

**FY 2003 Report to Congress
of the Panel to Assess the Reliability, Safety, and Security
of the United States Nuclear Stockpile**

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April 11, 2003

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

April 11, 2003

The Honorable John Warner
Chairman, Senate Committee on Armed Services
228 Russell Senate Office Building
Washington DC 20510

Dear Chairman Warner:

The Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile submits this report as required by the FY 2003 Defense Authorization Act.

The Panel's three previous reports described the disturbing gap between the Nation's nuclear deterrence strategy and the programs supporting that strategy. The weapons program has undergone more than a decade of turbulence and decline, and a long-term commitment will be required to restore the capabilities needed to sustain confidence in the stockpile over the decades ahead. Congress created the National Nuclear Security Administration (NNSA) to address this situation.

In response to this year's tasking from the Congress, the Panel asked the NNSA and DoD to assess progress against the Panel's expectations for transforming the weapons program to meet the long-term Stockpile Stewardship challenges.

The Panel's report describes progress in several important areas: The Nuclear Weapons Laboratories have strengthened key weapons assessment processes by strengthening independent reviews, and they have made promising progress in identifying and managing the risks in the program. The NNSA has accepted the need to improve test readiness, and is proposing a program to reduce lead times from 36 months to 18 months over the next three years. The DoD and the NNSA have worked together to re-invigorate the Nuclear Weapons Council, and through the Nuclear Posture Review they have collaborated to define a "New Triad" describing needed capabilities. This year, the Nuclear Weapons Council is studying ways to better identify stockpile stewardship risks and means to reduce them, and will also consider the nuclear deterrence capabilities needed for the future. Congress's decision to provide additional funding is supporting work on deliverable products, providing renewed focus for the program. The resulting hiring at the laboratories and plants is beginning to address the critical workforce problems identified by the Chiles Commission in 1997.

These actions are encouraging. They signal that the program is beginning to move in the right direction. The Panel urges Congress to continue its strong support and engagement, particularly in two areas where much more progress is needed.

Establishing sound management

Our previous report said 2002 would be a watershed year for determining whether the NNSA could provide the strong leadership Congress sought. There is some progress. The Secretary of Energy has given

the NNSA needed authority for managing environmental, health, safety, and security responsibilities in the weapons complex. Senior DOE and NNSA officials are working collaboratively in many areas, including preparing the NNSA budget. NNSA has reorganized, and announced plans to reduce its federal workforce by 20 percent. However, longstanding weaknesses in NNSA's internal program and resource management practices continue to hamper the program.

We urge the Congress to press for accelerated management improvements within the existing legislative framework that established the NNSA as a semi-autonomous Agency. Program management organizations and budgets should establish clear roles and responsibilities, and clearly link deliverables, milestones, and resources. With the Secretary of Energy's support, NNSA needs to institute a disciplined work authorization process that assigns responsibility and authority to a few line managers and prevents other staff from issuing direction to laboratory and plant personnel. The Panel is firmly convinced that a vigorous campaign focused on management understanding, clarification, and improvement is necessary to yield a more effective program and productivity improvements. For example, the strong commitment to the "Six-Sigma" quality management approach at the Kansas City production plant has resulted in significant productivity gains, and improved government-plant working relationships.

In the coming years, the laboratories will be designing refurbishments for current weapons, creating new capabilities to meet future needs, and training a new generation of nuclear weapons experts. The laboratories must rely on the core group of scientists and engineers with unique nuclear design and testing experience, many of whom are eligible to retire at any time. The Panel strongly urges that any future decisions on laboratory management be based on the need to preserve the capabilities of the laboratories to perform these critical tasks, as well as to reinforce their institutional commitment to the nuclear weapons program – their core mission.

Providing better options to meet uncertain future needs

Every two or three years for decades the U.S. has encountered serious problems in the stockpile...clear evidence that we have been running some risks, and that many of these risks have gone undetected for years. Surprises have occurred. And we should expect them to continue. Over this decade, the planned stockpile refurbishments will create additional uncertainties – and hence performance risks – in the weapons by introducing interactions among new components, materials, and manufacturing processes.

We urge the Congress to seek a balance in the weapons program that shares the focus on maintaining the existing warheads with the need to create the kind of stockpile that will be required in the coming decades. The program needs to restore the capability to respond to inevitable future surprises – whether arising from an aging stockpile, problems due to life-extension programs, or the reshaped global security environment. Four areas are of particular concern:

First, the laboratories lie at the heart of the weapons program, and their continued health is critical to the nation's ability to maintain confidence in the nuclear stockpile. Scientists and engineers must be encouraged to think about all aspects of weapons science and future weapons concepts. NNSA is proposing \$21 million in FY2004 for new concept studies. This is a start. But, it represents less than one percent of laboratory weapons funding. The Panel recommends rebalancing the program to enable a significant increase in work on new concepts as soon as possible. In addition, the Panel strongly supports the proposal of the DoD and the DOE to remove the Congressional prohibition on "Precision Low Yield

Weapons Design”(PLYWD). This prohibition casts doubt on the permissibility of important areas of research, perpetuating troubling gaps in our knowledge.

Second, the ability to fix or modify weapons also is essential; otherwise our ability to field new options in response to surprises could be measured in decades, not years. Today, the U.S. remains the only nuclear power without the ability to produce a complete nuclear weapon. Especially critical: the U.S. needs to accelerate work on a modern, modular pit facility. Under current plans, a facility will not be available for 17 years.

Third, a framework also is required that enables national leaders to assess options for sustaining deterrence capabilities, and to weigh their relative risks. The Panel recommends that the Nuclear Weapons Council, with the advice of U.S. Strategic Command, periodically coordinate a review by some of the nation’s best designers and production and military experts to provide an alternative perspective to the findings and recommendations of existing certification processes. Their task would be that of a “red team,” that is, to highlight the risks we are running, present the best contrary case for why to not certify an existing warhead or a proposed refurbishment, and present the case for less-uncertain alternatives, such as operational changes, requirements changes, or more robust weapons based on previously tested designs. Decision makers could thus be informed by the results of both the certification team and the red team. This procedure would also reinvigorate and transform the competition of ideas within the weapons program, which has been a critical foundation for sustaining the weapons program for five decades.

Finally, test readiness should be sufficient to provide the President the latitude for a timely and effective response to unexpected events. The NNSA is proposing to reduce the lead-time to 18 months. The Panel recommends that the Nuclear Weapons Council request the U.S. Strategic Command, the Services, the Defense Threat Reduction Agency, and the laboratories to identify the kinds of tests that most likely would be needed, and then for DoD and DOE to set aside test articles and instrumentation for such tests.

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 weapons 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

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April 11, 2003

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THE PANEL'S QUESTIONS, ASSESSMENTS, AND RECOMMENDATIONS

Is national leadership and policy guidance for the Stockpile Stewardship Program adequate to meet evolving challenges? The Nuclear Posture Review (NPR) provides a major step forward in identifying needed capabilities.

- The National Nuclear Security Administration (NNSA), the Department of Defense (DoD), and Congress need to periodically assess current and future stockpile needs and keep the Life Extension Programs (LEPs) focused on sustaining the needed stockpile. The delivery schedules required to do this should be a basis for disciplining the program and restoring key facilities in the weapons laboratories and production complex.
- The proposed funding to study new weapons concepts represents less than one percent of laboratory weapons work. Laboratory funding and Laboratory Directed Research and Development (LDRD) should be rebalanced to support a significant increase. Collaboration is needed in identifying areas to pursue. DoD should identify the need, and the laboratories should explore what is possible. An example is new concepts that would improve precision and reduce radioactive fallout and other collateral damage.
- Congressional support is needed for expanding concept exploration, particularly through repeal of the prohibition on “Precision Low Yield Weapons Design” (PLYWD), which has unduly inhibited essential scientific work. The Department of Defense and the Department of Energy (DOE) support repeal of this provision.

Is DoD adequately focused on the nuclear mission? DoD's planned Stockpile Stewardship Conference to examine program risks and uncertainties demonstrates commitment, and should help clarify requirements. U.S. Strategic Command, the Navy, and the Air Force are focused on the mission. However, issues remain:

- The DoD weapons effects research base has seriously eroded, and proper emphasis should be given to its restoration.
- The NNSA and DoD should perform joint reviews for the purpose of evaluating confidence in integrated weapon-platform-command and control systems.

Can the United States repair or replace each component in the stockpile? The NNSA has established an effective infrastructure assessment framework and developed plans to restore the production complex. Congress provided some money to begin. But, key facilities are more than a decade away and some initial work on refurbishing existing weapons is behind schedule.

- A significantly more flexible and accelerated approach for acquiring a modern pit facility is needed. It is too risky to wait until 2020 to have this facility. DoD and the NNSA should agree this year on the initial capacity of an adaptable, modular facility, and target its availability within the next ten years.

Are surveillance, assessment, and certification processes rigorous enough for the next decade and beyond? This report describes the laboratories' recent certification process improvements, which have strengthened independent reviews. The nation still needs a mechanism to provide national decision makers with a better understanding of the future risks beyond the known challenges of the Life Extension programs.

- In the certification process, the Los Alamos and Lawrence Livermore Laboratory Directors should provide an independent assessment of each weapon in the stockpile. The lead laboratory should make the case for certification of the weapon. The other laboratory should provide an independent second opinion.
- To complement this certification process, an independent team drawn of weapon designers, production experts, and military authorities should be assigned to identify uncertainties, present the best counter argument to the lead laboratory's certification, and offer lower-risk technical, military, or policy alternatives. This could be coordinated through the Nuclear Weapons Council (NWC).

Is test readiness appropriate? The NNSA is funding a program to reduce test readiness from 36 months to 18 months by 2005.

- The Nuclear Weapons Council should coordinate a review by U.S. Strategic Command, the Services, the Defense Threat Reduction Agency (DTRA), and the laboratories to identify the tests that are most likely to be needed. The DoD and DOE should prepare the appropriate test articles and instrumentation. An occasional sub-critical experiment in a vertical hole can serve as a readiness demonstration. These steps could provide an appropriate degree of test readiness.

Is the NNSA providing decisive leadership and effective management? The Secretary has given the NNSA authority for managing environment, safety, and health (ES&H), and security responsibilities, and is collaborating in developing the NNSA budget. However, longstanding weaknesses in NNSA's internal program and resource management practices continue to hamper the program.

- The Administrator should institute a vigorous campaign to ensure an effective management structure is put in place in the coming year. Program management organizations and budgets should establish clear roles and responsibilities, and clearly link deliverables, milestones, and resources.
- With the Secretary of Energy's support, the Administrator needs to institute a disciplined work authorization process that assigns responsibility and authority to a few line managers and *prevents other staff from issuing direction* to laboratory and plant personnel.

- The NNSA Administrator needs to underscore that the unique role of the NNSA laboratories and production plants is in the nuclear weapons program – and stress their obligations to manage accordingly.
- The NNSA, the laboratories, and plants should aggressively apply a structured management process, such as “Six-Sigma,” to improve the quality of design, production, and management processes. Such an approach also provides a basis for identifying and eliminating bureaucratic inefficiencies.
- Security – Clearance processing takes over a year, and the NNSA Administrator needs the flexibility to shorten the delays.
- ES&H management – The Panel supports the principle underlying the Defense Nuclear Facilities Safety Board’s recommendation to strengthen the laboratories’ support for weapons safety throughout the weapons production complex.

FY 2003 REPORT TO CONGRESS
of the
PANEL TO ASSESS THE RELIABILITY, SAFETY, AND SECURITY OF
THE UNITED STATES NUCLEAR STOCKPILE

April 11, 2003

Congress established this Panel in 1999 to examine whether the United States can expect to sustain confidence in its nuclear stockpile while continuing our voluntary moratorium on underground nuclear testing.¹

The Panel has observed the nuclear weapons program for four years. In performing our assessments, the Panel has used as a benchmark the long-standing commitment, of this and previous Presidents, that *sustaining confidence in U.S. nuclear deterrent capabilities is a supreme national interest*. Our work has focused on the steps necessary to manage the nuclear stockpile and its supporting program accordingly.

Confidence in the stockpile is a judgment about how completely we understand and assess the reliability, safety, and security of the stockpiled weapons. The history of technological surprises in complex technical systems, including space launch vehicles, many DoD munitions, and satellites, argues for caution in making this judgment. In the mid 1990s, for example, the nation was surprised by a series of launch failures with Delta and Titan rockets that had been proven in use for decades. The lessons of such troubling experiences must be applied in managing the nuclear weapons program.

Our stewardship of nuclear deterrent capabilities must assume that nuclear weapons embody significant “unknown unknowns” that make future surprises inevitable. The Panel sees no reasonable rationale for assuming otherwise. U.S. nuclear weapons are complex, highly optimized devices, with little margin for error. Their performance depends on nuclear phenomena that are not fully understood. They were not tested to the degree necessary to provide statistical confidence before they were stockpiled, nor would this have been feasible. For decades, we have encountered serious problems in the stockpile every few years. This is clear evidence that we have been running some risks, and that many of these risks have not always been readily recognized or fully understood.

Surprises should be expected. Over time, components and materials are subject to the effects of radiation and the decay of organic compounds. In addition, complex

¹ *The 1999 Strom Thurmond Defense Appropriations 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 criteria to be provided by the Department of Energy for evaluating its science-based Stockpile Stewardship Program.

interactions among new components, materials, and manufacturing processes will be introduced as weapons are refurbished over the coming decade.

The Panel's FY 2001 Report to Congress identified six questions for judging whether current plans and programs adequately prepare us for this uncertain future. In each area we ask: Is the nation laying the foundation needed to meet the national commitment to sustain confidence in nuclear deterrent capabilities? This report provides our assessment of the situation in each area, and presents recommendations for addressing current concerns.

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

The Panel's earlier reports emphasized the need for clear national guidance to shape the weapons program. The 2001 Nuclear Posture Review (NPR) represents a major step forward. The Department of Defense and the National Nuclear Security Administration collaborated to create a shared concept for a "capabilities-based force" to address future uncertainties.² This comprises a "New Triad" of: strike capabilities; defenses, including ballistic missile defense; and the supporting infrastructure needed to develop, build, and maintain offensive and defensive systems. Through the NPR, and recent implementation guidance, both DoD and the NNSA have declared a strong commitment to redressing the decline in the weapons program, and to supporting the steps needed to address new and emerging threats. Congress also provided critical leadership in allocating funds to fill some of the shortfalls in the nuclear weapons program.

Action is needed in four areas:

Requirements for Life Extension Programs: A number of issues and decisions remain to be addressed in defining the programs for maintaining and refurbishing the existing stockpile for the long term. The scope of the modifications, and that portion of the inventory that will be refurbished, have not yet been adequately defined. Commitment and timely guidance as to what weapons complex capabilities should be established is needed to shape NNSA investment planning and decisions. The Nuclear Weapons Stockpile Plan should be appropriate for this purpose.

The W87 ICBM warhead refurbishment program is nearing completion. Programs for the W80 cruise missile warhead, the W76 submarine-launched ballistic missile warhead,

² In the DoD context, the need for capabilities-based planning is described as follows: "Capabilities-based planning will be required to mitigate risks associated with long-term challenges and hedge against surprise in the mid-term. Capabilities-based planning recognizes that it is impossible to describe future threats with precision, although it is possible to describe certain desirable future capabilities." See Donald H. Rumsfeld, "Guidance and Terms of Reference for the 2001 Quadrennial Defense Review, June 22, 2001, pg. 4.

and the B61 bomb will begin later this decade. The NNSA, DoD, and Congress need to keep the Life Extension Programs focused on sustaining the needed stockpiles. In addition, the delivery schedules required to do this should be a basis for disciplining the program and restoring key facilities in the weapons laboratory and production complex.

Further, some initial life extension activities are not being completed on schedule.³ There also is concern within the Navy that the current NNSA plans for the W76 refurbishment are too optimistic, and that the production complex and experimental facilities may not be capable of completing life extension programs on the scale that is currently anticipated. The requirements for these programs still need to be reconciled with available resources, the capabilities of the weapons complex, and the long-term plans for the stockpile.

Requirements for Concept Exploration Studies: A second requirement defined in the NPR is for advanced concept exploration. Work must proceed on future concepts and technologies to avoid technical surprises, to attract and train future stockpile stewards, and to assess intelligence information on the continuing development and proliferation of WMD and their delivery methods. The Panel emphasizes that it is essential for Congress to be kept apprised of developments in foreign weapons programs and their potential implications for U.S. security.

We urge Congress to seek a balance in the weapons program that shares the focus on maintaining the existing warheads with the need to create the kind of stockpile that will be needed in the coming decades. The Panel has stressed the need to develop options to address problems that may arise in existing warheads. Furthermore, the nature of the security environment has changed so radically that the stockpile itself must adapt. Small numbers of weapons designed with more robust performance margins may be needed to replace existing weapons. The credibility of the stockpile would be enhanced by improvements in weapon accuracy, and corresponding reductions in yield as well as radioactive fallout and other collateral effects. The Defense Department must provide leadership as the proponent for the programs to create the capabilities that will be needed.

There is much internal DoD and NNSA interest in new weapons concept studies. A “Robust Nuclear Earth Penetrator” (RNEP) study is under way. About \$6 million is proposed on FY 04 for other studies, and some initial work is being undertaken at the laboratories. Although this is encouraging, the current effort represents less than one percent of laboratory weapons funding. Laboratory funding and Laboratory Directed Research and Development (LDRD) should be rebalanced to support a significant increase.

³ U.S. Department of Energy, Office of Inspector General, Office of Audit Services, *Audit Report: Refurbishment of the W80 – Weapon Type*, DOE/IG-0590, March 2003.

In 1999, the Panel recommended increasing LDRD funding, with the expectation that the added funding should support LDRD relevant to the weapons program. The Panel strongly recommends adjusting this allocation in order to provide a significant increase in support for exploring possible future needs. The NNSA's allocation of funding for concept studies should encourage the laboratories to use LDRD funds for this purpose. Studies should be identified through a collaborative process: DoD must examine what capabilities it will need; in parallel, the laboratories must explore what is possible and so inform DoD.

Congressional Support for Concept Studies: The Panel strongly supports the proposal of DoD and the NNSA to remove the Congressional prohibition on "Precision Low Yield Weapons Design" (PLYWD).⁴ This proscription on R&D casts doubt on the permissibility of important areas of research, and perpetuates troubling gaps in our knowledge. The Executive Branch and Congress should continue to discharge their responsibilities by exercising control over Phase III (and Phase 6.3) decisions for commencing full-scale development, and at subsequent decision points. This permits necessary oversight and control without hamstringing the laboratories' ability to perform needed intellectual work in the interests of national security.

Laboratory Management: The laboratories lie at the heart of the weapons program, and their continued health is critical to the nation's ability to maintain confidence in the nuclear stockpile. The laboratories' weapons work draws on the core group of a few scientists and engineers with unique nuclear design and testing experience, many of whom are eligible to retire at any time. In the next few years, the laboratories will be refurbishing current weapons, creating new capabilities to meet future needs, and training a new generation of nuclear weapons experts. The Panel strongly urges that any decisions on laboratory management focus clearly on these objectives.

To accomplish this, NNSA's stewardship must reinforce the laboratories' institutional commitments to the nuclear weapons program. Laboratory directors need to be responsible for the weapons program first, as this is the unique role of these institutions; yet, about half of the work at the laboratories is performed for other than the nuclear weapons program. The Administrator and the Directors must balance the weapons program, homeland security, and other laboratory activities; they need to address the risks this poses to focusing on the primary mission.

To sustain the laboratories' focus on the weapon program, the NNSA also needs to ensure a balanced workload that adequately engages every laboratory in important weapons-related work. In particular, the NNSA budget should provide adequate funds for each laboratory to provide independent assessments for each of the weapons in the

⁴ Section 3136 of Public Law 103-160, the prohibition on Precision Low-Yield Weapons Design. As long as this law remains in force, ambiguities will remain regarding the permissibility of design activities.

stockpile. In addition, the Panel's recommendation (below) to relate budgets more closely with program deliverables will provide a basis for balancing workload and resources among the laboratories.

Is DoD adequately focused on the nuclear mission?

The Panel finds that both the civilian and military leadership in DoD have taken important steps to restore the needed focus within DoD on the weapons program. One sign of this, as noted in the Panel's previous report, is that DoD and the NNSA together have revitalized the Nuclear Weapons Council (NWC), which provides a forum for raising and resolving issues. The Department of Defense, with Congressional support, has retained the position of the Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs, filled the position after forty-five months of vacancy, and formed an effective staff.

In another key indicator of progress, DoD has apprised the Panel of its plans to undertake a substantive review of stockpile issues in a major Stockpile Stewardship Conference under the auspices of the NWC. This conference was advocated by the Under Secretary of Defense for Acquisition, Technology, and Logistics as Chairman of the NWC and will be hosted by U.S. Strategic Command. The conference is an attempt to identify the future nuclear capability needed and the risks and uncertainties in maintaining the Stockpile, and how to reduce them. Panels have been formed to review DoD's future needs, and to consider the role of nuclear weapons in the context of the New Triad.⁵ This undertaking reflects a significant re-commitment to the nuclear mission. The Panel expects this effort to yield significantly sharper guidance and needs for shaping our nuclear capabilities in the coming years.

The U.S. Strategic Command has retained its focus on the nuclear weapons program; nuclear capabilities remain a core element of the Command's responsibilities for the New Triad. The synergies with the newly assigned global missions – Global Strike, Integrated Missile Defense, Information Operations, Space Operations, and global aspects of Command and Control and Intelligence, Surveillance, and Reconnaissance – will provide the nation with important new military capabilities.

Advising the Commander, U.S. Strategic Command, the Stockpile Assessment Team (SAT) continues to perform a valuable function in its reviews of the DoD-NNSA Annual Certification. This group has helped to bring added focus and rigor to this activity. It also has advanced working-level interactions and information exchange within the government and between government and the laboratories.

⁵ The charter tasks the DoD and DOE to assess the uncertainties in the existing Stockpile Stewardship Program that affect confidence in the stockpile, and to identify alternative approaches for mitigating those uncertainties. Four panels will examine: Strategy and Policy, SSP Risk, NNSA Infrastructure, and the Future Arsenal.

The Navy and the Air Force have expressed general satisfaction with the support they are receiving from the NNSA. This represents a marked improvement in relationships relative to earlier years. Some observations:

- Navy: The Navy's Strategic Systems Programs Office has been a source of competence and continuity for the Navy's nuclear weapons-related programs and management. This focus has continued, even as the Navy has begun to reduce the size of the strategic Trident fleet from eighteen to fourteen SSBNs. The Navy has a high level of interest in advanced concepts that would support its mission.
- Air Force: The Air Force has restored focus to the nuclear mission over the last half decade. It has strengthened processes for ballistic missile surveillance. To promote a technically oriented community within the Air Force, and in response to an earlier recommendation of the Panel, the Air Force Nuclear Technologies Fellowship Program has been reinvigorated. Responsibility for the Air Force's nuclear delivery systems, however, resides in several different offices.

DoD Weapons-Effects Science: The Defense Threat Reduction Agency needs to develop improved capabilities for assessing the collateral effects of weapons and the effectiveness of agent-defeat weapons. The Navy reports satisfaction with improved DTRA responsiveness, but basic research in nuclear effects is still almost non-existent, and the DoD nuclear effects research base is not sustainable at current levels of funding: about one-tenth of what it was fewer than ten years ago. This base of knowledge is critical if the U.S. is to implement the NPR, particularly the Global Strike Mission. DTRA is beginning to focus on these issues, and in April will host a conference on technical issues. Significant additional funds are needed to support these efforts. (Also, see the following section on test readiness.)

DoD-NNSA Joint Program Reviews: The Panel has reviewed both DoD and DOE programs designed to support the nuclear deterrent and was struck by the fact that there is little evidence of program integration between them. The Panel recommends that the NNSA and DoD coordinate (perhaps through the NWC) to perform annual "joint program reviews" for the purpose of evaluating program integration across the many programs involved. This mechanism also should provide an assessment of confidence in the ability of integrated warhead-platform-command and control systems to meet DoD mission requirements.

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

The infrastructure component of the NPR's New Triad emphasizes that maintaining a capable nuclear weapons complex is an important contributor to deterrence. The

previous reports of the Panel cited the alarming deterioration of nuclear weapons production facilities and the concurrent loss of critical skills through retirement and attrition. We emphasized that the most important step that could be taken to reverse these trends would be a commitment to a schedule for programmatic deliverables. Such a product-driven approach, coupled with adequate funding from Congress for facility repairs and the removal of NNSA administrative burdens, would provide a sound basis for re-establishing production capabilities.

This year, the Panel is beginning to see evidence of progress in replenishing both the facility and workforce infrastructures. Congress provided funds in the last two budgets. The NNSA intends to reduce the facilities' maintenance backlog to normal industrial standards by the end of the decade. And the NNSA expects the future years' planned funding to be adequate to meet the near-term demands of the planned life extension programs.

The NNSA has institutionalized an annual process to assess production readiness. Now in its third year, this process has improved to the point that it provides a reasonably complete, if coarse-grained, picture of the state of the production complex. It is being used for planning facilities' readiness programs. These assessments are beginning to show positive results from the infrastructure restoration program. While many of the biggest problems remain, the discipline of planning for upcoming needs has enabled work to move forward in many areas.

There also is progress on the workforce. With the impetus and funding for the weapon Life Extension Programs, the production facilities report new hiring, and more importantly, excellent quality in the new hires. Further, a mass exodus of frustrated senior workers has not materialized, in part due to the prospect of upcoming production work. After a nearly ten-year decline, the turnaround in hiring and retention has come none too soon. There is still some time available to mentor the less experienced workers as the LEP workload ramps up. A focus on training and qualifying this incoming generation of workers will present a significant challenge to the laboratories and plants in the years to come.

More than a decade of decline in the production complex will not be reversed quickly. There are still serious problems to confront, and the goal of recovery can reasonably be expected to take a decade. While there is progress, the fact remains that major gaps persist, and the weapons complex will remain unable to fix many problems that may arise in the stockpile over the next decade.

Accelerate Work on a Modern Pit Facility: The NNSA has initiated, and Congress has funded, a program to begin conceptual design work on a Modern Pit Facility. This facility is needed to fill the most important gap in our current production infrastructure.

The Panel is concerned that the current plan envisions another seventeen years to elapse before this facility is available. This poses undue risks for sustaining the stockpile.

The Panel recommends that the NNSA alter its current approach to the Modern Pit Facility. To address future uncertainties, the facility must be designed with the flexibility to concurrently produce a variety of pit designs in adequate numbers. The facility design should be modular, so that it can be built to a reasonable capacity, with the option to increase capacity later. The NNSA needs to step up the pace of work on this project, engage a broader range of industrial expertise in the early design stages, and ensure that modern production processes and innovative facility designs are considered as a basis for making the new facility truly modern and modular. The Panel recommends that DoD and the NNSA agree this year on the initial capacity of the new facility, and target its availability within the next ten years.

Are surveillance, assessment, and certification processes rigorous enough for the next ten years, and beyond?

These processes are the day-to-day foundation for understanding stockpile safety and reliability. They also will be critical for judging our confidence in the warheads that will be refurbished over the next decade. As the technical challenge of maintaining the stockpile grows, these processes must be as rigorous and probing as the responsible stockpile stewards know how to make them. Decision makers need to be apprised of all the viable options for sustaining confidence. Key to this is sustaining the competition of ideas between the Los Alamos and Lawrence Livermore nuclear design laboratories, which has been a critical foundation for the weapons program for five decades, and is the *raison d'être* for the two laboratories.

In last year's report, the Panel told Congress that existing certification processes would not be adequate to sustain confidence because they depended too heavily on the existing test pedigree of the weapons, and the relevance of that pedigree is eroding. Since then, we have seen progress. The NNSA, DoD, and the laboratories are paying more attention to surveillance activities, and they have strengthened independent reviews of certification activities. In addition, priorities have been established to ensure a more timely resolution of anomalies that are found.

The laboratories also have made considerable progress in developing more formalized and systematic methodologies for estimating warhead performance margins. In response to the Panel's recommendations, and Congressional requirements, the NNSA and the laboratories have strengthened their independent assessments of the quality of their certification activities. Also, Congress now requires the Annual Certification Process to include assessments of the current adequacy of scientific tools for assessing problems, the ability of the complex to find and fix potential problems, and nuclear test readiness.

The laboratories also provided encouraging reports on their progress in developing the computational and experimental tools for strengthening assessments and certification. Major initiatives, such as Advanced Strategic Computing, NIF, DARHT, the Z-pinch pulsed-power facility, and ATLAS are progressing, and many are already contributing to our understanding of the health of the warheads in the stockpile.⁶ The Panel was encouraged to find that the laboratories are doing a much better job in defining the contributions that these tools can make to directed stockpile work and ongoing warhead refurbishments. Given progress since the Section 3158 report was last prepared, it would be appropriate for Congress to request the NNSA and its laboratories and plants to prepare an updated edition that also includes new tools to be deployed within the production facilities. For each tool, this report should identify critical contributions for stockpile stewardship and how the tool is to be validated.

Provide the National Leadership with Better Options for Managing Uncertainty: Having been given a difficult task, the NNSA, the laboratories, and the plants should be credited for their progress in developing the tools and methods for identifying and assessing risks in the stockpile. The Panel's remaining concerns go deeper, however. There are "unknown unknowns" in the stockpile, and we should expect that surprises are going to occur. National leaders need to be aware of the risks we are running, and must be provided a perspective on the alternatives available for sustaining effective deterrence capabilities. The Panel recommends that the existing Annual Certification Process be complemented by two additional actions.

First, although it is appropriate for certification to be the unique responsibility of the Laboratory Director with primary responsibility for each warhead type, the process should also require an independent assessment from the other nuclear laboratory director. This approach would ensure that the lead laboratory retains complete responsibility for the weapon, but that each certification action is informed by a first and second opinion, continuing the tradition of independent competitive reviews within the weapons program.

Second, this technical certification process should also be complemented with a broad review of all the issues that challenge our confidence and an assessment of the relevant technical, military, and policy options for sustaining confidence. This review would be broader in scope than the existing technical certification process. It would provide senior decision makers with a context for interpreting the technical certification findings, assess the adequacy of the process used for technical certification, and consider military and policy factors beyond the scope of the technical certification process. It would, in effect, institutionalize the process for reviewing risks and alternatives that is being undertaken this year in the Nuclear Weapon Council's Stockpile Stewardship Conference, discussed earlier.

⁶ National Ignition Facility (NIF), Dual-Axis Radiographic Hydrodynamic Test Facility (DARHT), the Z-pinch pulsed-power facility, and the ATLAS pulsed power experimental facility.

To implement the recommended approach, the Nuclear Weapons Council, with the advice of U.S. Strategic Command, should periodically commission a team of some of the nation's best designers, production experts, and military authorities. Their task would be that of a "red team" – that is, to highlight uncertainties that could not be addressed in the certification process, present the best case for why to not certify an existing warhead or proposed refurbishment, and present the case for less-uncertain alternatives. The options proposed by this independent team could include continued deployment of an existing warhead but with changes in military operations or requirements, substitution of existing warheads, alternative modification approaches, or more robust alternatives based on previously tested designs. Decision makers could thus be informed by the results of both the technical certification team and the red team.

Is the nuclear test readiness posture appropriate?

The Panel's FY 2001 Report emphasized the need for significant improvements in test readiness. The recommended objective was readiness of three months to a year, depending on the type of test. The NPR also called for improved nuclear test readiness. The NNSA has defined and is executing a program for improving test readiness, including continuing sub-critical experiments at the Nevada Test Site and planned new initiatives, such as improving diagnostics, bringing the safety Authorization Basis up to date, and reconstitution of facilities and heavy equipment. The target is to achieve a test readiness posture of 18 months by FY 2006.

Improve Preparations for Test Readiness: The Panel finds that the NNSA's planning assumptions for test readiness are overly conservative, and consequently exceptionally long preparation times become a self-fulfilling prophecy. NNSA planning should focus on the scenarios under which a test would likely occur, both in terms of the urgency and in terms of the security environment.

The Panel recommends that the NNSA and DoD coordinate through the Nuclear Weapons Council on a few specific steps to create a useful test-readiness posture. First, the NWC should coordinate a review by the laboratories, the U.S. Strategic Command, the Services, and DTRA to identify the tests that are most likely to be needed. Based on this review, DoD and DOE should prepare the appropriate test articles and instrumentation. For example, it would make sense to set aside test-ready devices as a normal component of weapons refurbishment programs. This would include a remanufactured W88 primary and refurbished versions of the W87, W76, W80, and B61 warheads. In addition to testing stockpiled warheads, the laboratories should lay out an underground test program that would fill in the many knowledge gaps about underlying weapons physics.

In parallel, DoD needs to institute a test readiness program. Senior DoD leadership should task the military Services and Defense Agencies with identifying the systems that should be given priority in effects testing should the moratorium end. Based on these priorities, DTRA should work with other DoD and NNSA organizations to develop a program plan for such testing. It may be appropriate to deploy some long-lead items to the Nevada Test Site. For example, as weapon proliferation continues, there is an increased need to ensure that military forces and systems can withstand the electromagnetic pulse (EMP) and other threats that might be posed by adversary nuclear weapons, which may include types of weapons and effects not emphasized in past U.S. weapons effects testing programs. Additionally, it is important for DoD to support the Nuclear Weapons Council so as to ensure that the advanced concepts research responds to current and projected DoD needs. This requires DoD to understand weapons effects, target interactions, and collateral effects.

Under the current U.S. moratorium on nuclear testing, sub-critical tests that do not result in nuclear yield are authorized and are being done at the test site. To sustain high confidence in test readiness, it is important to have a regularly scheduled series of high fidelity sub-critical tests at the Nevada Test Site. An occasional sub-critical experiment in a vertical hole can serve as a readiness demonstration.

Is the NNSA providing decisive leadership and effective management?

Last year, the Panel said that unless the NNSA makes significant progress in improving management of the weapons program, Congress should act to strengthen NNSA's autonomy. Progress has been disappointing, but the NNSA is beginning to make headway.

The NNSA reorganized on December 20, 2002 in order to address the long-standing "dual headquarters" problems cited by this Panel, the Chiles Commission, and the "120 Day Study." The former Operations Offices (Albuquerque, Nevada, and Oakland) are being consolidated into a single "Service Center" that provides substantive program support but does not stand in the line of authority. As part of this reorganization, the NNSA will consolidate and reduce the federal workforce 20% by the end of FY 2004, with a 30% reduction focused in the Washington headquarters.

Over the past two years, the Secretary of Energy has reduced the involvement of DOE headquarters organizations in managing NNSA's environment, health, safety, and security responsibilities. These offices no longer interact directly with the weapons complex facilities on a routine basis. They provide policy guidance and technical support to the NNSA leadership and staffs. This is needed progress in insulating the weapon program from non-value-added involvement with DOE headquarters staffs.

Senior officials see the existing ties between the NNSA and DOE as benefiting the weapons program: The Secretary of Energy remains responsible for and informed on NNSA matters. On major issues, the Department speaks for the NNSA. The Secretary of Energy strongly supports the weapons program both inside the DOE and in Congress and the Executive Branch. Senior NNSA and DOE officials emphasize that working relationships between NNSA and DOE headquarters have become much more collaborative. The NNSA continues to work with the DOE Chief Financial Officer in formulating and executing programs and budgets. The CFO has supported the Panel's recommendations for improving NNSA program and resource management practices, and his involvement has helped encourage progress. Many in DOE believe the collaboration of NNSA and DOE headquarters in working with DoD, the Office of Management and Budget, and the Congress was essential in securing the increases in Program funding that began last year.

While there is not the clean break between NNSA and the DOE headquarters that some in Congress envisioned when it established the NNSA in 1999, on balance the Panel concludes that the relationship is moving in the right direction, and should be given more time to mature. Many of the most pressing management issues that the NNSA needs to address are internal, and fall within its authority to resolve. We urge Congress to press the NNSA to demonstrate measurable progress in the following areas in the coming year.

Clarify Roles and Responsibilities. The Panel continues to see misunderstanding and confusion regarding the roles and responsibilities of government personnel and the directors of the laboratories and plants. This confusion needs to be remedied. The NNSA Administrator should establish a vigorous campaign to clarify roles and responsibilities, and eliminate non-value-added work at all levels. Three key management initiatives are required.

First, the NNSA needs a program management structure that clarifies goals, deliverables, responsibilities, and resources. Several programs are already being run using effective project management principles, which provide models for the approach the Panel advocates. For example, the NNSA introduced program management structures to help solve problems with the NIF construction project and the W88 primary production and certification program. Other major programs, such as the Life Extension Programs, continue to be coordinated through a loose confederation of team leaders at the NNSA, the laboratories, and the plants. An effective program management structure is needed. Specifically, a program manager should be assigned and responsible for program deliverables, cost, budget, and schedule. In addition, for such major activities as the Life Extension Programs, major science facilities, and production complex facilities upgrades, the NNSA budget must be geared to programs, milestones, and deliverables, and not to level of effort.

Second, the NNSA needs to establish a single channel of tasking between the government and the contractors for all matters. The NNSA briefed the Panel on a promising work authorization framework intended to achieve this, but while such a framework has been under discussion for several years, the weapons program continues to be hampered by uncoordinated tasking. A disciplined tasking system needs to be implemented this year. It should be made clear which individuals, as designated by the NNSA Administrator, have line management responsibilities and their authorities. The remainder of the federal staff may have oversight responsibilities, but not direct tasking authority.

Laboratory directors and plant managers should be tasked and enabled to meet the requirements, standards, timelines, and budgets established by the NNSA leadership. Within each laboratory and plant, the director or manager must be responsible for establishing the environment for program performance, accountability, safety, and security. It is the laboratory directors' and plant managers' responsibility to meet program requirements within the appropriate safety or security envelopes. At the same time, the NNSA Administrator must demand their unequivocal commitment to the weapons program, and behavior of the whole organization that is consistent with the mission. When security, safety, or ethical concerns are raised, the laboratories and plants are appropriately judged by the President, the Congress, and the public in terms of their unique, and historic, roles as the stewards of the nation's nuclear deterrence capabilities.

Security, safety, and other functional organizations within NNSA headquarters should continue to perform their assessment and advisory functions. However, these organizations should not provide independent direction to the laboratories or plants. Direction on such matters should always come through the Administrator and a small number of specifically designated line managers, never from such offices.

In the new NNSA organization, the NNSA site offices will provide a critical point of interface between the government and the contractors. The NNSA Administrator will need to take great care in clearly defining the appropriate roles and authorities of his federal site office directors and the appropriate roles and authorities of the laboratory directors and plant managers. There cannot be two bosses at the facility, and any lack of clarity on this point will significantly undermine the intent of the reorganization.

Third, over the next year, the NNSA should take specific steps toward improving productivity. The workload of the weapons complex will grow over the remainder of this decade, and the laboratories and plants will need to focus their resources on delivering products. The NNSA should enable them to concentrate on productive work by freeing up resources from bureaucratic, non-value-added administrative and functional activities.

The Panel believes that a vigorous management improvement campaign can result in a more effective program and significant productivity improvements. For example, the strong commitment to the "Six-Sigma" quality management approach at the Kansas City

production plant has resulted in significant productivity gains and improved government-plant working relationships. The NNSA must take a strong lead in implementing such an approach throughout the weapons program through senior corporate-level commitment followed by involved implementation.

The Six-Sigma quality management approach also should provide a conceptual basis for improving weapon designs. As noted, the laboratories have made progress in their efforts to quantify known risks and performance margins. However, we continue to find problems in nuclear components and even in the non-nuclear components that are more fully tested, indicating that the current process needs improvement. We urge Sandia to take the lead in applying a systematic quality philosophy, such as Six-Sigma, in the design and manufacture of challenging components. Through its design, development, and the opportunity to test these devices, Sandia can quantify the improvements in manufacturing yield and reliability that result from the new processes. The resulting lessons learned in the design and manufacturing practices then can be shared with the nuclear laboratories.

Weapons Complex Safety: The Panel supports the principle underlying the Defense Nuclear Facilities Safety Board Recommendation 2002-2, which discusses laboratory support for the safety basis of production operations.⁷ The Board is concerned that the “hand-off” of weapon safety-related information from the laboratories to the production plants is critical, and any shortfall here could increase the risk of accidents. Thus, the Board continues to press the issue of strengthening the link between the laboratories and the rest of the complex, especially Pantex.

Weapons Complex Security: Security has had an increased emphasis since September 11th, 2001, and the NNSA has been examining possible long-term strategies for improving security without hamstringing the weapons program. The Panel did not investigate this issue, but notes that weapons and materials storage would be likely targets for terrorists. We recognize that security provisions are being reviewed in light of the increased terrorist threat. We recommend that serious review be given to the safe keeping of weapons and materials, with an eye toward consolidating storage in the safest and most secure places.

There is a 12-18 month processing time for security clearances. Weapon program organizations are incurring significant expenses paying salaries to personnel who are in a holding status, pending award of clearances. Action should be taken immediately to remove this wasteful backlog. The Panel supports the DOE proposal that the NNSA Administrator be provided the flexibility to allocate clearance investigations between the FBI and Office of Personnel Management, consistent with appropriate Congressional and

⁷ Defense Nuclear Safety Board Recommendation 2002-2, *Weapons Laboratory Support of the Defense Nuclear Complex*, is available at: www.dnfsb.gov/pub_docs/dnfsb/rec_2002.html

DOE guidelines. In addition, OPM should be authorized to process clearances for weapons program personnel, and NNSA should be authorized to send funding to either OPM or the FBI to provide the resources needed, if this will expedite processing.