clearances;
- Restrictions on travel funds limiting recruiting activities;
- Salary competition with local industries;
- Inability to cover (gross-up) personal taxes applied to relocation reimbursements; and
- Competition between requirements for Stockpile Stewardship experiments and underground testing readiness.

8.4.2 Critical-Skills Workforce Planning

At BN, the term *critical* is used to denote a skill that is essential and specific to the Stockpile Stewardship experiment and underground-test readiness programs, as parts of the NTS mission. These skills typically are required to perform tasks of significantly above average risk, hazard, or technical requirements (including the "art" of performing it). The term *at risk* (also called *fragile*) is used to denote a skill, skill set, or capability in danger of falling below an acceptable inventory in terms of:

- The numbers of people who possess them,
- The degree to which the skill(s) have been maintained since last used actively, and
- The extent to which the knowledge and experience base underlying the skill has been captured such that the skill could be reconstituted in an appropriate time if necessary.

BN identifies 216 critical or fragile skills employees out of its 800 who perform direct work for DP. Their average age is 50, approximately 13 years from retirement. Of the total, 75 (35 percent) of the critically skilled employees are eligible to retire in FY 2000, and more than 150 (~70 percent) will become eligible within the next 10 years.

8.4.3 Critical-Skills Retention and Regeneration

BN actively manages its critical-skills inventory. It has implemented a salary adjustment program to ensure compensation competitiveness for critical skills personnel. The BN retirement program is back-end loaded to provide an incentive for employees to stay beyond their initial retirement eligibility. A small strategic hiring program, supported by university partnerships, summer hires, and competitive compensation, has been in place since 1998. In 1995, BN began

archiving knowledge associated with underground testing, and this methodology needs to be extended to subcritical experiments and other current activities to capture the evolution of nuclear expertise. Continuing education and mentoring will be used to retain existing critical skills personnel and to develop their replacements. BN maintains a retiree corps of more than 40 members to support underground nuclear test readiness and to consult on current activities.

8.4.4 Implementation Status and Cost

At an estimated cost ramping up from approximately $1 million to $4 million by FY 2002, BN intends to establish a critical skills assessment and planning process. The initiative also will allow existing critical-skills personnel to participate in job enrichment and workforce cross-training.

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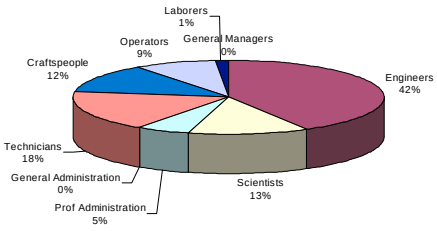
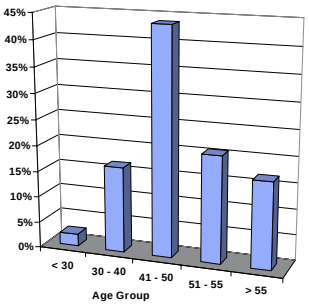


KCP Critical Skills Employment by Category



KCP Critical Skills Employees by Age Group

8.5.1 The Challenge

Management at KCP believes that the ability to recruit and retain the workforce necessary to perform required work in the future is in question. The ability to hire new people and retain current workers is at risk today, because of funding limitations. The ability to adjust total compensation packages (wages and benefits) to be competitive with commercial companies is critical in the retention and hiring of all workers. A key dissatisfaction among KCP employees is the disparity between the Honeywell, Inc. benefits package and that which DOE allows to be offered by Honeywell Federal Manufacturing and Technology (FM&T).

The employees most at risk today are engineers and computer professionals. Both groups are recruited vigorously by other companies. In some critical-skills areas, KCP has only a single person remaining with a given skill. The age and length of service of this workforce indicates that approximately one-third of the critically skilled workers could leave through attrition or normal or early retirement within the next three years. Seven percent are currently over sixty years of age, and fifteen percent are over fifty five.

8.5.2 Critical-Skills Workforce Planning

KCP defines critical skills as those skills necessary to maintain the spectrum of the manufacturing and process capabilities necessary to meet DP mission requirements. This includes most technically degreed employees, as well as selected other classifications. Thirty-one percent of KCP's DP workforce is critically skilled.

The wide diversity of the technologies (more than 40 product lines) at KCP requires constant retraining and shifting of personnel to meet mission requirements within budgetary constraints. A sophisticated Technical Work Force Skills Inventory has been conducted to identify gaps, potential gaps, and replacement plans to ensure coverage of key technologies.

KCP management has prepared and implemented workforce restructuring plans with speed, effectiveness, and compassion for the workers affected. They have demonstrated the ability to mobilize and effect restructuring in as little as six weeks. KCP management has, in place, the mechanisms to focus on maintaining minimum levels of critical skills and knowledge, consistent

with managing the workforce to conduct current and anticipated future workload. The recent changes in the collective bargaining agreement have greatly increased KCP's flexibility to move employees to where they are needed, and has allowed increased cross training of manufacturing employees.

8.5.3 Critical-Skills Retention and Regeneration

KCP management is proud of its rewards and training programs. The rewards program is flexible and offers a variety of rewards and recognition opportunities ranging from monetary rewards to distinguished, high honor recognition. There are three major components of this rewards program. First, FM&T financially rewards up to twenty teams and twenty individuals annually for their contributions to KCP business success. Second, the Significant Technical Achievement Reward and Recognition (STARR) Program annually recognizes and rewards employees for technical excellence. Third, to retain top talent, FM&T has a Stock Option Program that awards grants of approximately 22,000 stock options each year. In addition, FM&T has made selective pay adjustments for workers in areas essential to its business.

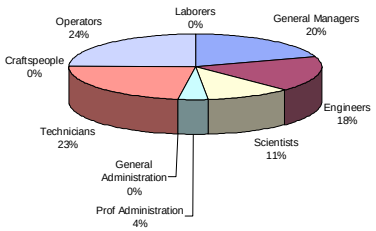
The ADAPT and Enhanced Surveillance Campaigns have allowed more than 150 KCP employees to develop critical skills for application within the nuclear weapons program. In addition, management commits to offering 40 hours of learning each year to each employee. This learning can be accomplished through formal topical classes, continuing university education, a Technical Fellowship Program, or any number of targeted subject presentations through traditional classroom training or through the use of computer based training.

Honeywell has targeted 36 of the world's best universities for recruitment activities. These universities are selected based on National Business & Engineering Rankings, past recruitment yield, diversity enrollment, and industry and geographic considerations. FM&T is active on the Honeywell University Relations Council, and has access to the corporation's electronic database of all Honeywell university recruitment candidates. Extensive corporate networking is available to FM&T to, assist in identifying experienced candidates to support the KCP mission.

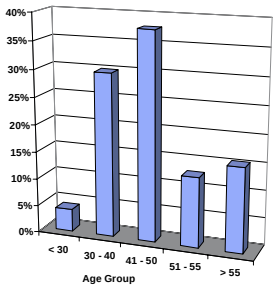
Given the age profile of the KCP critically skilled workforce, management is concerned regarding whether it will be able to hire replacements that can be trained before current critically skilled personnel leave. KCP management would like to get ahead of attrition in its critical-skills hiring, but is unable to do so under current budget constraints.

8.5.4 Implementation Status and Cost

KCP estimates that it would cost between $4 and $4.5 million per year to make the KCP benefits package equal to the rest of Honeywell, a step that would ease retention and recruitment problems. Hiring additional critically skilled personnel in FYs 2000 and 2001, to get ahead of attrition, would require additional funding outside of current plans.



Pantex Critical Skills Employment by Category



Pantex Critical Skills Employees by Age Group

8.6.1 The Challenge

Pantex's primary mission is the assembly and disassembly of nuclear weapons. Stockpile assessment and storage activities also occur at Pantex. Due in part to fluctuations in the dismantlement workload, employment at Pantex actually increased from 2,514 in 1991, to 3,378 in 1995. It now stands at 2,841. Pantex's continued dismantlement and surveillance workload has also meant that the Pantex workforce has current hands-on experience.

With a high average retirement age and a relatively low average age for critically skilled workers, Pantex critical-skills employees now average 19 years to retirement. Only 14 percent of current Pantex critical-skills workers are now eligible to retire; this percentage is projected to rise to just 31 percent in 2010. Pantex also used Voluntary Separation Incentive Programs in 1997 and again in 2000 to rebalance its workforce.

It often takes Pantex six to nine months to fill an advertised position, especially for occupational specialties that are in demand in the high-technology economy and for potentially hazardous jobs such as explosives and plutonium handling. Pantex's remote location and incommodious facilities inhibit recruiting, as do security clearance requirements and a perceived lack of salary competitiveness.

8.6.2 Critical-Skills Workforce Planning

While critical skills seem less imperiled at Pantex than elsewhere in the Nuclear Weapons Complex, Pantex has instituted a workforce planning process that reviews current and projected workloads and watches for potential skill gaps.

8.6.3 Critical-Skills Retention and Regeneration

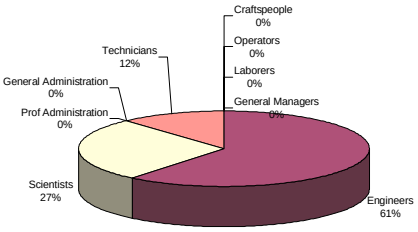
Management is reviewing compensation and publicizing favorable results to aid in retention. It is also educating managers and encouraging continued education for the same reason. Other retention measures include flexible compensation and incentives, rewards and recognition, and job enrichment through ADAPT and the Enhanced Surveillance

Campaign. Access to knowledge is maintained through an archiving program and a retiree corps (established May 1999) that will help train new hires and provide specialized consultation. An inter-plant senior scientist network involving Pantex, KCP, Y-12, and SRS promises a positive work environment for senior professionals.

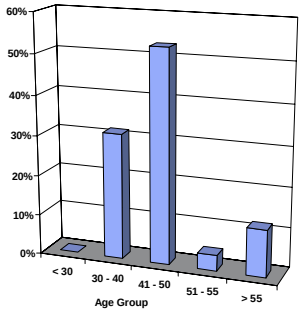
Pantex is pursuing a variety of collaborative programs with colleges and universities and taking advantage of the Internet for recruiting. It has established a variety of formal training and periodic skills assessment programs to ensure that the workforce develops its skills as required for the projected workload.

8.6.4 Implementation Status and Cost

Pantex's workforce planning, retention, and recruitment measures are in place and have been funded within current programs.



SRS Critical Skills Employment by Category



SRS Critical Skills Employees by Age Group

8.7.1 The Challenge

The SRS Tritium Facility's primary mission is supplying tritium-filled reservoir components for the nuclear weapons stockpile. Activities that support this mission include: tritium recycling and recovery, reservoir loading and unloading, and reservoir surveillance testing. Both the operating facilities and the technological expertise for execution of the mission have resided at SRS for the last 45 years. As the DP mission represents approximately 10 percent of the overall workforce at SRS (12,500 personnel), a large resource is available to draw from should a critical need develop. In general, the DP workforce at SRS has been and is projected to remain stable. The DP program at SRS annually hires small numbers of college graduates to feed the experience pipeline that supplies critical-skills positions. The mix of attractive location, low cost of living, competitive pay scale, and technically challenging work continues to allow the Tritium Facility to hire high-quality personnel. The only barriers to retaining and replacing critically skilled employees are fluctuating ADAPT Campaign and Enhanced Surveillance Program budgets and the general disfavor with which today's college graduates view the nuclear complex.

8.7.2 Critical-Skills Workforce Planning

Westinghouse Savannah River Company (WSRC) has evaluated the long-term critical-skills workforce required for the SRS Tritium Program to support the needs of the Nuclear Weapons Complex. SRS categorized critical skills as those specialized skills essential for the continuance of the SRS mission that would take two to three years of training and on-the-job experience to replace. For planning purposes it was assumed that in a critical situation the larger site workforce could be used as a resource pool from which personnel, with appropriate security clearances, could be drawn. The majority of the manufacturing positions were not deemed critical given the availability of the site workforce to draw upon, and the existence of well-developed training and qualification programs that have a one year execution time. The majority of the SRS critical-skills positions fall in the areas of engineering, science, and computer support. Fifty one specific critical-skills jobs were identified.

Employees currently filling these positions have an average of 14 years remaining until retirement, eight are older than 50 years.

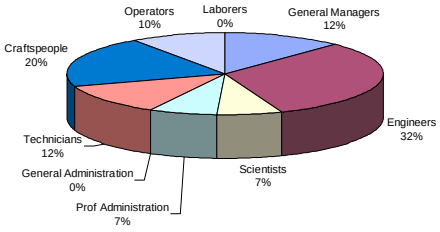
The DP area at SRS hired eleven scientists and engineers in FY 1999, and is anticipates hiring at a level of 9-11 scientists and engineers per year, indefinitely. This recruiting effort maintains the level of technical competence in the staff and offsets forecast attrition. Experience has shown that refilling the critical-skills pipeline will not be difficult provided adequate funding levels are maintained and recognition of the need to maintaining this level of recruiting.

8.7.3 Critical-Skills Retention and Regeneration

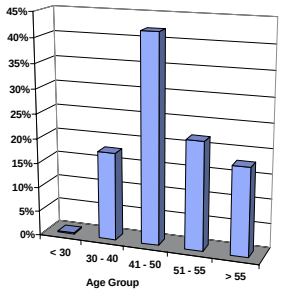
SRS maintains numerous key personnel retention programs. These programs include paid fellowship leave, exchange programs with LANL, external recognition programs and partnerships with educational institutions to perform unclassified R&D. Employee benefits for continuing education also play a role in retention and in the broadening of needed skills. As needed, salary adjustments have been made to select skills in the workforce to ensure they remain competitive with commercial industry. Attrition in engineering, which is the predominant skill in the SRS DP critical-skills assessment, has been lower than the site average.

8.7.4 Implementation Status and Cost

SRS has a retention and recruitment plan and sufficient funding to ensure the preservation of critical skills in the plant manufacturing area. Critical skill retention is at greater risk in the scientist category due to fluctuations in ADAPT Campaign and Enhanced Surveillance Program funding.



Y-12 Critical Skills Employment by Category



Y-12 Critical Skills Employees by Age Group

8.8.1 The Challenge

Y-12 is responsible for each nuclear weapon secondary, as well as for the radiation case of the weapon. This includes cradle-to-grave responsibilities in materials science, production process technology, manufacturing, certification of quality, surveillance of secondaries removed from the stockpile, and disassembly, storage, and disposition of materials from secondaries retired from service. The technical and craft skill base for this mission is broad in terms of the number of skills required, deep in terms of the knowledge base required, and unique because of the mission centrality of special nuclear materials fabrication. Moreover, the demand on these skills varies tremendously depending on the stockpile workload. The Y-12 DP workforce is down more than 35 percent from its 1990 level, yet the workforce retains the skills needed to operate processes required to support all weapons in the stockpile, even where these processes are not currently operable or in immediate demand. This is the result of a deliberate process of core-competency planning, institution of the Production Capabilities Assurance Program that mixed technical and operational tasks to retain skills and exercise processes, establishment of the Knowledge Preservation Program to document the knowledge of experienced employees and retirees, and initiation of a Y-12 Retiree Corps to permit access to unique skills of retired personnel.

8.8.2 Critical-Skills Workforce Planning

Although all of the workforce is essential for Y-12's mission and workload, the critical skills embody the core capabilities that must be protected. Specific definitions are used in Y-12's planning:

> *Critical Skill:* A knowledge-base or skill, specific to Y-12, that must be retained in order to meet DP mission requirements and that requires greater than 2-3 years of work experience at Y-12 to develop (in addition to any formal educational requirements.)
>
> *Minimum Number:* The minimum number of personnel that must be

retained for each critical skill to maintain the capability to meet DP requirements. In general, the minimum number should be independent of workload but able to support a minimal production rate and ramp up to production activities within a three year time period.

These definitions are focused on those skills that require a long training period to reach competency. An additional concern is for personnel capability, instead of capacity or workload. The definitions yielded a list of about 120 specific critical skills in seventeen occupational categories. Out of the DP workforce of 3,609 employees, 929 (28 percent) are critically skilled, and 539 (16 percent) comprise the minimum required number. The critical-skills workforce averages 49 years in age and is ten years from retirement. Through 2010, 606 critically skilled employees will reach full retirement eligibility, at about age 58. While attracting newcomers to the weapons business is difficult, Y-12 hopes to make 150 critical-skills hires through 2005, a level that it believes would be adequate to maintain a minimum level of critical skills. Y-12 updates its critical-skills assessment annually, because critical skills will change along with changes in technology and the demands of the SSP.

8.8.3 Critical-Skills Retention and Regeneration

The focus on a minimum level of critically skilled workers provides for an efficient critical-skills retention and regeneration program. Y-12 can focus, by name, on the people it most needs to retain. It has resumed recruitment at universities this year, as well as various university cooperative activities, summer hiring, and fellowships – an activity that had atrophied from disuse. Y-12 uses about 30 retirees for mentoring, training, modernization planning, and process operation consultation.

8.8.4 Implementation Status and Cost

Having started critical-skills planning in 1998 and focusing on maintaining minimum levels of critical skills, Y-12 has an effective planning process in place. Y-12, which began critical-skills hiring this year, estimates that needed critical-skills retention and regeneration measures can be accomplished for a total of $40 million from FY 2001 through FY 2006. Existing target funding at the Y-12 Plant does not provide for extensive critical-skills hiring. Y-12 expects this funding to be provided through the Secondary Readiness Campaign. A major expense is salaries for on-the-job training, to bring new hires up to the necessary level of proficiency during an overlap with existing, critically skilled personnel, while being mentored.

8

APPENDIX A

DOD NUCLEAR MISSION MANAGEMENT PLAN (U), CHAPTER 8: PERSONNEL PROGRAMS (REDACTED)

With Dr. Hamre's signature on March 17, 2000, DoD completed its first Nuclear Mission Management Plan (NMMP). NMMP is DoD's first attempt at a comprehensive overview of the current and predicted state of U.S. nuclear forces, the policies and plans that direct them, and the infrastructure available to sustain and support them. The NMMP contains a chapter dedicated to Personnel, which is included in its entirety in this appendix.

CHAPTER 8

PERSONNEL PROGRAMS

TABLE OF CONTENTS (U)

Chapter 8. Personnel Programs (U).

(U) There is no doubt that DoD's greatest strength is in its people. As the focus of the United States' nuclear deterrence has changed over the recent years, DoD personnel have remained flexible and adapted to these changes. This chapter addresses DoD and Service plans to maintain core nuclear expertise through programs to recruit, train, and retain both military and civilian personnel. These members include traditional operational roles in the active duty components but also the reserve and medical resources, too.

8.1. RECRUITING AND CAREER PATHS (U).

8.1.1. ARMY PROGRAMS (U).

Background (U). (U) While the Army's operational tactical nuclear weapons capability was eliminated, its people still play a vital role in the joint nuclear mission. To meet these continuing requirements, the Army maintains an officer inventory in Functional Area 52, Nuclear Research and Operations. The Director, USANCA is the personnel proponent for Army officers designated FA52. As the proponent, USANCA is responsible for the structure, acquisition, distribution, development and sustainment of FA52 officers. FA52 is the functional area where trained and experienced officers apply knowledge and expertise of weapons of mass destruction in: developing national and theater strategy, plans and policy; in conducting nuclear weapons effects research and analysis; developing international treaty formulation and verification; and in planning the employment of nuclear weapons to support theater and strategic operations. FA52 currently has an inventory of 283 officers assigned to satisfy 142 authorizations in joint, OSD and Army organizations. Each year, FA52 assesses an additional 30-35 Captains through the Functional Area Designation process.

(U) To qualify with this FA52 specialty, new ascensions receive two weeks of training at the Defense Threat Reduction Agency's (DTRA) Defense Nuclear Weapons School (DNWS) at Kirtland AFB, NM. Instructors teach the Nuclear Research and Operations Course (NROC) and cover skills required to apply knowledge for all types of weapons of mass destruction. Larger bodies of Army officers, not necessarily part of FA52 specialty, hold the Additional Skill Identifier 5H as a Nuclear Target Analyst.

(U) Qualified officers are assigned to meet FA52 billets at the appropriate grade. Because the FA52 grade structure is very close to the optimal personnel management structure, officers seldom participate in assignments outside the core functional area. Instead they move into consecutive, developmental FA52 assignments, with only attendance at required professional development courses between assignments.

Current Improvements (U). (U) Based on an Army initiative, DNWS now sponsors the Joint Nuclear Operations and Targeting Course (JNOTC) and a JNOTC mobile training team. This five day course provides training for staff nuclear planners from each of the Services for joint nuclear operations and targeting. The course curriculum covers the mechanics of nuclear targeting IAW Joint Publication 3-12.2 and satisfies U.S. Army qualification requirements for the 5H Additional Skill Identifier.

8.1.2. Navy Personnel Programs (U).

Background(U). (U) Navy Strategic Systems Programs (SSP), headquartered in the Washington, D.C. area, employs approximately 775 civilians and 500 military across the U.S. Major field activities include the two SSBN homeports in Bangor, WA and Kings Bay, GA, Naval Ordnance Test Unit, Cape Canaveral, FL, contractor facilities and the DOE nuclear weapons laboratories. Navy SSP is a unique organization responsible for all elements, cradle-to-grave, of the Navy deterrent missile systems.

(U) SSP 's mission effectiveness is grounded in three fundamental tenants:

- (U) Single mission (strategic deterrence)
- (U) Dedicated platform
- (U) "Closed Loop" detailing to maintain a stable workforce.

(U) SSP ensures that people and processes are qualified/certified for technical adequacy. Fleets, field activities, and contractors are subjected to literally dozens of evaluations each year.

(U) The personnel employed at the two Strategic Weapons Facilities (SWFs) in Bangor, WA and Kings Bay, GA assemble and test the Trident I and Trident II missiles respectively and load them onboard SSBNs. As part of the planned Trident II (D5) upgrades to Bangor, an initial operating capability (processing and limited storage) is planned for June 2002.

(U) Early technicians in Navy nuclear weapons programs were designated as Gunners Mate Technician (GMTs). With weapons becoming more sophisticated and the reduction of the Navy's nuclear stockpile, the GMT rating evolved into the WT, Weapons Technician, rating. Finally, when the Navy's stockpile was reduced to the W76/Trident I, W80-0/Tomahawk and W88/Trident II weapon systems, the WT rating was dissolved.

(U) Nuclear weapon systems operation, maintenance and deployment from the enlisted cadre are conducted by MTs (Missile Technicians). Originally, there was also a FTB (Fire Control Ballistic) rating to operate the fire control system. However, the

FTB and MT ratings have been combined into a single MT rating. In their capacity as submariners they have no direct contact with nuclear weapons.

(U) Historically, the officer community manning submarines has come from two disciplines; Nuclear Power trained officers for engineering and command billets and General Submarine Officers (GSOs) and Limited Duty Officers (LDOs) for weapons and navigation billets. The Nuclear Power trained officers were typically selected from the Naval Academy and college Reserve Officer Training Corps (ROTC) programs. GSOs were obtained through OCS (Officer Candidate School), and LDOs from enlisted to officer programs including service-funded college degree completion programs such as the Naval Enlisted Scientific Education Program (NESEP).

(U) In the late 1980s, the Navy set a goal for "all nuke" submarine wardrooms. Officers with nuclear power training were sent to basic submarine weapon schools and assigned as Weapons Officers and Assistant Weapons Officers. However, the goal was never fully met and to date, the Navy is reintroducing LDOs into submarine wardrooms.

(U) Although the uniformed workforce has undergone some reductions as well (about 25 percent) despite no change in requirements, the Navy has had reasonably good success with recruitment and retention of both officers and enlisted personnel. Officers receive an array of incentives and bonuses, which certainly have helped. Some shortfalls exist in the technician ranks, but are being addressed.

8.1.3. Air Force Personnel Programs (U).

Background (U). (U) This section describes the officer and enlisted career fields that support: operations; maintenance; nuclear force protection; nuclear surety; emergency ordnance disposal; scientific research and development. Maintenance on specific nonnuclear aircraft subsystems (e.g., engines, and avionics) is not covered. Officer career field management is governed by Air Force Manual 36-2105, *Officer Classification*; enlisted career field management by Air Force Manual 36-2108, *Airman Classification*. For each of the Air Force Specialty Codes (AFSCs) discussed below, the 'x' represents the skill/experience level; 1 to 4 (4 is highest) for officers, and 1, 3, 5, 7, or 9, plus 0 (0 is highest) for enlisted personnel.

Operations (U). (U) Officers who maintain alerts for the command and control of ICBMs are part of the, Space and Missile Operations career field (AFSC 13SxC). After attending an initial space and missile orientation course at Vandenberg AFB, CA, these officers continue at Vandenberg to learn specific weapon system operation and employment for their assigned system. Total time in training is about nine months. Upon completing these basic qualifications, officers move on to their assigned wing for unit-specific training and qualification for approximately one

month. A typical missile operator progression through the wing then begins when they join the crew force. Missile operators will typically serve as a missile combat crew deputy for 6 to 18 months and then move to a staff position within the missile squadron or operations group. Depending on the officer's time in grade, they may later move to other support positions or upgrade to Missile Combat Crew Commander and return to the crew force. After serving in this second crew position, officers may return to another staff position or a permanent change of station to a new assignment. Typical missile operator tours last four years at the assigned wing. Follow on assignments may include a follow-on nuclear-related assignment or a space operations tour. Figure 8-1 summarizes typical career progression in the 13Sxx career field.

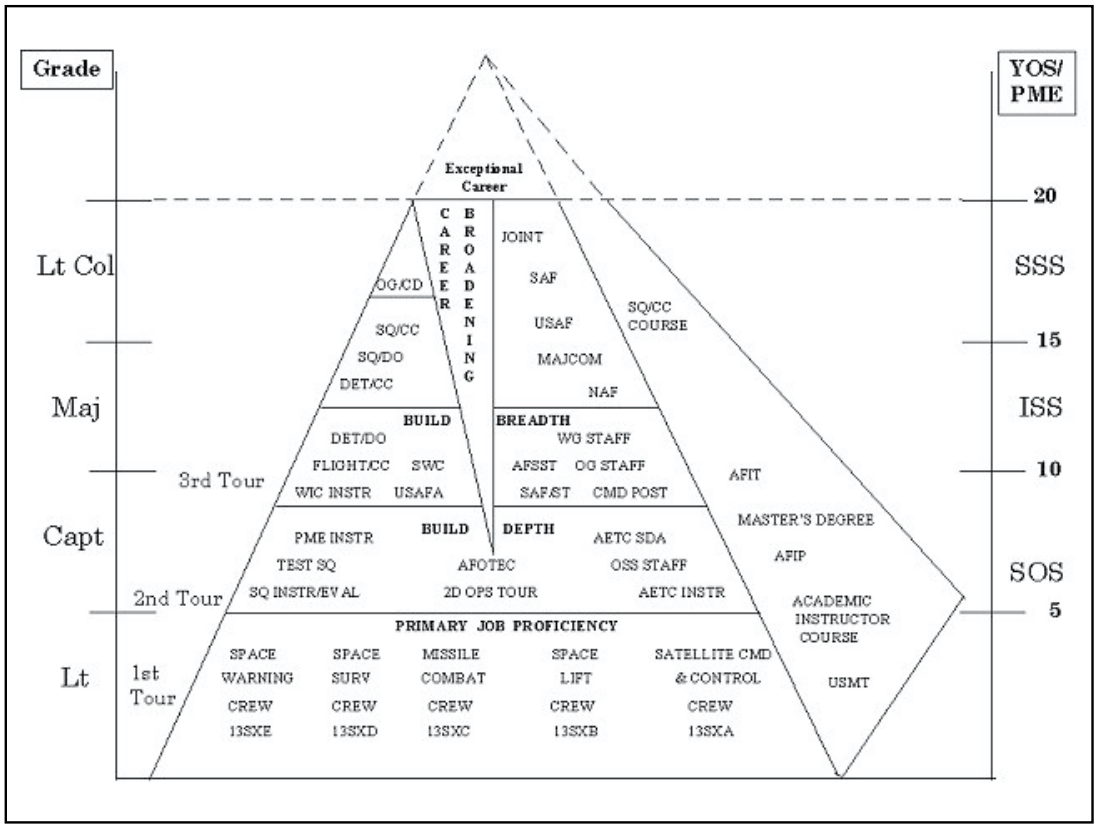


Figure 8-1. (U) Typical space and missile operations career path.

(U) There is no specific pilot, navigator or aircrew career field to support nuclear operations. For example an F-16C/D pilot assigned to a nuclear capable unit has the same AFSC as other pilots in the same weapon system assigned to a unit with a conventional only mission. Nuclear mission planning and weapon delivery are skills taught and practiced at the unit level when assigned to a nuclear-capable unit. Similarly, those transport crews assigned to nuclear certified logistics airlift units hold

the same C-141 or C-130 pilot/navigator/aircrew AFSC as other nonnuclear airlift crew members.

(U) Assignment and career progression is similar to other Air Force operations career fields. Newly assigned officers start at Undergraduate Pilot Training or Undergraduate Navigator Training for about one year; some navigators receive additional training as Electronic Warfare Officers/Defensive Systems Operators. Next these officers are assigned to a particular weapon system and receive specific training that can last up to an additional year. Once officers move on to their assigned wing, they receive specific unit training that will include nuclear-related skills, as required. Figure 8-2 shows a similar progression as seen above in Figure 8-1.

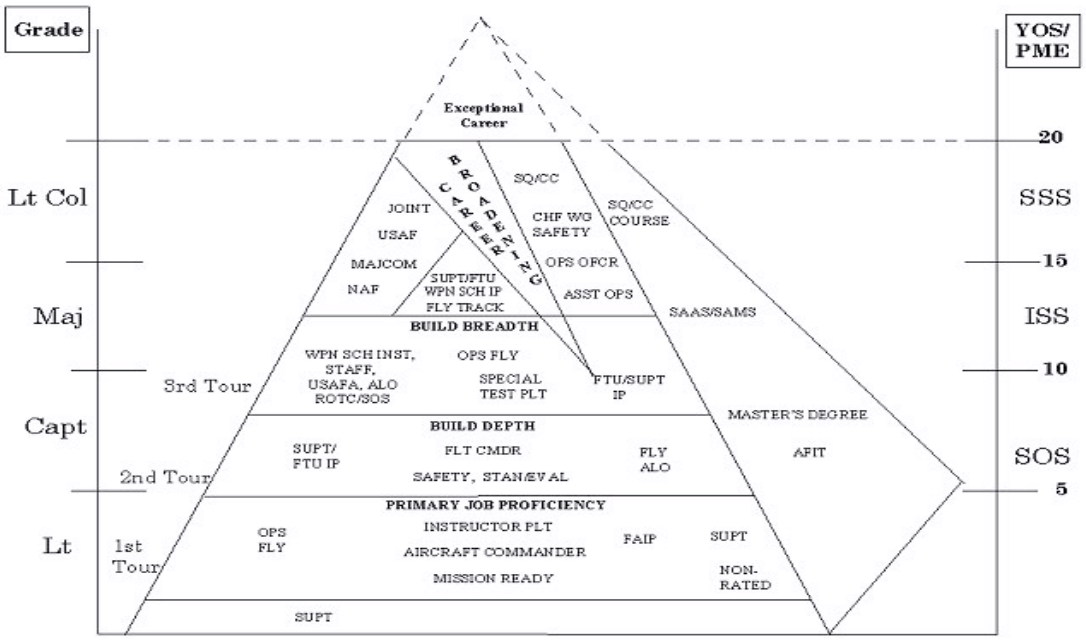


Figure 8-2. (U) Typical pilot career path.

. **<u>Maintenance (U)</u>.** (U) Those who maintain the ICBM weapon systems are drawn from two different career fields. Weapon system maintenance, except the reentry vehicles (RVs), is the responsibility of officers in AFSC 21Mx, Space and Missile Maintenance. Officers overseeing RV and warhead maintenance are part of the 21Ax career field, Aircraft Maintenance and Munitions, with a special identifier (21AxA) for those assigned to nuclear munitions maintenance. Officers supervising aircraft armament (nuclear and nonnuclear) maintenance and munitions maintenance are also part of the 21Ax career field. Figure 8-3 shows typical career progression for maintenance officers.

(U) The Missile Maintenance Officer Training course at Vandenberg AFB, CA is designed to provide an introduction to ICBM weapon systems and the organizations, programs and processes required to maintain the weapon system. In addition to

classroom lecture, students also perform hands-on training on a sampling of maintenance tasks performed in the missile field during the 27-day course.

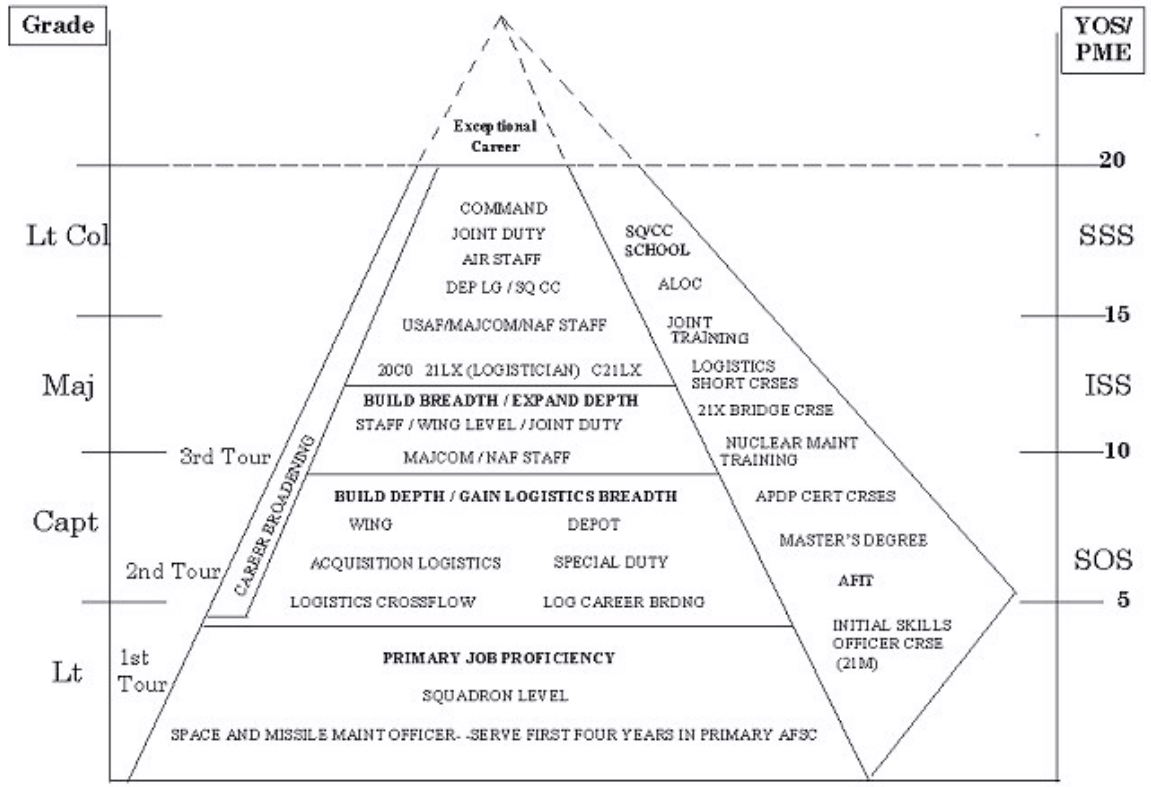


Figure 8.3. (U) Typical maintenance office career path.

(U) Enlisted AFSCs performing nuclear weapon system maintenance are listed in Table 8-1.

A

Table 8-1. (U) Air Force Enlisted Nuclear Maintenance Specialty Codes

AFSC	Career Field Identification
2M0x1A	ICBM Missile and Space Systems Electrical Maintenance
2M0x2A	ICBM Missile and Space Systems Maintenance
2M0x3A	ICBM Missile and Space Systems Facility Maintenance
2W0x1	Munitions Systems (storage, handling, nonnuclear maintenance)
2W2x1	Nuclear Weapons (nuclear bomb and warhead maintenance and inspection)
2M0x1B	ALCM Missile and Space Systems Electrical Maintenance (ACM/ALCM missile system maintenance)
2W0x1	Munitions Systems (storage, handling, nonnuclear maintenance)
2W1x1a	Aircraft Armament Systems (aircraft weapon system maintenance & weapons loading) (a = identifier for specific aircraft type)
2W2x1	Nuclear Weapons (nuclear bomb and warhead maintenance and inspection)

Nuclear Force Protection (U). (U) Force Protection officers in AFSC 31Px, and enlisted personnel in AFSC 3P0x1, Security Forces, perform nuclear security duties when required by the unit mission. There is no separate AFSC or specialty identifier for nuclear security operations. However, this type of experience early in an officer's career is considered the cornerstone for leadership development while providing technical expertise.

Nuclear Surety (U). (U) The Air Force uses the term nuclear surety to encompass nuclear safety, security, and reliability. Until about 1994, each base with a nuclear mission had a weapons safety officer assigned to the commander's staff. (Bases with only explosives and/or missile missions might have an officer or NCO as the senior member of the weapons safety staff, depending on the scope of the mission.) This officer was drawn from AFSC 21Ax, Aircraft Maintenance and Munitions, and carried a special AFSC of 21AxX for weapons safety. One or more NCOs drawn from the functional AFSCs applicable to the nuclear, explosives or missile maintenance missions being performed supported the weapons safety officer. These NCOs also carried the "X" designator on their AFSCs to indicate they were assigned weapons safety duties. Since 1994, the Air Force has eliminated all weapons safety officer positions and assigned their duties to senior NCOs who are either ground/weapons safety managers, AFSC 1S0x1, or NCOs from relevant functional areas (e.g., 2W1, 2W2). 'X' designators are no longer used to indicate weapons safety positions.

Explosives Ordnance Disposal (EOD) (U). (U) Until the early 1990s, EOD officer and enlisted personnel were a part of the munitions career field. Since then, both became part of the civil engineering career field. Officers hold AFSC 32ExH, Explosives Ordnance Disposal Engineer, or AFSC 32ExK, Explosives Ordnance Disposal (Non-Engineer), and enlisted EOD personnel hold AFSC 3E8x1, Explosives Ordnance Disposal. All EOD personnel are trained in both nuclear and nonnuclear operations.

Nuclear Engineering and Nuclear Physics (U). (U) Officers who maintain the core technical expertise in the nuclear field are part of the 61SxD career field. These scientists and engineers are responsible for maintaining the scientific credibility behind operations and analysis concerning nuclear phenomenon. The pool from which to pull members is rapidly decreasing in size and suffering from the Graybeard phenomenon, highly experienced personnel retiring in large numbers and very few younger, new personnel entering the nuclear field. Career progression in this field is dependent upon advanced academic degrees in nuclear engineering or physics.

Personnel Actions (U). (U) The Air Force is having retention problems with pilots, navigators, and various enlisted support specialties. The problem is even more exaggerated in smaller year groups (1990 to 1998) because of extreme cuts in new pilot and navigator training during these years. Although the service increased class sizes and the number of overall classes over the last three years, this junior to mid-level experience gap can not be readily replaced without keeping more senior officers in these billets. In the future there will not be enough new or older pilots and navigators to fill them. In 1998 alone, the Air Force lost more pilots then it could train. The Service is implementing many options to fill this gap. They include raising training age limits for pilot and navigator training from 27 and a half to 30 years of age and less than 5 years commissioned service and the possibility of using more contractors as instructor pilots .

(U) Retention problems are also being felt in the security forces and command post controller career fields, major players in the effectiveness at any nuclear-capable wing. This shortage is exacerbated by high TDY rates to support global contingencies, already poor retention rates, and high operation tempos. Senior officials are aware of this problem and potential corrective actions are being explored. These include: improving conditions and compensation for those who decide to stay on active duty beyond their initial enlistment; single dorm rooms; signing bonuses; placing reservists on the Personnel Reliability Program to augment deployed active duty members. Retention is not the only issue impacting the Air Force's nuclear community.

(U) The loss of a separate AFSC for munitions officers, the elimination of weapons safety officer positions at nuclear units, decreased opportunities for nuclear operations experience and a corresponding decrease in personnel with nuclear experience are all causing concern within the Air Force. In response to some of these

problems, the Air Force Chief of Staff approved a strategic plan to modify personnel and training program modifications to improve nuclear operations and logistics support. Part of this plan will reincorporate the munitions officer career field into the missile maintenance career field. The proposal's goal is to form a core nuclear experienced career field with more options than strictly ICBM maintenance. The Air Force will establish the re-engineered billets by April 2000. All selected officers will re-cored by June 2000. In addition, the Air Force Personnel Center added nuclear experience identifier codes to personnel records following a recommendation from the Institutional Support to Air Force Nuclear Units that cited a lack of prior nuclear experience in personnel placed in some key nuclear related positions. The new codes identify members assigned to positions giving initial nuclear experience and those who have two or more years nuclear experience. In this case nuclear experience was defined by the Air Staff as being certified under PRP. The new Air Force personnel data system will be tasked with matching these identification codes on billets with the personnel identifiers. The new system is scheduled to come on line in mid-1999.

8.2. TOTAL FORCE IMPACT (U).

(U) There are many open issues about the roles and responsibilities of the reserves in the nuclear mission. For instance, component units in the Naval Reserve kept nuclear certified for tactical nuclear weapons for over 20 years. This was especially challenging with the constraints and monitoring requirements in the Personnel Reliability Program (PRP). Today, the Air Force Reserve is faced with a similar scenario. It must decide how to best certify and monitor reserve aircrews tasked with a nuclear airlift mission or an offensive nuclear capability. Beyond the cockpit, reservists could make up for experience and/or personnel gaps in critical support areas like security forces and C^2. Along with individual PRP certification and certifying units to handle nuclear weapons, other concerns include: determining the time and funding required for training, determining the required readiness level for these designated units, appropriating the right amount of resources to cover mission requirements.

8.3. TRAINING AND EDUCATION (U).

8.3.1. DoD Training and Education Programs (U).

8.3.1.1 Nuclear Overview And Employment Training (U).

(U) The Defense Threat Reduction Agency's (DTRA) Defense Nuclear Weapons School (DNWS) provides the following courses related to nuclear weapon issues and employment:

- (U) The Nuclear Weapons Orientation Course (NWOC) presents an overview of the U.S. nuclear weapons program including nuclear weapons effects, nuclear weapons stockpile, and operational effectiveness.

- (U) The Joint DoD/DOE Nuclear Surety Executive Course (JNSEC) provides an overview of nuclear weapons safety, security and control.

- (U) The Nuclear Weapons Effects Course (NWEC) familiarizes the student with principal nuclear weapons effects and how variation in burst location and yields change the effect.

- (U) The Joint Nuclear Operations and Targeting Course (JNOTC) provides training for staff nuclear planners for joint operations and target analysis including basic targeting concepts, targeting based on Joint Publication 3-12.2, and target analysis mechanics.

- (U) The Nuclear Crewmember Course (NCC) which provides air and missile crews an overview of the U.S. nuclear weapons program and stockpile, and explains the Nuclear Weapons Technical Inspections.

(U) DTRA developed a Battlefield Nuclear Targeting Optimized (BNTO), a Windows-based PC program designed to assist nuclear planners in theater nuclear targeting and aim point planning. BNTO automates the nuclear targeting and analysis methodology contained in Joint Pub 3-12.2, "Nuclear Weapons Employment Effects Data."

(U) DTRA provides a number of other products to the DoD nuclear community. A "Nuclear Weapons and WMD Education & Outreach Program" arranges guest expert briefers on both a regularly scheduled and ad hoc basis to the War Colleges, Armed Forces Staff College, and at various other organizations. Under development by DTRA is a Strategic Nuclear Targeting aid,
which is based on DIA's "Physical Vulnerability Handbook for Nuclear Weapons". This is a Windows update of DTRA's prior Strategic Weaponeering PC-DOS program. Potential future projects within DNWS include: HPAC/CATS training aides; Coding Course or training aides; WS3 Vault training aides for USAFE senior officers and for USAFE technicians; data base of DoD WMD training and DTRA expertise.

(U) The Army includes nuclear operations in its courses at the Field Artillery School, the Combined Arms Center, the Army Command and General Staff College, and the Army War College.

8.3.1.2. Nuclear Accident/Incident Training (U).

(U) DTRA's Defense Nuclear Weapons School (DNWS) maintains the only DoD radiological training sites for realistic response training. DNWS offers the following nuclear weapon accident/incident related courses:

- (U) Commander and Staff Radiological Accident Response (CASRAR) Workshop. Provides worldwide deployable mobile training designed to promote a fundamental understanding of complex radiological accident response issues and to involve/integrate the Commander's staff.

- (U) Radiological Accident Command, Control, and Coordination (RAC3) Course. Provides training in responsibilities and problem resolutions involved in a radiological weapons response.

- (U) Radiological Emergency Team Operations (RETOPS) Course. Covers the scope of actions required to respond to a radiological accident as a radiological emergency team member. Includes basic physics, accident/incident history, and Federal response plans and capabilities. Joint Nuclear Explosive Ordnance Disposal Course (JNEODC). Provides sustainment training for officers and enlisted in nuclear EOD operations to include nuclear weapons, hazards, weapons stockpile safety features, and weapons development.

- (U) Radiological Emergency Team Orientation (RETOR) Course. Provides world-wide deployable mobile training tailored to specific organization/installation radiological emergency response needs.

(U) DNWS is also developing several new courses to improve planning and response across the DoD:

- (U) Weapons of Mass Destruction Command, Control and Coordination Course will provide DoD installation commanders and their staff with tools they need to develop and evaluate installation plans.

- (U) Hazard Prediction and Assessment Capability (HPAC) Course will formalize instruction and training on the HPAC model to help with force protection.

8.3.1.3. Medical Response to Nuclear Accidents, Casualties (U).

(U) Defense Nuclear Weapons School (DNWS). DNWS offers the following medical response courses:

- (U) Radiological Hazards Training Course (RHTC). Provides medical personnel training to be members of a nuclear emergency response team and teaches how to set up a contamination control station and the use of various types of radiation detection equipment.

- (U) Medical effects of Ionizing Radiation (MEIR) Course. Provides medical personnel with background material relating to human injury and combat effectiveness in a nuclear weapons detonation or accident scenario.

8.3.2. NAVY TRAINING AND EDUCATION PROGRAMS (U).

(U) Early in the Navy nuclear weapons program, Gunners Mate Technicians (GMTs) received technical training in "A" schools and "C" schools (basic and advanced nuclear weapons maintenance) directly following Navy Boot Camp. Specific training was provided for each weapon-type to which the technician was assigned. GMT training included technical processes that were generic to all nuclear weapons in the Navy's stockpile, e.g., use of procedural documentation and basic maintenance procedures and hand tool use. Additional training on specific weapon-types was provided dependant upon assignment to particular duty stations, e.g. Submarine Launched Ballistic Missile (SLBM) Reentry Body mating and demating was a requisite for assignment to one of the Navy's Strategic Weapons Facilities (SWFs). When the GMT rating evolved into the WT, Weapons Technician, rating, the initial and follow-on training remained essentially the same as that which was provided for the GMT. The weapon-specific training was dramatically reduced because there were fewer different weapon-types.

(U) Submarine officers are required to attend the Submarine Officer Basic Course (SOBC) at the division officer level and the Submarine Officer Advanced Course (SOAC) for department heads. These courses provide the knowledge and skills necessary for deploying the Navy's nuclear stockpile. The submarine schools are administered by the Chief of Naval Education and Training (CNET). Technical courses dealing with nuclear weapons are taught at the Trident Training Facilities (TTFs) located at the Navy's two submarine bases in Bangor, WA and Kings Bay, GA.

(U) Training for the Trident weapons systems is under the responsibility of the Trident Program Manager, the Director, Strategic Systems Programs (DIRSSP). Training for the Tomahawk weapon system is directed by the Program Executive Office, Cruise Missile, Unmanned Aerial Vehicles (PEO(CU)).

(U) Currently, both SWFs provide training and qualification processes whereby weapons handlers attend classroom courses and hands-on training for the specific operations that they will perform. These courses are taught by contractor (LMMS) personnel, at both SWFs. More general nuclear weapons information is taught at the Trident Training Facilities at both SWFs, such as nuclear weapons security, radiation control, nuclear safety, etc. Technical contractor-provided training is developed and "sold" to SSP through SP-11, the Plans and Nuclear Surety Branch, Training Section.

For the Tomahawk system, training is provided by government personnel at Weapons Training Group (WTG) in San Diego, CA.

(U) Both SWFs have an extensive qualification process that requires periodic rectification for proficiency, continuous oversight by supervisors and Quality Assurance (QA) personnel, and certification through the Navy's and DOD's Nuclear weapons Technical Inspection process.

(U) LMMS instructors have indicated that the entry level knowledge and experience of both civilian and military personnel being assigned as weapons handlers is waning. SP-11 with the assistance of SP-28 (Reentry Branch) is beginning development on training guides and requirements, as well as specific Navy Enlisted Codes (NECs) to identify personnel with IMA experience in nuclear weapons. By identifying such personnel and including training topics that were taught to the WT ratings in the IMA curricula, SSP will ensure the availability of an adequate cadre of handlers for present and any future nuclear weapon programs.

8.3.3. Air Force Training and Education Programs (U).

8.3.3.1. Air Force Technical Skills Training (U).

(U) The Air Force training and education process consists of three elements. The first of these is formal technical training, conducted by the Air Education and Training Command (AETC). Formal technical training includes courses that provide the initial skills necessary for holding an AFSC, those courses that provide advanced skills necessary for a NCO in an AFSC, and those courses that provide specialized skill needed by some members of an AFSC. Normally, AETC conducts formal training only for those skills used Air Force-wide by those in an AFSC. The second element is on-the-job or upgrade training. Apprentice technicians fresh from initial skills training work with an experienced trainer at their first unit of assignment to practice and expand their technical skills. Completion of upgrade training allows an individual to perform most functions in their AFSC without direct supervision.

(U) The third element in the training process is specialized training needed to meet unique theater, major command, or unit requirements. A recent addition to this element that specifically addresses nuclear command and control is the Joint Nuclear Command and Control School at the Air Mobility Warfare Center, Fort Dix, NJ. The two-week course is designed to train newly assigned nuclear command and control personnel who do not have previous SIOP experience. Students learn what the SIOP is and how it originated, the origin of U.S. weapons program, and the forces that support the SIOP. Students also learn what the current weapons of mass destruction threat is to the U.S. and its allies and how it effects the SIOP. Chain of command, COMSEC, nuclear surety, CJCS and USCINCSTRAT EAMs, EAM receipt systems and EAM processing, reports, and controller actions are instructed to

prepare the student for certification at the home unit. The course is open to USAF, USAFR, ANG, and Navy personnel with a nuclear command and control commitment.

(U) A key part of maintaining trained proficiency is maintained through exercises and simulators. Operators and maintenance technicians utilize various levels of training material and simulators to introduce and practice various procedures and techniques.

(U) The strategic personnel plan discussed in this section will continue to change the AFSC structure for nuclear weapons support and drive changes in the formal training requirements. With these changes comes diffusion of nuclear-specific skills in order to support both conventional and nuclear systems. Although the new AFSC identifiers will help track experienced personnel, an issue in the near future will be how well those skills required for nuclear-related operations, maintenance, and security are maintained over time.

8.3.3.2. Air Force Formal Technical Education Programs (U).

(U) Formal academic training. Due to the highly sophisticated nature of nuclear weapons physics, nuclear weapons effects physics and related disciplines, there is an ongoing requirement to educate military officers at the graduate (MS and Ph.D.) levels. The Air Force Institute of Technology (AFIT) at Wright-Patterson AFB, OH, offers graduate programs in nuclear engineering tailored to include concentrations in all aspects of nuclear physics. In addition to providing a foundation in nuclear engineering and nuclear physics, this curriculum includes topics in nuclear fuel cycle (pivotal for working in the nonproliferation and counterproliferation arenas), nuclear weapon device physics and nuclear weapons effects. Graduate education is offered to military officers from all the services.

(U) The nuclear engineering faculty at AFIT aggressively interacts with nuclear science and technology (S&T) organizations throughout the Air Force and DoD to continually monitor and enhance the relevance of its nuclear engineering degree programs. In this manner, AFIT is able to offer education in high demand by Air Force and DoD customer organization, and officers enter the field with an extremely vital education. In spite of the high value of this tailored AFIT program, it and other AFIT S&T graduate education continually put at risk by an unpredictable entering class size each year.

(U) Currently, the Air Force requires organizations to generate an educational entitlement in order to create MS and/or Ph.D. positions for Air Force officers in a given entering class at AFIT. In this manner, each organization with nuclear S&T advanced academic degree requirements must plan several years in advance to create entitlements in AFIT programs. Each such organization must compete for such positions through separate chains-of-command throughout the Air Force and DoD,

and the outcome of this process is never certain. This has resulted in a wide fluctuation in class size at AFIT in recent years, making it difficult to maintain this program in spite of strong Air Force and DoD requirements.

(U) Nuclear Technology Fellowship Program (NTFP). A new program designed to improve Air Force technical nuclear knowledge has been developed. In part, the program objective is to provide an additional source of technical expertise that can be utilized in many staff positions, e.g., ACC/DON, AFSPC/DOM, USSTRATCOM J-3. NTFP will use an existing two-year educational course hosted by Sandia National Lab. The nuclear community is comprised of many different career fields therefore the program and the candidates selected can be tailored to meet specific Air Force needs.

(U) The plan is to begin sending Air Force officers to the program in October 1999 and will use Air Force continuing education quotas assigned to AFIT. The Air Force gains intimate knowledge of the nuclear business from major weapon design to stockpile security. By sending mid-level captains/junior majors to this program, the Air Force retains this expertise for another 8-12 years during the officer's career. Three officer quotas for FY00 have been approved. Selection qualification requirements and process include:

- (U) Envision candidates to come from rated and non-rated operations, aircraft and missile maintenance, security forces and the acquisition/engineering career fields.
- (U) Technical/Operational qualifications are based on ties to the Air Force nuclear mission.
- (U) Technical undergraduate degree or higher highly desired.
- (U) Applicants are nominated by senior raters.
- (U) Availability is cross-checked with AFPC assignment teams.
- (U) Air Staff board chaired by XON selects best-qualified candidates.

(U) The NTFP is split into two phases. Year 1 of the program is largely, but not exclusively, academically oriented. Students attend in-depth courses in many national nuclear subjects. Year 2 allows significant opportunity to apply the education within a specific branch at Sandia National Laboratory, Loa Alamos national Laboratory or other agencies resident in the Kirkland AFB, NM area such as the Defense Threat Reduction Agency. It is not desired or expected for these officers to remain at Sandia

after the program's completion. The program is intended to bring this expertise out of the academic environment and back into Air Force applications.

8.4. CIVILIAN PERSONNEL (U).

(U) Most studies of nuclear weapons and command and control have identified personnel concerns as one of the most, if not the most important problem that could undermine our nuclear operational and deterrent capabilities. The 1990-92 FARR Review said that highly trained and motivated personnel are the most important component of effective nuclear command and control. The 1996 and 1997 NSS Annual Reports expressed concern in this area. Specifically, the Reports noted that shifting priorities, program cuts and downsizing, retirements, retention shortfalls brought on by a robust economy, changes in force structure and readiness posture, and reduced attention by senior officials to nuclear matters were resulting in the loss of the nuclear expertise base. Maintenance of adequate numbers of highly trained and qualified personnel with unique nuclear expertise is crucial for operational excellence throughout NCCS Departments and Agencies. The Secretary of Defense's 1997 Annual Report to Congress noted the need to establish career paths for both military and civilian personnel that attract and retain sufficient numbers of personnel with appropriate qualifications. More recently, the DSB Task Force on Deterrence identified the need to restore the value afforded to nuclear expertise and experience.

(U) While the military Services can centrally track, shape, recruit and manage their nuclear mission personnel by specialty code (with associated specific education or training requirements) in formalized career progression plans, no such similar system exists for the federal civilian nuclear mission workforce. The situation is arguably more chaotic on the defense contractor side where workforce management is a short planning horizon function of current contracts and personnel available in the market with requisite experience.

(U) Many of the nuclear related science and engineering (S&E) positions in both the Federal Government and contractor facilities deal with S&E issues in common with other high tech aspects of space or defense programs. These areas are assured a consistent healthy population of scientists, engineers, and technicians. The difficulty lies in maintaining a market of skills in those areas not exercised by other programs. In most cases, civilians are eligible to take the military nuclear related training courses discussed in section 8.3, in Appendix A. However, these are more operational or technician oriented, and don't provide education or experience in the unique S&E areas required. Some of these S&E areas are specified in section 9.2 of the *DoD Nuclear Mission Management Plan*, Contractor Industrial Base Infrastructure: high speed reentry physics and materials, nano- and femto- timing electronic and electromechanical devices, etc. One area that is particularly hard to maintain is expertise in nuclear weapons effects. There is very little overlap with other areas of

conventional defense or space programs. The intensities of the environments of concern and the nuances of the effects on systems just simply are not encountered elsewhere; i.e., natural space radiation hardening.

(U) In response to Senate Armed Services Committee tasking to DoD in 1997 to assess the status of and identify initiatives to assure the long-term health and viability of DoD nuclear weapons related technology (NWRT) expertise, DTRA initiated a critical skills study program. It has focused initially on the DTRA community and its associated support contractors, using data from the Defense Manpower Data Center and voluntary surveys from contractors. So far the study found that the median age of DTRA NWRT scientists and engineers is 49 (up from 40 in the mid-80's) and increasing at one year per year. In addition, the study shows an overall community manpower half-life is about 8 to 9 years, and a projected staff loss below an effective critical mass in 15 years.

(U) The current thrust of the DTRA critical skills program has two parts: sell the mission- convince young scientists and engineers that NWRT is still relevant and important; and develop plans for magnet initiatives of forward-looking NWRT work (not just maintenance or historical analyses). Future work must entail extending this study DoD wide, to encompass all Service components, agencies, and contractors concerned with deterrent systems and operations.

(U) The DTRA developed plan: lay a foundation for NWRT community development and sustainment based on three parallel and mutually supporting technology thrusts, first two of which are viewed as magnet programs:

- (U) Advanced nuclear weapon effects simulators.
- (U) Advanced modeling and simulation.
- (U) University Outreach.

A

(U) **Simulators**. DTRA's historical involvement in the design and operation of nuclear weapon effects simulators, coupled with advanced scientific computation, afford science-based opportunities to replace the role of underground NWE testing for nuclear survivable systems. This also couples well with the Graybeard knowledge preservation effort to archive what we know about simulators and simulation testing, how we learned it, what is it we still don't know. Such an effort demands strong systems analysis support to establish requirements and priorities, as well as a solid science base to remain current with all relevant technologies.

(U) **Modeling and Simulation**. DTRA has been a leading proponent and provider of scientific computing to its R&D community for over a generation. It has a well-planted foot in both the DoD High Performance Computing community and, by virtue of maintaining its "scientific computing center" at Los Alamos Laboratory, the DOE ASCI community. DTRA contractors have been awarded several DoD

HPC Modernization Program (HPCMP) "Challenge" projects, and we are actively engaged in porting major modeling and simulation codes to ASCI-class massively parallel computers. As part of the Critical Skills initiative we propose to expand this work more extensively across the Agency's broad range of M&S applications. An important initial effort was made last year when DSWA hosted a Workshop on Very Large Scale High Performance Computing Requirements bringing together leading members of the DSWA contractor community, DOE labs, and other DoD HPCMP organizations. A number of recommendations were made for follow-on activities that will be pursued under this initiative.

(U) A closely related aspect of modeling and simulation has to do with validation, verification, and accreditation (VV&A) of M&S codes. This is becoming much more of a scientific discipline in its own right. With the advent of truly large-scale computing capabilities and the relative ease of modeling almost anything, it's getting harder and harder to know when we've gotten the physics, numerics, and essence of the physical problem right. Confidence in code predictions and consequent hazard management decisions is at the top of the requirement list. Accordingly, we anticipate recognition of the need for the Agency to establish a more formal VV&A program to which the Critical Skills initiative will contribute. There is a unique opportunity to mine the legacy nuclear test database, including nuclear simulations, for "ground truth" data of V&V quality. Again, this initiative plays well with DARE/Graybeard activities to identify appropriate data sets (from both individual experiments and suites of experiments), and to augment their documentation as required and to the extent possible. Also as part of this initiative, we are considering establishing a high-level VV&A evaluation methodology panel under National Research Council auspices.

(U) **University Outreach.** The DOE has established a very aggressive and forward-looking university collaborative research program that merits our further study. An Academic Strategic Alliances Program (ASAP) under ASCI awarded multi-year contracts to establish centers of excellence at Stanford University, California Institute of Technology, the University of Utah/Salt Lake, the University of Chicago, and the University of Illinois at Urbana/Champaign. The DoD Critical Skills initiative will seek cooperative agreements with those centers pursuing overlapping technology thrusts. Candidates are: Stanford's Center for Integrated Turbulence Simulations, Caltech's Computational Facility for Simulating the Dynamic Response of Materials, Utah's Center for Simulation of Accidental Fires and Explosions. Cooperation could take the form of joint research programs, funded academic research, industry intern programs, participation in peer review activities, etc.

(U) Additional outreach programs with other universities and Service academies will be considered as a means of attracting young engineers and scientists to a NWRT career field. Examples include:

- (U) Introducing elements of NWRT appropriately into undergraduate and graduate curricula at participating organizations.

- (U) Enhancing career development opportunities with government laboratory, university, and industry partners through scholarships, post-doctoral studies, faculty research, etc.

- (U) Developing career enhancement opportunities for military and industrial personnel through cooperative education and training.

(U) DTRA's Defense Nuclear Weapons School will be involved to the extent practicable.

(U) The availability of funding for DTRA critical skills study and magnet initiatives remains a concern.

Civilian Education (U). (U) Steps have been taken in leader and occupational development for DoD civilian employees in numerous career fields that approximate the more structured program of training, education, and assignment for military personnel. The recently established DoD-wide Defense Leadership and Management Program (DLAMP) provides a funded framework for developing future civilian leaders with a DoD-wide capability. It involves a 12-month career broadening rotational assignment, a three or ten month course in professional military education, at least ten advanced level graduate courses in defense related business topics, and any Component or occupation specific development courses. The government-wide Intelligence Community (IC) has established an Intelligence Community Officer (ICO) program to increase the understanding of the Community as a whole, enhance understanding of IC missions and functions, and increase the ability to integrate the capabilities resident in different Community organizations. This program is composed of an extended rotational assignment in a sister Agency or Service, a curriculum of IC training requirements, and agency specific employee development requirements. In the 100,000-plus member acquisition workforce, the Defense Acquisition Workforce Improvement Act (DAWIA) established a program of certification at the entry, journey, and senior levels setting forth mandatory and discretionary training, education, and experience standards. In addition, the Under Secretary of Defense for Acquisition and Technology recently approved a program of continuous learning that requires at least one week per year for professional development. The Under Secretary of Defense for Policy requires that some one-fifth of Policy's workforce change positions each year. The Army and Air Force have developed robust career development programs that include intern recruitment, training, and managed assignments. The Army's program includes a structured program of civilian leadership training for Interns, Supervisors, Managers, and Executives. The Army has also instituted values and ethics training for civilian as well as military leaders. In addition, the Army funds specialized technical and managerial training, including doctorate-level courses, tailored to the needs of its scientist and engineer workforce. Navy commands have established leader and occupational development programs. The Air Force funds masters and doctoral degrees for scientists and engineers in their career program service.

(U) Science and Engineering Career Program (SECP) Nuclear Experience Career Broadening – The Air Force Personnel Center (AFPC) Civilian Career Management Office has recently created a 24 month management development program that provides experiential training in nuclear weapons related applications to registrants identified for accelerated advancement to senior SECP leadership positions. Selectees are assigned temporary positions in various critical Air Force and MAJCOM headquarters level organizations, and other nuclear agencies at various geographical locations as specified in SECP Career Broadening opportunity announcements. This training will support nuclear and counter-proliferation training to individuals involved in the S&E functions associated with arms control and operations. Selectees are expected to work fundamental S&E issues and communicate at senior organizational levels.

8.5. NEXT STEPS (U).

(U) This initial document is a snapshot of existing and planned nuclear sustainment programs. During the review process, trigger points for senior decision makers will be developed and included here.

(U) Also during the review process, future studies that are needed will be identified and included in the NMMP. Examples include:

- (U) How a long term recruiting and retention campaign (similar to techniques used in Navy nuclear power production) could improve core nuclear experience within DoD.

- (U) Reassess AFIT billet assignments for nuclear-related degrees to allow a constant number of officers to move through the program (MS or Ph.D.) to help stave off the Graybeard phenomenon.

- (U) Conduct a comprehensive and coordinated review to determine which areas of Joint, Service, and CINC Staffs weapons and nuclear supporting disciplines are experiencing problems due to lack/loss of personnel or nuclear expertise. Follow that with analysis of specific corrective actions that would address the problems.

- (U) Evaluate whether a centrally managed DoD/DOE training course management OPR would reduce redundancy or fill gaps among the various courses offered within or between the two departments.


A

APPENDIX B

DOD NUCLEAR SKILLS RETENTION PLAN SURVEY

The 2000 National Defense Authorization Act (S.1059, Public Law 106-65 Section 3163) stipulates that the Secretary of Defense, in coordination with the Secretary of Energy, shall submit a plan of action to retain core scientific, engineering, and technical skills to maintain the U.S. nuclear deterrent force indefinitely. This plan must be submitted by March 15, 2000. It shall include a number of actions relating to the U.S. nuclear workforce that will depend upon critical inputs from your organizations. To respond to this tasking in the most efficient and effective manner, we are sending this data call to the OSD, Defense Agencies, and the Services, with a specific request that their respective contractors be included in the response.

Services, Agencies, Commands, and Organizations with a nuclear mission or responsibility for maintaining nuclear expertise should solicit comments from their experts and provide a consolidated organizational input by January 30, 2000. Inputs will be consolidated by Nuclear Matters and submitted for coordination using the NWC process.

INSTRUCTIONS: The Data call consists of three sections. The first listed below is submission and POC information for the data collectors. Please provide accurate POC information so the data collators can follow up if there are any questions. Section two consists of a spreadsheet for submitting quantitative data. The last section includes multiple choice questions with a small section after each for comments or clarifications. Each of the sections includes a hyperlink to more detailed instructions on filling in the item. Click on the underlined text to move to the instructions. After you have read the instruction click on "Return" to go back to the question.

SUBMISSIONS: Return completed survey to Office of the Deputy Assistant to the Secretary of Defense (Nuclear Matters), Room 3C125, Pentagon, Washington, DC 20301-3050. The POC is Lt Col Thomas E. Erstfeld at (703) 693-9409, email: erstfete@acq.osd.mil

SECTION ONE: Responder Information

Organization Name:
Address:

POC Name:
Address:

Phone Number:
Fax Number:
Email address:

SECTION TWO: Status of the Nuclear Workforce:

In this section you will be completing an excel spreadsheet of personnel data for your command. Gather the information for each of the cells for personnel with nuclear skill requirements, and insert the information in the appropriate columns. The driving concern and emphasis of the survey should be on core nuclear, scientific, and technical skills. Include your contractor personnel if at all possible. (NOTE: Make sure Excel is running, or you may get an error message.) After you have entered your data, follow the instructions to the right of the data columns to continue. Click here to continue.

When you are finished with Section Two save this file as "your organization".doc and click here to move to Section Three.

B

INSTRUCTIONS

SECTION ONE

Organization Name: Insert the name of the organization that you represent. Return

Address: Enter the official address of your organization. Return

POC Name: Enter the name of the point of contact who can provide information on the data submitted for the survey. Return

POC Address: Enter the official address of the POC including any required office symbols. Return

POC Phone Number: Include a complete phone number with DSN, if available. Return

POC Fax Number: Include a complete fax number with DSN, if available. Return

POC email address: Include a complete email address for the POC. Return

SECTION TWO

Organization: Enter the organization/location/MAJCOM of the personnel reported on this line. Return

Component: Enter Branch of Service (A, N, F, M), Civilian (C), Contractor (K) Return

Specialty: Enter the specialty code to which the personnel are assigned. Use the occupational specialty code for your specific service or organization. For civilian employees, use the occupational series code on their official position description. Return

Specialty Name or Title: Enter the generic name of the specialty of the personnel reported, *i.e.*, Maintenance Technician, Rocket Scientist, Supervising Engineer. For civilian employees, enter the position title assigned to their official position description. Return

Grade: Enter the pay grade of the personnel reported using standard military or civilian grades, *i.e.*, O-6, GS-15, *etc.* Return

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Authorized Quantity: Enter the number of personnel of the appropriate grade and specialty authorized on the approved manning document for your organization. Return

On-hand Quantity: Enter the number of personnel actually filling the authorized positions within your organization. Return

Minimum Education Level: Enter the minimum education level for the authorized position, *i.e.*, BS, MS, Ph.D., *etc.* (This is the minimum education level requirement prescribed by the Office of Personnel Management Qualifications Standard, or what is desired by management for a specific position.) Return

Min: Enter the number of personnel failing to meet the minimum education level for the position. Return

Organization	Component	Specialty	Name	Grade	Auth	OH	Education Level				Min #	when completed, save document and
							BS	MS	PhD	None		
"Unit A"	A	91E	EOD Tech	O4	1	1	1	0	0	0	0	Click here to continue
"Unit A"	C	1301	Physical Scientist	GS14	2	1	1	1	0	0	0	

B

SECTION THREE: Retention Plan Information. Click on the box to check the block, add a date or add text. Use the TAB key to move through the document. Each question is on a separate page. Continue down through the document until you reach the paragraph stating that you have completed the survey.

1. This round of questions concerns a statement of measures that will be taken to retain nuclear skills or capabilities.

Do you have a specific plan of measures for retaining personnel with nuclear skills?

- ☐ Approved and implemented
- ☐ Approved plan
- ☐ Plan under development *estimated completion date:*
- ☐ No specific plan (YYYY-MM-DD)

Does your retention plan include specific employee motivations and concerns?
☐ Yes ☐ No ☐ Not applicable

Does your retention plan specifically address senior personnel?
☐ Yes ☐ No ☐ Not applicable

Does your retention plan have any administrative restrictions inhibiting retention?
☐ Yes ☐ No ☐ Not applicable

Does your retention plan allow for coordination with other affected agencies?
☐ Yes ☐ No ☐ Not applicable

Does your retention plan have budget restraints affecting retention?
☐ Yes ☐ No ☐ Not applicable

Does your retention plan include career planning at all levels within the organization?
☐ Yes ☐ No ☐ Not applicable

Does your retention plan have measures of effectiveness to gauge retention sources?
☐ Yes ☐ No ☐ Not applicable

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Add any additional information you would like to submit to clarify your retention plan for personnel with nuclear skills:

2. What proposals would you recommend for recruitment measures to address the loss of skills and capabilities within the nuclear career fields?

Which of the following measures has your organization considered or implemented for the recruitment of personnel nuclear skill?

☐ Using Colleges, Universities or technical schools to improve recruiting.
If so, how?

☐ Cultivation of students and instructors.
If so, how?

☐ Using recruitment techniques of similar industries or organizations to attract personnel with nuclear skills.
If so, how?

Does your organization have any administrative restrictions that inhibit your ability to attract personnel with nuclear skills? ☐ Yes ☐ No
If yes, what are they?

Does your organization coordinate with other activities to attempt to maximize recruitment of personnel with nuclear skills? ☐ Yes ☐ No
If yes, how is that accomplished?

Does your organization gauge the effectiveness of your recruitment of personnel with nuclear skills? ☐ Yes ☐ No
If yes, how do you do it?

Add any additional information you would like to submit to articulate measures DoD could take as recruitment measures to improve or address the loss of nuclear skills and capabilities.

3. Answer the following as they pertain to your organization's training and evaluations of personnel with core nuclear skills and capabilities.

Are you using or considering use of any of the following to assure training and evaluation of personnel with core nuclear skills?

B

☐ A designed on-the-job training program?
If so, how?

☐ A centralized in classroom training program for new personnel?
If so, how?

☐ Cross training courses with personnel within your agency or personnel from sister services or agencies?
If so, how?

☐ An archive of training or evaluation criteria to lead personnel through the requirements for critical nuclear skills evaluations?

If so, how?

☐ A catalogue or archives accessible by personnel for researching core information?

If so, how?

☐ Assignments of personnel to DOE laboratories or other non-DoD facilities to improve core nuclear knowledge?

If so, how?

4. The following two questions deal with the use of advanced manufacturing and engineering programs to support the maintenance of the nuclear deterrent force.

Do you recommend using advanced manufacturing and engineering programs to support the maintenance of the nuclear deterrent force ? ☐ Yes ☐ No
If yes, what do you specifically recommend?

Is your organization currently using advanced manufacturing and engineering programs to support the maintenance of the nuclear deterrent force? ☐ Yes ☐ No
If yes, what programs are you using?

5. The following questions concern the desirability of establishing a nuclear weapons workforce reserve.

Does your organization have a reserve of core nuclear personnel to draw expertise from when required? ☐ Yes ☐ No
If yes, how is it organized and of what does it consist?

Would your organization consider using, or is it currently using, any of the following to assure the availability of an experienced reserve of core nuclear personnel?

☐ A national or special program focused on knowledge preservation?

If so, how?

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☐ A budget or cost estimate either to use or to establish and use a national core nuclear personnel reserve?

If so, how?

☐ A selection program to identify personnel ready to participate in a reserve workforce?

If so, how?

Do you have any other questions or concerns regarding the current state of core nuclear personnel, their recruitment, retention, or use of these personnel as it applies to your organization? ☐ Yes ☐ No
If yes, please input your concerns here.

You are now finished with the survey. Click File, then Save As, then save the file as "your organization-1.doc. Then return on disk or email all three completed files, "your-organization.doc, "Your-organization-1".doc, and "your organization".xls to Office of the Deputy Assistant to the Secretary of Defense (Nuclear matters), Room 3C125, Pentagon, Washington, DC 20301-3050. The POC is Lt Col Thomas E. Erstfeld at (703) 693-9409, email: erstfete@acq.osd.mil

B

APPENDIX C

RECOMMENDATIONS FROM THE CHILES COMMISSION REPORT

The Commission on Maintaining United States Nuclear Weapons Expertise (the Chiles Commission) was prescribed by the National Defense Authorization Act of FY 1997. The Congress identified the need for the Commission because of the substantial changes in the environment affecting nuclear weapons design, production, and testing since the end of the Cold War. In view of these changes, the Commission was tasked with reviewing ongoing efforts by the Department of Energy (DOE) to attract scientific, engineering, and technical personnel, recommending improvements and identifying actions where needed, and developing a plan for recruitment and retention within the DOE Nuclear Weapons Complex.

The Chiles Commission Report offers 12 specific recommendations for action under four broad categories: National Commitment; Program Management; Personnel Policies; and Oversight. With respect to National Commitment, the Commissioners urged the Congress and the Administration to make a concerted and continuing effort to unequivocally and clearly convey the importance of the nuclear weapons mission to the nuclear weapons community. In the area of Program Management, the Commission recommended measures to improve communication among the laboratories as well as ways to strengthen coordination within the DOE and between agencies. Regarding Personnel Policies, the Commission issued specific recommendations for improving the Department's ability to recruit and retain the technical talent it will need, now and in the future, to replace the test-experienced nuclear scientists and engineers as they retire from the workforce. Finally, the report calls for reinvigorated Congressional Oversight and a multi-year fiscal commitment to stable funding for the Stockpile Stewardship Program.

Following receipt of the Commission Report, DP formed a Steering Group of senior program officials from Headquarters, field offices, industrial plants and the weapons laboratories to develop a coordinated "Path Forward" for each of the 12 Commission recommendations. The Steering Group developed a coordinated action plan and briefed senior department officials, Chiles Commission members, the Nuclear Weapons Council and the Defense Nuclear Facilities Safety Board (DNFSB). There is an overall consensus that DP's Path Forward is sound and can achieve the objectives outlined in the Commission Report.

COMMISSION RECOMMENDATIONS

The twelve major Commission Recommendations are organized into four areas:

A. NATIONAL COMMITMENT
   1. Reinforce the National Commitment and Fortify the Sense of Mission.

B. PROGRAM MANAGEMENT
   2. Complete an Integrated, Long-Term Stockpile Life Extension Program Plan.
   3. Strengthen the DOE - Department of Defense (DoD) Relationship.
   4. Take Immediate Steps to Achieve Greater Laboratory Coordination.
   5. Expedite Improvements and Efficient Use of the Nuclear Weapons Production Complex.
   6. Establish Clear Lines of authority within DOE.

C. PERSONNEL POLICIES
   7. Establish and Implement Plans on a Priority Basis for Replenishing Essential Technical Workforce needs in Critical skills.
   8. Provide Contractors with greatly expanded latitude and flexibility in Personnel Matters.
   9. Expand training and career planning programs, which are adapted to the dramatically changed workforce environment.
   10. Expand the use of former nuclear weapons program employees.

D. OVERSIGHT
   11. Create a permanent Defense Programs Advisory Committee.
   12. Enhance Congressional Oversight.