

**PANEL TO ASSESS THE RELIABILITY, SAFETY, AND
SECURITY OF THE UNITED STATES NUCLEAR STOCKPILE**

March 15, 2002

The Honorable Carl Levin
Chairman
Committee on Armed Services
U. S. Senate
228 Senate Russell Office Building
Washington DC 20510

Dear Mr. Chairman:

The Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile submits this final FY 2001 report, in compliance with the Strom Thurmond National Defense Authorization Act of 1999.

The Panel's previous two reports described the disturbing gap between the nation's policy that maintaining a safe and reliable nuclear stockpile is a supreme national interest and the actions taken to support this policy. Congress created the NNSA to address this situation and other longstanding problems. Although progress has been made, much more needs to be done.

The weapons program is entering a challenging new phase. Confidence in the nuclear-test "pedigree" is deteriorating. The decision has been made that three more warhead types will undergo extensive refurbishment in the coming decade. Sustaining high confidence in such complex systems—as we introduce new materials and production methods, using a new generation of stockpile stewards and refurbished facilities—is an unprecedented technical challenge for the laboratories and production complex. The magnitude of this challenge is underscored by our past difficulties in fielding new conventional expendable munitions, which, although tested extensively, often have proven to be less reliable in combat than expected. The nation needs the strongest possible processes for designing, assessing, certifying, and manufacturing our nuclear warheads.

The Panel's report discusses six areas where the weapons program will need to be transformed to meet the challenge. Drawing on the insights provided by the laboratories, production plants, DOE, and DoD, the report offers recommendations as well as expectations that Congress could use in judging progress. The Panel urges Congress to continue its strong focus and leadership, particularly in the following four areas:

First, there is significant potential to strengthen stockpile surveillance, assessments, and certification. These processes are the day-to-day foundation for understanding and investigating the issues associated with stockpile safety and reliability, and they should be as rigorous and probing as the responsible stockpile stewards know how to make them. Congress should encourage the proposed revisions to these processes, which are needed to obtain a balanced and complete assessment of stewardship issues

and options.

Second, we need to articulate and fund a balanced, forward-looking weapons program that meets the requirements for weapons refurbishments, explores advanced concepts, and maintains leading-edge capabilities in weapons-relevant science and technology. A renewed and sharpened focus on deliverable products will drive the need to restore the weapons complex, to train a new generation of stockpile stewards, and to address long-standing management deficiencies.

Third, test readiness, the time required to conduct a test after a decision to test is made, must be addressed much more realistically. This is not because a need to test is imminent, but because prudence requires that every President have a realistic option to test, in a timely manner, should technical or political events dictate a requirement.

Fourth, the coming year will be critical for determining whether the NNSA can provide the strong leadership Congress sought by establishing this organization in 1999. The Secretary of Energy has limited the oversight of NNSA by DOE's environmental, safety, and health organization. However, he should also be urged to do still more to remove staff activities in DOE headquarters that are redundant to functions in NNSA. Such redundant activities inevitably hamper the efficient pursuit of NNSA's mission. NNSA must lead in transforming the weapons program by creating a resource plan that explains how it will address the challenges of stockpile stewardship, and in establishing the management capable of executing the plan. If NNSA is unable to accomplish such tasks within the current year, Congress should take positive action to further strengthen the mandate and support needed to adequately manage the national nuclear weapons program.

It has been the Panel's privilege to address this vital national security concern. Our efforts were aided substantially by the support provided by the Department of Energy, the national laboratories and weapons production plants, and the Department of Defense. The Panel is in unanimous support of the report's recommendations.

Respectfully,

John S. Foster, Jr.
Chairman

EXECUTIVE SUMMARY

The *Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile*¹ concludes that redirection of the Stockpile Stewardship Program is needed to maintain confidence in our nuclear stockpile. We must close the gap between our national policy that maintaining a safe and reliable nuclear stockpile is a supreme national interest and the actions taken to support this policy. Two years ago, Congress created the National Nuclear Security Administration (NNSA) to provide the leadership to remedy this situation. Both the Secretary of Energy and the Secretary of Defense have provided their strong support for the Stockpile Stewardship Program. The program has made progress, but much more remains to be done. The Panel's salient issues and recommendations follow.

Is National leadership and policy guidance for the Stockpile Stewardship Program adequate to meet evolving challenges?

In the 2001 Nuclear Posture Review (NPR), the Administration has asserted leadership in charting a new nuclear strategy. Presidential guidance now is needed to buttress the annual assessment process and to establish weapon program priorities that are responsive to the NPR.

The current annual assessment process focuses on a narrow question: Is there a technical issue that necessitates a return to nuclear testing? In order to meet the growing technical challenges of stockpile stewardship, the Panel recommends that Presidential guidance be revised to require a balanced and complete assessment of the stockpile, the nuclear weapons complex that supports it, and the alternative options available for sustaining confidence.

The NPR provides the basis for re-establishing a well-balanced Stockpile Stewardship Program by outlining both stockpile and infrastructure needs. Stockpile surveillance must remain the first priority. The program also must include end-to-end design, development, production, and certification activities, including refurbishing warheads, exploring advanced concepts, and the technical activities needed to retain a preeminent capability in nuclear weapons-relevant science and engineering. Such work, under the aegis of Nuclear Weapons Council oversight, will provide the basis for assuring a properly trained cadre of stockpile stewards and for restoring critical facilities in the nuclear weapons complex.

Can the United States repair or replace each component in the stockpile?

We currently do not have all the capabilities essential for sustaining the stockpile, nor is there a programmatic commitment to their prompt restoration. Investment priorities must address deficiencies in the nuclear weapons complex, with particular attention to the design and construction of modern facilities for production of plutonium and uranium parts. The Panel remains especially concerned that, while Congress and the NPR have supported the conceptual design of an adequate pit production facility, there still is no firm resource commitment to design and build this facility within a reasonable timeframe.

¹ The 1999 Strom Thurmond National Defense Authorization Act created the Panel to review and assess (1) the annual process for certifying stockpile reliability and safety, (2) the long-term adequacy of that process, and (3) the adequacy of the criteria to be provided by the Department of Energy for evaluating its science-based Stockpile Stewardship Program.

With regard to existing facilities, the NNSA and Congress have established a special account for facilities and infrastructure restoration. Continuing oversight is warranted to ensure that NNSA's milestones respond to national priorities and are achieved on schedule.

Are surveillance, assessment, and certification processes rigorous enough for the long term?

More emphasis must be given to identifying potential technical issues; "red teams" within the laboratories should contribute to this. Stronger, better-documented inter-lab peer review also is needed; this should include development and evaluation of alternative options. As part of the new process, each laboratory director should provide an annual assessment of the substantial issues and options relevant to every warhead type in the enduring stockpile. Backlogs in surveillance testing of critical items must be eliminated, new surveillance tools deployed, and laboratory scientists and engineers must be engaged at the production plants where most of the surveillance activity is performed.

Is the test readiness posture adequate?

The President should have the latitude for a timely and effective response to unexpected events, whether due to problems in the stockpile or an international situation. Current test readiness of two to three years does not provide a viable option for timely response. The Panel's assessment is that test readiness should be no more than three months to a year, depending on the type of test.

Is NNSA providing decisive leadership and effective management?

As stressed in the Panel's previous reports, actions are needed to improve program management, clarify roles and responsibilities within a smaller NNSA staff, and effect major reductions in non-value-added activities throughout the complex. NNSA has taken some initial steps through its re-engineering efforts, but it is the Panel's judgment that the rate of progress needs to be accelerated significantly. NNSA has not achieved the degree of autonomy intended by Congress, especially in the area of budget planning. The Secretary of Energy should eliminate the redundant staff functions in DOE headquarters. If Congress is not satisfied with the current rate of progress, the Panel suggests Congress should take positive action to further strengthen the mandate and support needed to adequately manage the national nuclear weapons program.

In addition to improving program management, the NNSA budget must be more transparent. Resource requirements must be clearly identified with resulting NNSA products. The NNSA, with the support of the Secretary of Energy, must eliminate staff redundancies throughout the weapons program and reduce non-program or indirect costs.

Is DoD adequately focused on the nuclear mission?

While the Panel concentrated mainly on the NNSA weapons program, the report offers some specific recommendations on closely related DoD activities. The active participation of the Strategic Command and its Stockpile Assessment Team in the stewardship program has been highly production and remains imperative. The Panel also recommends that, in view of the NPR, DoD should review current and future threats, hostile environments, potential capabilities, and alternative military options. Two other areas require more emphasis from DoD: (1) the development of an appropriate weapons effects phenomenology, simulation, and nuclear test readiness posture; and (2) improvement of the rigor of DoD surveillance and assessment processes for delivery platforms and warhead interfaces.

EXPECTATIONS AND RECOMMENDATIONS

NEW PRESIDENTIAL GUIDANCE —IN FY 2002:

The Presidential Guidance for the Annual Certification Process should require a balanced and complete assessment of stewardship issues and options:

- Require assessments of relevant alternative options at each level in the assessment process, including the potential contributions of a nuclear test to stockpile confidence.
- Broaden Annual Certification reporting to encompass significant issues bearing on confidence across the full spectrum of capabilities necessary to sustain the stockpile.

New Presidential Guidance, supplemented with joint DoD/DOE directives, implementing the NPR, are needed to define priorities and budgets for a balanced weapons program:

- Warhead Life Extension Programs.
- Exploration of advanced concepts.
- Sustaining a preeminent capability in nuclear weapons-relevant science and experimentation.

A CAPABLE AND FLEXIBLE WEAPONS COMPLEX—IN FY 2002:

The NNSA must complete a plan and program for restoring the weapons complex:

- Establish, with urgency, a pit production capability adequate for national needs.
- Restore capabilities needed to meet DoD's requirements in the coming decade.
- Recruit and train the next generation of stockpile stewards.
- Assure completion of planned stewardship tools.

RIGOROUS SURVEILLANCE, ASSESSMENT, AND CERTIFICATION PROCESSES—IN THE NEXT TWO YEARS :

NNSA must continue to improve surveillance:

- Eliminate NNSA backlogs in the testing of critical items and in the investigation of significant findings.
- Develop a firm plan to deploy the best evaluation tools in the coming decade.
- Systematically engage laboratory engineers and scientists at the production plants.

NNSA should ensure the integrity and completeness of Assessment, Component Qualification, and Warhead Certification processes:

- Create a "red-team" process within each laboratory that asks, "what might fail in the stockpile?" and that provides technical alternatives to the laboratory director.
- Establish inter-laboratory peer review that provides technical assessments of the pros and cons associated with alternative options.

TEST READINESS—IN THE NEXT TWO YEARS :

Establish test readiness of three months to a year, depending on the kind of test.

- Require NNSA and DoD to establish test objectives and plans for potential weapons and weapon effects tests.
- Set requirements for preparing the test site, and for providing test items and diagnostic tools.

DECISIVE NNSA LEADERSHIP AND MANAGEMENT – IN FY2002:

The Secretary of Energy should foster the autonomy of NNSA by removing all unnecessary duplication of staff efforts within the DOE headquarters, including budget planning.

NNSA should define and implement a decisive, results-oriented line management framework.

NNSA should present a realistic and transparent long-range stockpile stewardship plan, program, and budget that clearly links resource requirements with program products.

NNSA should define a smaller government organization, particularly at headquarters, focused on its core oversight and policy responsibilities.

DoD FOCUS ON NUCLEAR MATTERS – BEGINNING IN FY2002:

Strategic Command's focus on nuclear missions, as well as on stockpile stewardship, assessment, and the Annual Certification Process, is imperative.

- USCINCSTRAT's Stockpile Assessment Team should continue its active roles in the Annual Certification Process.

In view of the NPR, DoD should review current and future threats, hostile environment definitions, and alternative military options.

DoD must significantly improve its nuclear weapon effects understanding and nuclear test readiness.

DoD should establish systematic surveillance and assessment processes for DoD platforms and components. Adequate flight-testing is essential.

EXPECTATIONS FOR THE U.S. NUCLEAR STOCKPILE STEWARDSHIP PROGRAM

FY 2001 Report of the Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile

INTRODUCTION

The Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile was created by Congress to review and assess (1) the annual process for certifying stockpile reliability and safety, (2) the long-term adequacy of that process, and (3) the adequacy of the criteria provided by the Department of Energy for evaluating its science-based Stockpile Stewardship Program. The Panel's findings on these specific matters are provided in Table 1.

The Panel's previous two reports described the disturbing gap between the nation's policy that maintaining a safe and reliable nuclear stockpile is a supreme national interest and the actions taken to support this policy. These reports described specific problems in the weapons program, particularly in the certification process, management, production capabilities, and test readiness.

In this report, the Panel describes a path forward. The Panel has identified specific areas where new Presidential direction is warranted for annual assessment of the stockpile and balancing of weapon program priorities. The report focuses on six areas where the weapons program must succeed in order to accomplish the stockpile stewardship mission, and thereby meet national security requirements as recently reformulated in the Nuclear Posture Review. In each area, the report outlines expectations to provide Congress a basis for judging progress in transforming the weapons program to meet the challenges of the next decade and the evolving requirements for sustaining the nuclear stockpile in the decades ahead.

Table 1. Responses to the Congressional Questions*

The Annual Certification Process is a snapshot review of the status of the weapons stockpile, providing the President a certification that there are, or there are not, technical problems that require a return to testing. The Annual Certification Process relies on information developed in the broader Stockpile Stewardship Program to support the certification.

Is the Annual Certification Process adequate to sustain confidence in stockpile reliability and safety in the short-run?

Yes. Thus far, National leaders have been provided a reasoned assessment of the status of the stockpile. The current process has worked because the warheads in the nuclear stockpile were tested and fielded before the current test moratorium. These assessments have been underwritten primarily by the warheads' pedigree of nuclear tests, the experience of the personnel, and by evolving scientific, analytical, and experimental capabilities.

Will the current Annual Certification Process be adequate to sustain confidence in stockpile reliability and safety in the long-run?

No. Nuclear warheads are changing as they age, due both to chemical and nuclear changes in their components and to the cumulative effect of modifications. We already have seen age-related deterioration of some components, necessitating their refurbishment. At some point, the nuclear test pedigree for a weapon will no longer be relevant. We do not know when that will happen.

Significant potential exists to improve processes in order to address these challenges. Significant advances in practices and tools are required. Processes also are needed that create stronger incentives to identify potential failures. We need a production capability to execute fixes and to replace defective components. In addition, we must not only continue scientific progress, but we must also change the culture to one that continually seeks to identify issues and to evaluate alternatives. Although we should be less confident in our assessments without nuclear testing, it will be possible to find and fix some problems.

Has the Department of Energy established adequate criteria for Stewardship Tool Development?

No. Section 3158 of the Strom Thurmond National Defense Authorization Act of 1999 required DOE to report on criteria for stockpile stewardship tools. In our second report to Congress, the Panel reviewed the initial DOE report, and found it to be a good first step, but incomplete. The Panel concluded that NNSA still needs to develop criteria that are relevant to maintaining the stockpile, not simply measures of technical achievement. This has not been done.

* These questions reflect the tasking from Congress: The 1999 Strom Thurmond National Defense Authorization Act created the Panel to review and assess (1) the annual process for certifying stockpile reliability and safety, (2) the long-term adequacy of that process, and (3) the adequacy of the criteria to be provided by the Department of Energy for evaluating its science-based tools for Stockpile Stewardship.

THE CHALLENGES

Nuclear weapons are a core element of the nation's security strategy, and sustaining confidence in the weapons stockpile can be expected to remain a supreme national interest in the decades ahead, as most recently reemphasized in the Nuclear Posture Review (NPR). This commitment to sustaining confidence is the basis for the Panel's assessments of the policies, programs, and resources devoted to maintaining our nuclear weapons capabilities.

In performing our assessments, we have had the privilege of interacting with dozens of people in the weapons production plants and laboratories, as well as in the Departments of Defense and Energy, who have the day-to-day responsibility for sustaining the safety and reliability of the nuclear stockpile. In this third year, the Panel again observed the Annual Certification Process, interacted with the national laboratories and production plants, reviewed progress on the Stockpile Stewardship Program (SSP), and monitored progress on the Panel's previous recommendations. In addition, the Panel reviewed the readiness of the underground test facilities at the Nevada Test Site, as well as test readiness activities throughout the weapons complex and DoD.

Over the three years that the Panel has been appraising the weapons program, there has been important progress. The NPR provides needed direction. The Nuclear Weapons Council has made important decisions concerning warhead Life Extension Programs that will comprise much of the work program for the next decade. Following open competitions, strong new management teams have been selected for the Y-12 and Pantex facilities. Shortfalls in infrastructure maintenance have been increasingly recognized. Congress has taken important steps by reducing the number of budget line items and establishing a budget account for infrastructure restoration.

Notwithstanding these positive developments, significant problems still need to be solved. The findings and recommendations in the body of this report reflect two major challenges posed by stockpile stewardship: reestablishing the capability of the weapons complex and sustaining confidence in the stockpile in the long-term.

The weapons program must be transformed from a decade focused on the scientific building blocks of stockpile stewardship to a focus on meeting DoD's stockpile requirements and restoring the infrastructure necessary to sustain and refurbish the stockpile.

Congress created NNSA in 1999 to provide strong leadership within the government for addressing the challenges of stockpile stewardship. NNSA is standing up at a time when the weapons program must be transformed from its 1990's focus on the

preservation of institutions and the expansion of scientific capabilities, during which funding for weapons production and infrastructure were reduced, to a focus on meeting DoD's warhead refurbishment requirements and related National priorities established in the NPR. To accomplish this transformation, the program needs to overcome the consequences of the decades-long shortfalls in infrastructure maintenance, refurbishment, and replacement investments. All of these have present day impacts. As an example: plutonium operations were halted at the Rocky Flats Plant in 1989, and the decision was made to close it a few years later. More than a decade has gone by and no replacement production plant for plutonium pits has been put into place. Difficulties encountered in accomplishing a refurbishment program for the W87 ICBM warhead and in accomplishing the surveillance and other routine activities on schedule have shown that the complex has deteriorated to an extent not fully appreciated in the 1990s.

The current situation demands joint DOE and DoD leadership. Through the Nuclear Weapons Council, DoD and DOE have agreed to refurbish three weapon types over the next 10 years – the B61 bomb, the W76 SLBM warhead, and the W80 cruise missile warhead. Prospects for success are mixed. While Congress and DoD have responded positively to this Panel's recommendations to provide NNSA with the mandate and resources needed to do the job, NNSA itself and the organizations it oversees have been slow, at best, to transform.

Confidence in the stockpile requires a judgment based on the

- ***Accomplishments of the Stockpile Stewardship Program***
- ***Integrity of stewardship processes for assessing and reporting progress, risks, and alternative options***
- ***Plans and capabilities for executing alternative options, if necessary***

Confidence in the safety and reliability of the nuclear stockpile has always been a judgment call – a determination that the weapons will perform reliably to specifications. Sustaining an incompletely understood, aging, and inevitably changing stockpile is a unique and risky challenge, which has been described as follows:

[W]e are asked to maintain forever an incredibly complex device, ... filled with exotic, radioactive materials, that must create, albeit briefly, temperatures and pressures only seen in nature at the center of stars; do it without an integrating nuclear test, and without any reduction in extraordinarily high standards of safety and reliability. And, while you're at it, downsize the industrial complex that supports this enterprise by a factor of two, and stand up critical new manufacturing processes.²

The strategy for sustaining confidence is based on the Stockpile Stewardship Program (SSP). SSP has set ambitious technical goals, and its effectiveness should always be challenged, particularly in the absence of nuclear testing. Even with nuclear testing, one cannot prove conclusively that the stockpile is reliable; without it, there is less confidence. This Panel has warned that a sense of false confidence or complacency may be the greatest danger facing the program in the long run. Only a diligently executed SSP, with honest assessments of the progress and risks, and viable risk management options, will give us a fair chance to maintain a credible stockpile.

The confidence we have had in nuclear weapons has always been based on a very limited nuclear test history. Conventional munitions systems, such as air-to-air missiles, accumulate extensive live experience during their development, training, and employment. These experiences provide a continual flow of information for assessing the reliability and safety of the remaining inventory. Even with these extensive data, however, there are many examples where expendable munitions proved to be less reliable in battle conditions than was predicted from previous data. In trying to assess the reliability of nuclear weapons, we have only several nuclear test results available for each weapon type. This is more than an order of magnitude less test data than that available for

² Speech by Victor Reis (Assistant Secretary of Energy for Defense Programs) at Sandia National Laboratories, January 19, 1999.

conventional weapons. Given this more limited basis for understanding nuclear weapon reliability, and the growing uncertainties that will be introduced by aging and changes during refurbishment, maintaining a reliable nuclear stockpile represents an unprecedented technical challenge. We must commit to establishing surveillance, assessment, and certification processes that have the highest degree of rigor possible.

In its third year, the Panel solicited inputs concerning the factors that, in the views of those responsible for doing the work, most impact confidence. An overview of these perspectives is appended to this report.³

³ The Panel received briefings from the national laboratories and production plants, the Department of Defense, and the National Nuclear Security Administration. Their views on the necessary actions and capabilities for executing the Stockpile Stewardship Program are summarized in Appendix A.

PRESIDENTIAL GUIDANCE

Presidential guidance for the Annual Certification Process should require a balanced and complete assessment of stewardship issues and options:

- ***Require assessments of relevant alternative options at each level in the assessment process, including the potential contributions of a nuclear test to stockpile confidence.***
- ***Broaden Annual Certification reporting to encompass significant issues bearing on confidence across the full spectrum of capabilities necessary to sustain the stockpile.***

Current national guidance for important parts of the Stockpile Stewardship Program was developed in the previous administration, or it has been inferred from the 1994 Nuclear Posture Review and the safeguard provisions of the proposed Comprehensive Test Ban Treaty. Since the early-to-mid 1990s, our circumstances have changed. Our warheads are older. There have been

indications of worrisome deterioration in some of our warheads. The production complex is in worse shape than anticipated in current policy. Thus, new guidance responsive to the new directions charted in the recently completed NPR is required for annual assessments of the stockpile and weapon program priorities.

Confidence in the stockpile is a judgment. The purpose of the Annual Certification Process is to inform this judgment. To sustain the integrity of this process over the long run, it is essential that annual assessments address the right questions.

The current guidance poses a very narrow question: Is there a technical issue that requires an immediate return to testing? The Panel recommends that the President revise this guidance to create a more balanced and complete assessment. National decision makers would be better informed if the laboratory directors, and the Commander-in-Chief of Strategic Command, were to provide the Secretary of Defense and Secretary of Energy a balanced assessment of the current technological situation, military requirements, and foreseeable trends. When necessary, significant issues affecting confidence would be identified, and options for addressing the issues would be identified and assessed.. Such an approach would examine the merits of such alternatives as altering maintenance procedures, weapon refurbishment, modifications, use of alternative, previously tested

weapons, or changes to DoD employment options for the weapon. Where relevant, the Secretary of State and the Intelligence Community would assess strengths and weaknesses associated with such options. Implementation of this new process within the design laboratories is addressed in a later section dealing with the rigor of certification.

An important consequence of the improved process would be greater involvement of DoD in the annual assessment of measures to provide the best possible confidence in the stockpile. The alternatives available to DoD would no longer be limited to refurbished or unmodified versions of enduring stockpile warheads. Focus would appropriately be redirected to what should be the fundamental issue – in order to provide effective nuclear deterrent capabilities, what set of warheads provides the highest confidence, the safest options?

The Panel also recommends that the reporting on technical certification issues be complemented by identifying any significant issues relating to three additional dimensions of stewardship: the adequacy of the scientific tools for assessing problems; the capability of the weapons production infrastructure to find and fix potential problems; and nuclear test readiness, with attention to what might be tested and the added value of such tests. Reporting on these elements in parallel with the warhead certifications would provide a superior perspective to judge the basis for continuing confidence in the stockpile. This reporting should enhance, not dilute, the certification process in place today. Through a parallel process, it should build on such existing assessment mechanisms as the test readiness report and production readiness assessments.

Presidential Guidance, supplemented with joint DoD/DOE directives, implementing the NPR, are needed to define priorities and budgets for a balanced weapons program:

- *Warhead Life Extension Programs*
- *Exploration of advanced concepts*
- *Sustaining a preeminent capability in nuclear weapons-relevant science and experimentation*

Prior to the early 1990's, DoD requirements for new weapons drove the weapons program. Scientific and production capabilities were developed and exercised because they were needed to design, develop, test, certify, and produce successive generations of warheads. It was easy

to determine if the program was on course: key indicators were improvements in warheads, on-schedule deployment of required numbers of weapons, and successful nuclear tests.

The NPR dictates a return to this emphasis on delivering products. It assigns two broad missions to the weapons program: seeking to sustain high confidence in the safety and reliability of the enduring stockpile; and developing and maintaining the capability to respond to new or emerging military requirements. These drive the requirements for mission deliverables in three areas.

A critical requirement involves Nuclear Weapon Council (NWC)-approved Life Extension Programs of the W76 SLBM warhead, W80 cruise missile warhead, and B61 bomb. These efforts will drive the restoration of critical end-to-end design, production, and certification capabilities throughout the weapons program. They also will focus NNSA resources. The extent to which milestones approved by the NWC are achieved will provide national leaders with important status updates on the program's success or failure.

Second, all three national laboratories, as well as the production complex, must initiate and remain continuously engaged in the exploration of advanced concepts. A flexible strategic posture must be based on the capability to adapt nuclear forces to changing needs. Only through work on advanced designs will it be possible to train the next generation of weapon designers and producers. Such efforts are also needed to exercise the DoD/NNSA weapon development interface.

A critical objective here is to better posture the weapons program to anticipate and respond to potential technological surprise. While we may have been satisfied with nuclear warheads with the characteristics of those in our enduring stockpile, we should not assume that this is the case for other nations. Technological surprise has occurred in the past and it is something we must be prepared for in the future—the recent Quadrennial Defense Review counsels us to anticipate surprise. To preclude technological surprise, the laboratories should examine technologies relevant to foreign weapon developments. It is imperative that the United States maintains a superior, up-to-date understanding of all relevant information, especially bearing on what might emerge as potential threats. A portion of this work should involve weapons that might be produced by terrorists or state sponsors of terrorism to develop the better understanding needed to deter and counter such threats. In this regard, the Panel believes that Congress needs to ensure it is kept apprised of developments in foreign advanced weapon programs and their potential implications for our security.

Third, a balanced stewardship program requires that a significant fraction of the laboratories' work be directed at weapons-relevant science and technology. The kinds of

achievements that would demonstrate commitment include experiments on weapons materials properties, hydrotest experiments, subcritical experiments, accelerated aging experiments, and laser and pulsed-power experiments. Other requirements for weapons-related data may require hundreds of small to medium scale experiments to be performed by the laboratories and in universities.

The Nuclear Weapons Council needs to provide appropriate oversight while providing the laboratories with the freedom and incentives to pursue an effective program of science and technology.⁴ Some major activities must be subject to the explicit review and approval of the NWC, such as Phase 6.2/6.3 warhead life extension programs, and formal Phase 1 or Phase 2/2A advanced concept initiatives. Fundamental science and technology activities require oversight that permits the lab directors to exercise initiative.

The work required in these three areas is ambitious, and will stretch the capabilities of NNSA, the laboratories, and the production plants. Rightly or wrongly, responsible people within the labs and plants believe that they are now precluded from taking initiatives in some of these areas by administrative or even legal constraints. The Panel believes that clear Presidential guidance is needed both to provide direction and to eliminate any actual or perceived constraints impeding achievement of NPR objectives.

⁴ Title 10 USC 179 charters the NWC as the entity charged with oversight of the nuclear stockpile, to include developing nuclear stockpile options; coordinating programming and budgeting matters pertaining to nuclear weapons programs; identifying options for cost-effective schedules for nuclear weapons production; considering safety, security, and use control issues; providing broad guidance regarding priorities for research on nuclear weapons; and coordinating and approving activities conducted by the Department of Energy for the study, development, production, and retirement of nuclear warheads. Its members are the Under Secretary of Defense for Acquisition, Technology, and Logistics; the Vice Chairman of the Joint Chiefs of Staff; and the Administrator of the National Nuclear Security Administration of the Department of Energy.

A CAPABLE AND FLEXIBLE WEAPONS COMPLEX

The NNSA must complete a plan and program for restoring the weapons complex:

- ***Establish a pit production capability adequate for national needs.***
- ***Eliminate the backlog of essential facilities maintenance.***
- ***Restore capabilities needed to meet DoD's requirements in the coming decade.***
- ***Restore adequate capabilities to repair and replace all warhead components.***
- ***Recruit and train the next generation of stockpile stewards.***
- ***Assure completion of planned stewardship tools.***

The Panel's previous (2000) report highlighted the major risks to the stewardship program posed by the persistent deficiencies in the weapons production complex.

The U.S. remains the only nuclear power without the ability to produce a complete nuclear weapon. The capability to build every part of our nuclear warheads is an essential hedge in the event that components fail. While it is desirable to attempt to forecast the life spans of plutonium

and other weapon components, we must be able to replace such parts if our predictions are incorrect or our needs for deterrence change. Restoration of complete production capability also has strategic import. We can more confidently build down if we know that we can build back if necessary. Restored production capability might be the enabling condition for some future stockpile reductions.

Completing the W88 Pit Manufacturing and Certification Project at the Los Alamos prototype production facility is essential for capturing the unique skills and technologies needed to produce these plutonium parts for the W88 and for other weapons in the enduring stockpile. In March 2001, NNSA approved the Los Alamos National Laboratory "W88 Pit Manufacturing and Certification Integrated Project Plan" which provides a path toward certification of a new production W88 pit by 2007-2009.

NNSA also has begun preliminary work on a full-scale pit production facility, although future years' budget commitment is still in doubt. Working through the Nuclear Weapons Council, NNSA and DoD should establish a requirement that NNSA

expeditiously produce an approved design, make a site decision, complete safety studies, and obtain environmental permits for pit production and secondary production facilities. In the conceptual design phase, NNSA should examine alternative facility designs, production methods, equipment, and development approaches that could reduce the time and cost necessary to restore the nation's pit production capability.

NNSA has assessed the current state of the complex, identified shortfalls, and begun the prioritization and planning that will be needed to bring production capability back to an acceptable level. The Facilities and Infrastructure Initiative was briefed to Congress last year. It reported a backlog of essential maintenance of some \$700-\$800M. Additionally, NNSA estimated there was a need for \$300-\$500M per year for some ten years for recapitalization to ensure that the production complex will be able to meet DoD's stockpile requirements.

In the FY 2002 Energy and Water Development Appropriation, Congress established a new Facilities and Infrastructure Fund with \$200M. Congress concurrently directed that NNSA give priority to infrastructure improvements and to weapon refurbishment activities. In January 2002, the Office of Management and Budget approved significant funding over the next five years for upgrading the weapons complex. With this approval, NNSA has the responsibility to accelerate its efforts to establish a comprehensive program for restoring weapons complex capabilities adequate to execute the planned weapon Life Extension Programs.

The ability to plan for and execute the W76, W80, and B61 Life Extension Programs is a demanding test of the weapons complex and its management. At this time, plans for each weapon are incomplete, and the totality of Life Extension Programs have not been integrated. These programs pose significant technical challenges to the weapons complex, including replacing obsolete technologies and restoring capabilities not fully exercised since these weapons were first produced. They also place demands on the Pantex plant, over and above the current maintenance and dismantlement work.

The ability of the laboratories, plants, and government to hire and retain top quality personnel remains a serious challenge. The laboratories and plants believe it will be possible to attract and retain world-class staffs if they are given a clear articulation of the stewardship mission and its importance, a challenging program of real work, and a credible long-term commitment of resources. They also believe the morale problems reached their depths last year, and are beginning to turn around.

In 2000, the Department of Energy published its “Criteria for Stockpile Stewardship Tools.” Taken together with the “Stockpile Stewardship Program Plan for FY2001” (also known as the Green Book), DOE has described its expectations regarding the performance of the major stewardship tools. To prioritize resource requirements, the justification for these stewardship tools must be linked with plans for their use and their contribution to maintaining the stockpile, and balanced against the other needs of the Stockpile Stewardship Program. In our 2000 Report, we commended NNSA for a good start on defining criteria for the stewardship tools, but observed that they are incomplete for the purpose of program prioritization. We continue to urge NNSA to complete this process.

RIGOROUS SURVEILLANCE, ASSESSMENT AND CERTIFICATION PROCESSES

Stockpile surveillance, assessments, and certification are the day-to-day foundation for sustaining stockpile safety and reliability. The information gained through these processes is essential to understanding the status of the stockpile and trends in the condition of the weapons.⁵ The Panel has consistently emphasized that these processes should be as rigorous and probing as the responsible stockpile stewards know how to make them.

NNSA and DoD must continue to improve surveillance:

- ***Eliminate NNSA and DoD backlogs in testing critical items and in investigation of significant findings.***
- ***Develop and deploy the best evaluation tools.***
- ***Systematically engage laboratory engineers and scientists at the production plants.***

Weapons surveillance data provide the leading edge of our knowledge about the stockpile, and are essential to stay abreast of possible aging phenomena. Significant lags in the availability of the critical surveillance data can undermine the basis for confidence.⁶

Backlogs undermine confidence in the management of the weapons program, highlighting the inadequacy of management processes to accomplish the most essential tasks. NNSA and DoD must take the steps necessary to clean up long over-due backlogs in critical surveillance activities.

This year, the Panel was briefed on development of new tools for the non-destructive surveillance of nuclear components that could significantly increase the data

⁵ The four key processes involved are: Weapons Surveillance entails the annual inspection, laboratory testing, and flight testing of a sample of weapons. Weapons Assessments entails the investigation of any surveillance findings, or other anomalies or questions regarding the stockpile. Weapons Certification entails the formal determination that a weapon meets military requirements. Annual Certification is the yearly process for apprising the President of the status of the stockpile and advising whether there is a technical requirement that necessitates performing an underground nuclear test. Notwithstanding special definitions for such terms within the weapons complex, this report uses such terms as “assessment” and “certification” in their more encompassing conventional usages.

⁶ US Department of Energy, Office of Inspector General, Office of Audit Services, Stockpile Surveillance Testing, DOE/IG-0528, October, 2001.

available on the potential deterioration of certain nuclear components. Such tools promise to expand the data many fold at a small fraction of the cost of expanding the number of destructive inspections. NNSA should aggressively explore such tools and implement the use of those that enhance capabilities in the formal surveillance program.

Laboratory scientists and engineers should be encouraged to observe weapons surveillance at the production plants. In this way, they will gain insights, and be exposed first hand to the surprises that occur.

Assessment, Component Qualification, and Warhead Certification: NNSA should ensure the integrity and completeness of these processes:

- ***Create a red-team process within each laboratory that asks, “what might fail in the stockpile?” and that provides technical alternatives to the laboratory director.***
- ***Establish inter-laboratory peer review that provides technical assessments of the pros and cons associated with alternative options.***

Process improvements are needed to reassert a culture that questions, rather than accepts, the data and the assumptions used to assess warhead safety and reliability.

The Panel is concerned that the current system has become too complacent. When a question regarding a potential failure mode is raised, the current culture too often

finds reasons why it should not, or cannot, assess the problem. Panel members are aware of situations in which environmental, safety, and security bureaucracy have been cited as the reason for excessive delays in conducting important tests. The Panel finds this lack of leadership and sense of priority, as well as the bureaucratic processes that give rise to it, inexcusable.

In a previous section, the Panel recommended Presidential guidance for the process employed in the annual assessment of warheads. Within the nuclear design laboratories, the Panel believes that the new process might be implemented in the following manner. As presently, a single nuclear design lab would be assigned the lead for each warhead type; e.g., Los Alamos for refurbishment of the B61 bomb. This lead lab would constitute a red team comprising laboratory staff plus any additional personnel it might elect to involve; e.g., retired designers. The task of the red team would be to identify potential Achilles Heel issues associated with surveillance, design codes, nuclear designs, and production. It would meet periodically and have access to all information concerning the warhead being examined. It would be the task of the lab team responsible

for B61 refurbishment to respond to the issues raised by the red team in such fora as midterm reviews. Both the design/refurbishment group and red team products would be provided to the lead laboratory director to inform her or his annual decision concerning warhead certification.

Concurrently, the other nuclear design lab (Lawrence Livermore for this B61 example) would provide peer review for the Los Alamos product. Again, it would be the task of the B61 team to respond to issues raised by the peer reviewers. Both the B61 team and peer review assessments would be provided to the Los Alamos and Lawrence Livermore directors to inform their annual judgments concerning certification.

The assessments provided by both nuclear design laboratories would not be limited to appraisals of the pros and cons of the B61. In the early, concept-exploration phase, the laboratories would be expected to consider the relative merits of broad alternatives, such as other, previously tested, warheads that might be used in place of a B61. This would be analogous to the inter-lab design competition that is integral to the Phase 1/ Phase 2 warhead design processes. Included in the appraisals would be consideration of the contributions that testing might make to the resolution of issues impacting confidence in the B61 or alternatives.

The competition of ideas between the nuclear design laboratories has been a critical foundation for sustaining the weapons program for five decades, and is the *raison d'etre* for two such laboratories. The primary rationale for maintaining two laboratories in present circumstances is to promote more rigorous identification and appraisal of options for providing the highest confidence possible in the stockpile. Recommended enhancements to inter-lab peer review support this objective.

This new process would provide the lab directors with a much stronger basis for their decisions. The same information would also support the decisions made by the Commander-in-Chief of Strategic Command, the Secretary of Energy, and the Secretary of Defense in the annual assessment process, and the decisions made by the President concerning recommended warhead certification options.

Red team and inter-laboratory peer reviews would make additional contributions to stockpile stewardship. The product of this work would be reviewed by the laboratories and, as appropriate, incorporated into the warhead surveillance program. Asking such questions can serve to guard against the onset of complacency. Answering them will stimulate the imagination of the participants and spark intellectual debate on possible failure modes in the stockpile.

TEST READINESS

Preparations that enable the weapons program to manage the technical risks embodied in the stewardship strategy are fundamental to confidence in the program. Contingency options need to be established in case baseline technical assumptions prove to be incorrect.

Establish test readiness of three months to a year, depending on the kind of test.

- ***Require NNSA and DoD to establish test objectives and plans that address the issues that might give rise to the need for a test.***
- ***Set requirements for preparing the test site, and for providing test items and diagnostic tools.***
- ***DoD should develop and fund credible plans and preparations for nuclear weapon effects tests.***

The test readiness objective stated in the START II Resolution of Ratification was 12 months. DOE states the current lead-time to be 24-36 months.⁷ It is the Panel's view that such lead times are excessive. The U.S. must not be caught flat-footed should another nation resume testing without warning, as we were when the former Soviet Union returned to testing in 1961. Furthermore, we do

not want to be in a situation in which visible efforts to improve test readiness might be interpreted as indications that preparations are under way to correct a major problem in the stockpile. Achieving an improved level of test readiness will preclude such perceptions. Every President must have the option to resume testing expeditiously, if necessary.

NNSA should take the steps necessary to reduce underground test lead times to three to twelve months from the time the President decides to proceed, depending on the type of test required.⁸ Shortening the timeline requires that test objectives be developed,

⁷The section on Weapon Activities/Executive Summary submitted by DOE/NNSA in February 2002 as part of its proposed FY 2003 Congressional Budget states that the core mission at the NNSA Nevada Test Site is to maintain the capability to conduct an underground nuclear test within 2-3 years of any such direction by the President.

⁸This posture is consistent with past US capabilities and with a reported foreign test readiness capability. For example, between 1995 and 1998, successive Indian governments maintained the capability to test within 30 days of a decision. Chas. Freeman, Jack Matlock, Dick Nelson, and Ken Weisbrode, *Managing Nuclear Arms Competition in South Asia: Work the Problem, Don't Fight It*. Washington, D.C. The Atlantic Council of the United States. July 31, 1998, p. 2.

specific tests planned, the test site readied, and devices and diagnostic equipment available. (As discussed in the final section, DoD may need to take the same actions in anticipation of possible needed “weapons effects” tests.)

The Panel encountered reluctance within the laboratories and NNSA, as well as at the Defense Threat Reduction Agency (DTRA) of the DoD, to apply funds to shorten test readiness. Many believe testing will never resume and that readiness will be at the expense of their other programs. NNSA and DoD senior leadership, therefore, must work through the Nuclear Weapons Council to establish requirements for prudent test readiness activities. Requirements should include the provision of test devices that would be available for testing on short notice, such as a Los Alamos manufactured W88 pit or a refurbished W87 warhead. By requiring test devices, the DOE and DoD would be induced to prioritize the kinds of tests that would be most beneficial. It would also engage the design and production capabilities necessary to sustain test readiness.

DECISIVE NNSA LEADERSHIP AND MANAGEMENT

Congress established the National Nuclear Security Administration in October 1999 to provide strong, independent leadership for defining the program and resource requirements for executing the Stockpile Stewardship Program, and to eliminate the bureaucratic obstacles within the Department of Energy that had hampered the program. The Panel's specific expectations for fulfilling these responsibilities are provided in the Panel's earlier reports and testimony before Congress. The Secretary of Energy has supported the NNSA budget, and he has taken steps to establish NNSA's independence of DOE oversight in such functional areas as environmental, safety, and health programs. Despite these actions, those working within the program report that problems with bureaucratic inertia have actually increased because NNSA continues to operate within the existing DOE hierarchy.

This year, the Panel was briefed on several plans and proposals for management improvements. The Panel reviewed NNSA's February, 2002, report on its proposed new organizational structure.⁹ In principle, the proposed approach can be made to work. It is time now for decisions, communication, and disciplined implementation.

There remains an urgent need for NNSA to address the fundamental problems that Congress created it to correct. The start-up phase is now over. If NNSA cannot within the current year achieve the autonomy and provide the leadership Congress intended, it is appropriate for Congress to revisit other options for managing the nuclear weapons program.

NNSA should implement a decisive, results-oriented program management framework.

Program management weaknesses have hamstrung the weapons program in several areas. There is a confusion of roles and responsibilities. NNSA designates government staff as "program managers," such as for the Life Extension Programs and the Campaigns, but most are more

⁹ National Nuclear Security Administration, "Report to Congress on the Organization and Operations of the National Nuclear Security Administration," February 25, 2002.

accurately described as program monitors or overseers. They do not control the resources for programs, nor do they have decision authority. Generally, headquarters staff should perform oversight functions while program management should reside in the field where the work is actually performed. A December 2000 GAO report described the problems that NNSA's weak management approach created for the W87 Life Extension Program.¹⁰ The Panel notes that when problems developed in the National Ignition Facility and pit manufacturing and certification programs, NNSA took action to clarify roles and responsibilities in a manner that has significantly improved management effectiveness, program performance, and confidence in the program plan. Comparable actions to clarify and reinforce responsibilities and authorities are needed throughout the program.

A number of alternative models have proven effective for managing both commercial and government programs. Common to these management models are five characteristics: First, documented program requirements, which define the criteria by which program participants can measure progress and success. Second, documented assignments of responsibility, authority, and accountability for each aspect of the program. Third, a program plan that specifies deliverables, milestones, and resources. Fourth, executive program reviews that determine whether progress and resources are consistent with the plan, or whether the plan needs to be revised. Fifth, realistic programs that include robust risk management approaches.

The Panel believes NNSA should implement a proven management model for each of its programs in 2002. As a matter of priority, experienced managers to implement this approach should be sought from within the government, the weapons complex, and industry.

NNSA should present a realistic long-range plan, program and budget that documents the resource requirements for the stockpile stewardship mission.

The NNSA is responsible to apprise Congress of the tasks and accomplishments essential to the stewardship mission, and to document

proposals for the resources necessary to accomplish this mission.

¹⁰ The GAO concluded: In the past, the Office of Defense Programs had an effective program management process and "each participant knew his/her role and how to manage the process." Following curtailment of major production activities, "people simply forgot how." See, "Nuclear Weapons; Improved Management Needed to Implement Stockpile Stewardship Program Effectively," December 14, 2000, GAO-01-48, page 82.

The ability to achieve agreement on the needed level of resources has been hampered by the inability of the NNSA resource management system to demonstrate their resource needs to the Administration and Congress. NNSA must create a multi-year program that describes the deliverables of the program and how resources are allocated to the output deliverables. DoD and DOE should agree upon NNSA funding priorities to achieve the objectives specified in the NPR. Budget categories must be transparent; for example, for each weapon system in the stockpile, all the funds spent on that weapon in a given year must be clearly identified. Reporting limited to Directed Stockpile Work accounts is insufficient. If scientific campaign achievements or infrastructure components are on the critical path, they also should be reported. The fact that some infrastructure supports multiple objectives is not an issue; it is still possible to identify such facilities and their costs, noting relevance for multiple objectives as appropriate. Within each budget category, the allocation of funds between direct and indirect charges must also be clearly identified.

GAO found in December 2000 that NNSA had worked on pieces of this problem, and had 70 different plans for elements of the weapons program. However, these plans were neither integrated nor consistent in their assumptions.¹¹ DOE's Inspector General also reported that DOE had not established the connection between planned workload, production capacity, and facility refurbishment requirements.¹² NNSA's briefings to our Panel in late 2001 confirmed that this situation has not been remedied.¹³ Concurrently, the NNSA scientific advisory panel also reported that NNSA lacks the framework necessary for coherent decisions on research and development activities, and for setting the priorities for developing major new research facilities.¹⁴

NNSA must create a program and budget focused on the deliverables necessary to perform the stewardship mission, and use this in its articulation and defense of the FY2003 budget request. The Panel observes that NNSA's stated program priorities do not match their funding priorities, nor are their funding or program priorities aligned with the national priorities identified in this Panel's reports.

¹¹ "Nuclear Weapons; Improved Management Needed to Implement Stockpile Stewardship Program Effectively," December 14, 2000, GAO-01-48, page 10.

¹² "Management of the Nuclear Weapons Production Infrastructure," September 22, 2000, DOE/IG-0484.

¹³ "NNSA Resource Management: Briefing to the Foster Panel," October 2001.

¹⁴ NNSA Advisory Committee Letter to Report to the NNSA Administrator," January 2002.

The Panel has no insight into how the cost of the program is developed, and therefore cannot comment. The difficulties that this Panel and others have encountered in unsuccessful attempts to develop insight are indicative of a management problem that needs to be addressed. The weapons program involves substantial indirect (non-program) costs. Portions are budgeted with some (but insufficient) transparency, such as the half-billion dollars per year for safeguards and security. Two actions are needed. First, the program needs to implement a much more transparent approach for identifying both direct and indirect costs; something directly analogous to standard DoD contractor practices with explicit identification of direct, overhead, and general and administrative expenses appears warranted. Second, indirect costs need to be identified, scrutinized, and reduced. Some of the resources needed to accomplish essential programs can and should be identified in these indirect accounts. Senior NNSA leadership must be held responsible for this task.

NNSA should define a smaller government organization, particularly at headquarters, focused on core responsibilities and effective management processes.

The Secretary of Energy should foster the autonomy of NNSA by removing all unnecessary duplication of staff efforts within the DOE headquarters, including budget planning.

In order for NNSA to establish itself as a credible leader of the weapons program, it also must create a lean, competent, achievement-oriented organization.

Roles, authorities, and responsibilities still need to be clarified. At the DOE headquarters level, the

Secretary must remove the unnecessary duplication of staff in such functional areas as security, environmental oversight, safety, and resource management. Congress intended NNSA to be tightly focused on the Stockpile Stewardship mission, yet this Panel has been told that the bureaucratic obstacles are now greater than they were before NNSA was established. The Panel recommends that the Secretary of Energy review NNSA/DOE authorities, responsibilities, and practices impacting the weapons program. Based on this review, DOE and NNSA should take actions to improve weapon program performance for matters that are within their authorities, and present recommendations to Congress for any matters requiring new legislation.

Within NNSA, the staff must focus on management tasks consistent with the strategic direction of the weapons program. The laboratories and plants are responsible to

NNSA for executing the program within these parameters. Government headquarters officials should not provide detailed “how to” direction in functional areas such as environment safety and health, and security, or in program work.

Three specific actions should be taken by NNSA:

- NNSA should restore management responsibility, authority and accountability to the laboratory directors and plant managers for meeting requirements, standards, timelines, and budgets.
- NNSA should focus environment, safety and health, and security oversight on establishing and sustaining effective processes to be managed within the performing organization. These processes should focus on adding value and reducing meaningless documentation requirements.
- NNSA should cut bureaucratic activities through these actions, with corresponding significant reductions in staff throughout the weapons program.

One of NNSA’s most critical leadership responsibilities is that of establishing effective processes that define, and integrate, the roles of government, laboratory, and production plant personnel in performing NNSA’s business. In doing this, NNSA has started to apply the “Six-Sigma” design and production philosophy.¹⁵ This process has the potential to improve quality and reduce costs in a broad range of areas, including management, design, manufacturing, logistics, business processes, security, and environmental, safety, and health functions. These can be achieved through a systematic approach for simplifying, reducing errors, and eliminating redundancies in key processes.

The NNSA must provide leadership, but it cannot be expected to accomplish the job alone. The Secretary of Energy, the Secretary of Defense, the President, and Congress have critical roles to play. First, NNSA needs to get its leadership team in place, including quick action to confirm NNSA senior officials necessary to build the top management team. Other personnel actions needed for effective program management also must have the support of the political leadership. Second, the Panel is particularly concerned that NNSA still does not have the ability to propose a program plan for consideration by the Office of Management and Budget independent of DOE headquarters review and approval.

¹⁵ Six Sigma is a management framework developed by the Motorola Corporation; it has also been applied by General Electric, Xerox, Honeywell, and other leading corporations. It is a quantitative approach for defining, understanding, and controlling business processes that yields significant cost savings and product improvements. Honeywell is applying it at the Kansas City Plant.

DOD FOCUS ON THE NUCLEAR MISSION

The Department of Defense has operational responsibility for nuclear deterrence capability. It holds many of the responsibilities associated with the nuclear weapons stockpile.

First and foremost, DoD is charged with establishing weapon requirements and specifying their military characteristics. As the “customer” for the DOE weapons, DoD must play an active role in establishing the DOE program and funding priorities to support the DoD mission.

Second, DoD is the repository of “weapons effects” expertise; as such it is responsible for developing phenomenology physics, models, simulations, simulators, and for the planning and execution of nuclear tests, in support of that mission.

Third, while NNSA is responsible for the design and production of the nuclear warhead, there are components of every nuclear warhead that are DoD’s responsibility, along with the delivery system.

Fourth, DoD has a co-equal role with DOE in the Annual Certification Process.

The Panel’s focus has been mainly on the NNSA weapons program, but the Panel also considered some of the closely-coupled nuclear program activities in the DoD. In recent years DoD and DOE have reinvigorated the Nuclear Weapons Council (NWC). The NWC adopted the "Phase 6.X" process, which provides a formal decision-making process for weapon modifications and Life Extension Programs. It is through this process that the NWC has approved Life Extension Programs for three weapon types -- the B61 bomb, the W76 SLBM warhead, and the W80 cruise missile warhead. The 6.X process establishes specific milestones for design review, acceptance of first production units, and full-scale production authorization that are unambiguous indicators of progress.

DoD has filled the position of the Assistant to the Secretary of Defense for nuclear, chemical, and biological matters. The NPR restated the strong national commitment to maintaining a nuclear deterrent. Most significantly, the DoD leadership has given strong support to NNSA in its efforts to win Administration support for funds to refurbish the weapons complex.

As part of the recommended revision of the annual assessment process, DoD needs to give more consideration to the mix of warheads that is most appropriate to maintain nuclear deterrence capabilities.

Strategic Command's focus on nuclear missions, as well as stockpile stewardship, assessment, and the Annual Certification Process is imperative.

- ***USCINCSSTRAT's Stockpile Assessment Team should continue its active roles in the Annual Certification Process.***

The advocacy and diligence provided by current and past USSTRATCOM commanders-in-chief has been essential in elevating stockpile issues to the proper level of national attention and in maintaining focus on the user needs.

USSTRATCOM's Stockpile Assessment Team (SAT) plays a vital role in the Annual Certification Process. The SAT's annual certification conference has added focus to the laboratories' annual assessments. The SAT also has created demands for greater rigor and consistency. The continued involvement of this team, and their input to CINCSTRAT's annual certification, are important contributors to the integrity of the surveillance, assessment, and certification processes. The Panel strongly encourages CINCSTRAT to maintain the SAT in this role.

The Panel has encouraged the SAT to diversify its base of expertise by involving experts in materials science, forensics, production, and other relevant areas. The SAT should continue building a team of reviewers for the future.

DoD's understanding of nuclear weapons effects and readiness to perform weapons effects tests must be significantly improved.

The Defense Threat Reduction Agency (DTRA) is responsible for nuclear weapons effects and target response assessments. The planning basis established by the 2001 NPR

requires consideration be given to different strategic environments. Furthermore, improved physics understanding and computational capability allow for improved fidelity of nuclear weapons effects phenomena and target responses. This capability is particularly necessary in scenarios using only a few nuclear weapons, or of a terrorist nuclear attack..

In view of the NPR, DoD should review current and future threats, hostile environment definitions, and the alternative military options. The intent of the review would be to develop simple and effective alternative solutions, whether they be modifications to the warheads or changes in their military applications. Revisions in military practices could significantly affect the complexity and priorities of the Stockpile Stewardship Program as well as the assessments of warhead performance.

The Panel has been told that there is virtually no funding for test readiness within DTRA. It is essential that DoD defines readiness objectives and funds such efforts. In addition, DoD needs to establish its long-term requirements for computational modeling and physical simulation of nuclear weapon effects. DoD needs to collaborate with NNSA to ensure that a national suite of simulators responsive to these needs is established on an appropriate timeline.

DoD should establish systematic surveillance and assessment processes for DoD platforms and components.
-- Adequate flight testing is essential.

The Panel has emphasized the need for robustness in NNSA's assessment of the stockpile, and the need to eliminate backlogs in maintenance, test and surveillance. The situation in

DoD merits parallel attention. Maintenance of some DoD weapon components has been inadequate, as have the test procedures that should highlight shortfalls. DoD is responsible for integrated flight tests that evaluate both DoD and NNSA components; but the flight tests and surveillance activities within the Services are not uniform. In particular, the Air Force has slipped flight test activities for its ballistic and cruise missiles. An appropriate use of red teams to examine the integrated DoD/DOE weapon systems could help alleviate these problems and energize these activities.

While the Annual Certification process gives DoD and DOE comparable roles, there is an apparent lack of symmetry in the assessment documentation. The lack of substantive, independent input from the weapon Project Officers Groups (POGs) continues to be a concern. The POGs seem content to review the laboratories' input on NNSA components -- a needed exercise -- but do not fully address the DoD warhead components. This asymmetry should be promptly corrected.

EXPECTATIONS

The weapons program has reached a watershed. The coming years will prove critical to the Nation's ability to execute the Stockpile Stewardship Program. As discussed in the body of this report, the Panel believes that Congress should expect the following actions.

Within this fiscal year:

Consideration is warranted for Presidential Guidance both to direct the transformation of the weapons program to implement the Nuclear Posture Review, and to make needed improvements in the Annual Certification Process.

NNSA should complete its reorganization, resolve organizational relationships with DOE headquarters, and develop a plan for reducing unnecessary administrative burdens. The Secretary of Energy should complete a review of DOE orders and directives, and remove all unnecessary duplication of staffs throughout the weapons program.

NNSA should clarify program management roles, responsibilities, and authorities. The coming year will provide a critical test of NNSA's ability to provide the strong leadership and responsiveness Congress envisioned when it created the Administration in 1999.

NNSA should create a future years program plan and budget directed at NPR objectives. This should include a credible program plan for reestablishing all of the capabilities needed for production of currently deployed warheads.

Within the next two years:

NNSA should implement new certification processes employing intra-lab red teams, and improved inter-lab peer review should complete at least one annual cycle. Concurrently, there should be significant progress in reducing surveillance backlogs of critical items.

Both NNSA and DoD should demonstrate test readiness of three months to a year, depending on the kind of test.

DoD should publish a funded program plan for weapon effects phenomenology, simulation, and test readiness, and should complete at least one cycle of a new annual assessment process in which there is enhanced rigor in DoD surveillance and assessment.

In view of the NPR, DoD should review current and future threats, hostile environment definitions, and the alternative military options.

APPENDIX A. INSIGHTS PROVIDED BY THE WEAPONS COMMUNITY

To help the Panel establish expectations, we asked the production agencies, design agencies, NNSA and DoD to describe what they would expect, and what should be expected from themselves, as indicators of confidence in the stockpile. Their contribution provided an important basis for developing and organizing the expectations and recommendations in this year's Panel report.

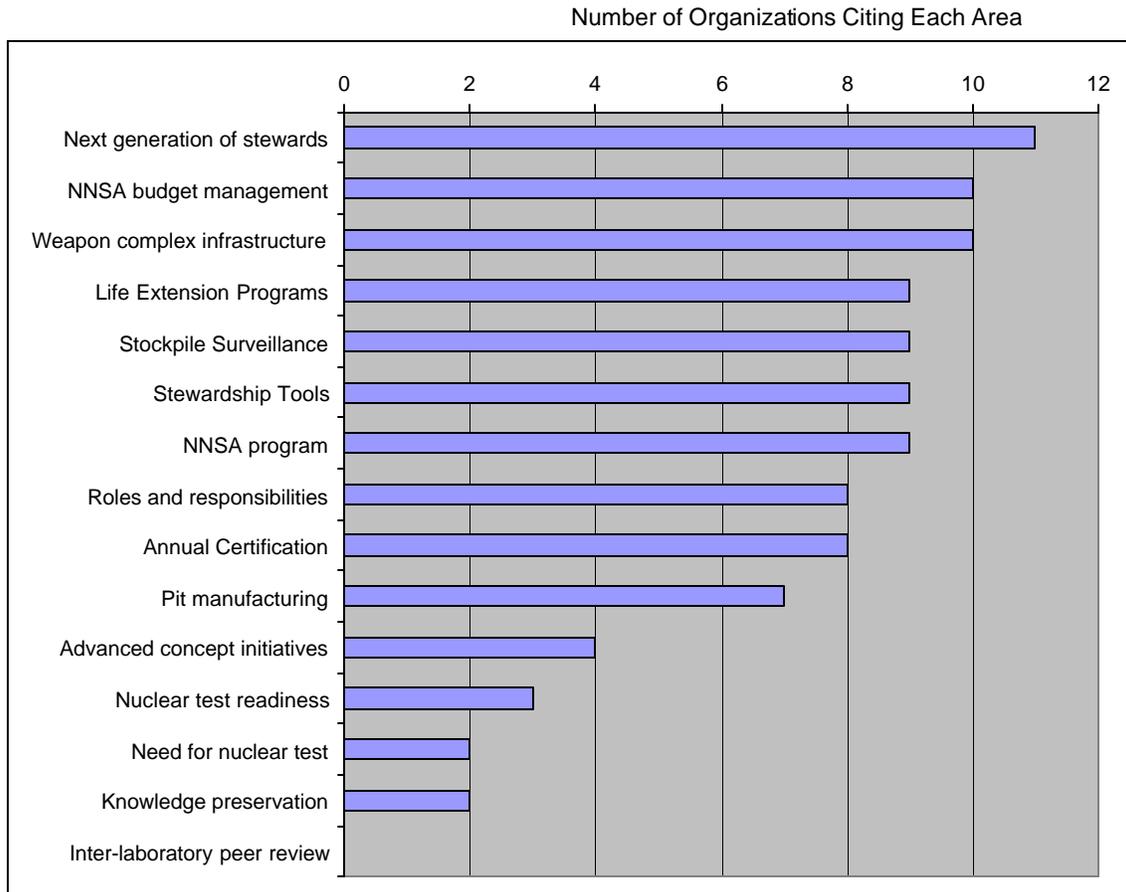
We are grateful to the representatives of the following thirteen organizations, whose perspectives are reflected here:

- U.S. Strategic Command Stockpile Assessment Team
- U.S. Air Force / XON (Nuclear and Counterproliferation)
- U.S. Navy Strategic Systems Project Office
- Assistant to the Secretary of Defense (NCB) / Nuclear Matters
- NNSA NA-10.1 (Stockpile Certification)
- NNSA NA-10 (Research, Development and Simulation)
- Los Alamos National Laboratory
- Lawrence Livermore National Laboratory
- Sandia National Laboratories
- Pantex Plant
- Kansas City Plant
- Savannah River Site
- Oak Ridge Y-12 Plant

We grouped the expectations proposed by these organizations into fifteen categories. The chart below indicates the number of the thirteen respondents who cited each subject area as a priority. In the table that follows, we summarize the expectations appropriate for each subject area and suggested criteria for determining whether the expectations are being met.

From the Panel's perspective, the importance of inter-laboratory peer review, knowledge preservation, test readiness, pit manufacturing and concept exploration is significantly higher than suggested by their relative priorities reflected in the accompanying table.

Priority Expectations Identified by the Weapons Community



Expectation Areas and Associated Confidence Criteria

| Issue | Expectation | Criteria |
|-------------------------------|--|--|
| Next generation of stewards | Recruited and trained | Performing design and production of war reserve weapons |
| NNSA budget management | Accountability and transparency | Stable long-term budgets with Congressional support for program |
| Weapon complex infrastructure | Capabilities restored | Replacement of obsolete facilities and responsible reinvestment |
| Life Extension Programs | Objectives met on time and budget | Nuclear Weapons Council approval of milestone achievements |
| Stockpile Surveillance | Enhanced capabilities and improved effectiveness | Backlogs reduced, new technology, authorizations up to date |
| Stewardship Tools | Tools meet established criteria | New design, assessment and production capabilities |
| NNSA program | Harmony with national priorities | Clear focus on the stockpile as “Job #1” |
| Roles and responsibilities | Reduction of administrative burdens; restore line-control of functional responsibilities | NNSA Administrator define and enforce roles and responsibilities |
| Annual Certification | Strengthening of process to find problems | Red Teaming, institutional shift to question “What will fail?” |
| Pit manufacturing | Re-established production capability at LANL and in a modern facility | Milestones met; commitment to budget in Future Years Plan |
| Advanced concept designs | New initiatives at all three labs | Phase 1 and 2 approval by NWC |
| Nuclear test readiness | Reduce time needed to conduct a test | Plans for specific test articles and diagnostics |
| Need for nuclear test | Formal decision process defined in advance of need | Coordination of process plans with NWC, Services |
| Knowledge preservation | Completion while test-experienced experts are available | Resumption and completion of archiving effort |
| Inter-laboratory peer review | Essential part of Annual Certification process | Each Lab Director provides assessment of all weapon types |