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The Secretary of Energy
Washington, DC 20585

September 25, 2000

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DNF SAFETY BOARD

The Honorable John T. Conway
Chairman
625 Indiana Avenue, NW
Defense Nuclear Facilities Safety Board
Suite 700
Washington, D.C. 20004

Dear Mr. Chairman:

On September 30, 1998, the Defense Nuclear Facilities Safety Board forwarded Recommendation 98-2, "Safety Management at The Pantex Plant." The Department's original Implementation Plan was issued on April 23, 1999. Enclosed is Revision 1 to that Implementation Plan.

During the past year, the Department has provided regular reports to indicate the progress being made toward completion of individual actions outlined in the Implementation Plan. The Department has also received several letters from the Board that have helped clarify the recommendation. As a result, the Department has identified several opportunities to enhance the focus and usefulness of the Implementation Plan.

The enclosed Revision 1 provides a mechanism to (1) apply lessons learned; (2) remove redundancies; and (3) better target the actions that are most essential to Seamless Safety-21 implementation. This revision reflects a fundamental change in the Department's approach to increase the focus on making safety improvements applicable to multiple nuclear weapon processes "across the board," while simultaneously continuing efforts to apply the concepts of Seamless Safety-21 to individual weapon processes in accordance with the established schedules.

Mr. David Beck, Assistant Deputy Administrator for Military Application and Stockpile Operations, is the responsible manager for this implementation plan. Mr. Beck can be contacted at 202-586-4879.

Yours sincerely,

Bill Richardson

Enclosure



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U. S. Department of Energy Implementation Plan

Revised Implementation Plan for Accelerating Safety Management Improvements at the Pantex Plant

(Board Recommendation 98-2)



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Executive Summary

On November 20, 1998, the Department of Energy (DOE) accepted Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 98-2, which addresses the need to accelerate safety improvements for nuclear explosive operations, conducted at the Pantex Plant. The Department's Implementation Plan for Accelerating Safety Improvements at the Pantex Plant was issued on April 23, 1999, and accepted by the Board on June 16, 1999. The commitments in the Implementation Plan represented a significant effort by DOE and the Pantex Plant Operating Contractor to simplify and standardize activity level safety management processes for nuclear explosive work. Overall, the objective of the plan was to ensure practical and timely implementation of safety improvements and tailoring of the Seamless Safety for the 21st Century principles.

The Department first undertook implementation of the process referred to as "Seamless Safety for the 21st Century" (SS-21) for all nuclear explosive operations at the Pantex Plant in 1993. During the past seven years, the SS-21 process has evolved, but the fundamental objective remains the same: eliminate hazards in assembly, disassembly, and testing of nuclear explosives through process and tooling design. Other substantial benefits derived from SS-21 include the development of operational controls through a systematic analysis of the hazards, and implementation of the operational controls through improved procedures written in a format more conducive to production technician understanding and adherence. The SS-21 process was applied to several older weapon programs being dismantled (e.g., W56), resulting in marked improvements in safety. However, application of the SS-21 process to achieve the same benefits for all ongoing nuclear explosive operations at Pantex has been slow.

Implementation Plan Issued April 23, 1999

In the original Implementation Plan the Department identified the following actions to improve the rate of SS-21 implementation:

- Fully define the safety management processes to be used for nuclear explosive operations through revision or issuance of Department standards and requirements
- Strengthen the role of line management in safety management processes
- Reduce the heavy reliance upon multiple task teams and shift greater responsibility for safety to the Pantex Plant Operating Contractor
- Establish a well-defined work scope for the actions needed to make safety improvements
- Upgrade the quality of hazard analyses and operational controls for nuclear explosive operations
- Improve the technical competence of both DOE and Pantex Plant Operating Contractor personnel involved in the preparation, review, and approval of safety documentation
- Emphasize the role of the nuclear explosive safety (NES) studies to an independent review of the adequacy of operational controls established by line management
- Alter the structure and membership of the nuclear explosive safety study group and strengthen the training and qualification requirements
- Integrate line management into the nuclear explosive safety change control process, and integrate the nuclear explosive safety change control process with the unreviewed safety question process
- Improve the efficiency with which new tooling concepts developed successfully for one nuclear explosive process can be implemented for another
- Reduce the time required to perform hazard analyses and derive operational controls

The Department committed to undertake the improvements listed above as linked components of integrated safety management. In addition to the above actions, the Implementation Plan also included specific commitments for the W62 weapon program. The Department implemented compensatory actions identified in the W62 Step 1 Project Plan to realize part of the potential SS-21 benefits as soon as possible on the W62. The commitments for the W62 weapon program are complete and the disassembly and inspection process has safely restarted.

As with any plan of the scope and complexity of 98-2, the Department and Pantex Plant Operating Contractor have achieved results with mixed success. Since issuance of the original Implementation Plan, the Department has made significant progress in revising or issuing a number of directives related to the safety of nuclear explosive operations. In many cases, the revised directives represent

fundamental changes in processes or roles and responsibility, aimed at simplicity and efficiency. The Pantex Plant Operating Contractor has completed implementation for a number of these changes, and the remaining changes are in-progress.

Line management both within the Department and the Pantex Plant Operating Contractor are now directly involved in the analysis of hazards and decisions involving the selection of operational controls. Primary responsibility for management of weapon program project teams has been transitioned to the Pantex Plant Operating Contractor, including responsibility for hazard analysis and operational controls. The Nuclear Explosive Safety Study Group (NESSG) is fulfilling its appropriate role by independently reviewing operations to assess the adequacy of controls established by line management.

The technical basis for DOE-approved controls used in nuclear explosive operations at the Pantex Plant is gradually improving. The controls are derived from a systematic analysis of hazards versus subjectively imposed by experts. The controls are now prepared in a format consistent with other DOE nuclear facilities (i.e., technical safety requirements). The formality and rigor of safety controls established in such areas as fire protection and lightning protection have been substantially improved. In both cases these include engineered controls. Although a number of technical challenges remain, the Department is encouraged by the progress made and remains committed to further improvements in these two critical areas of safety.

Both process changes and changes in organizational responsibilities have been applied to varying degrees on several nuclear weapon programs (e.g., W62, W87, W76, and W88). Although the Department, Pantex Plant Operating Contractor, and the national laboratories have occasionally struggled with execution of some changes, the Department remains confident that additional experience will yield consistent application and efficiency gains will be realized.

Revised Implementation Plan

This revision to the Implementation Plan reflects the progress made by the Department in closing previous commitments (under the original Implementation Plan), carries forward several commitments with revised completion dates or scope (where appropriate), and includes additional commitments needed to fulfill both the spirit and intent of the Recommendation.

The planned actions and commitments in the Implementation Plan are organized into the five core functions of the Department model for integrated safety management. This approach in presentation reflects the Department commitment to achieve resolution of the issues identified under Recommendation 98-2 as linked components of integrated safety management.

The fundamental change in the Department's approach is to provide increased focus and priority to making "generic" safety improvements applicable to multiple nuclear weapon processes "across the board." Thus, the Department will use a "two-pronged" attack for accelerating safety improvements in nuclear explosive operations at the Pantex Plant. The Department will continue efforts to apply the concepts of SS-21 to individual weapon processes in accordance with the schedules established.

However, the Department believes the most rapid way to gain major safety improvements is to attack the problem on a "hazard by hazard" basis, focusing on improved engineered controls applicable to multiple weapon programs and processes. In this manner, the Department can achieve tangible improvements in safety on a near-term basis, allowing weapon project teams to focus on further eliminating or reducing the remaining hazards through total process redesign, as required.

This approach should also alleviate unnecessary schedule pressures traditionally applied to weapon project SS-21 teams and focus the efforts of the Department and its contractors where the greatest benefits lie. That is, accelerating safety improvements that are generic in nature and which address the dominant hazards encountered in nuclear explosive operations at the Pantex Plant. The Department believes this approach is more consistent with the original theme and intent of Recommendation 98-2.

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1.0 Background

Over the past seven years, the Defense Nuclear Facilities Safety Board (hereafter referred to as "the Board") transmitted a number of formal recommendations and observations to the Department of Energy (hereafter referred to as "the Department") related to the safety of nuclear explosive operations at the Pantex Plant. In some instances, the Board provided broad recommendations applicable to multiple sites within the Department (e.g., Recommendation 95-2). In other cases, the recommendations or observations were more directly related to nuclear explosive operations conducted at the Pantex Plant.

Appendix B, "Historical View: DNFSB Recommendations and Letters," discusses some of the prior Board recommendations and summarizes observations transmitted through correspondence to the Department during the past four years. These recommendations and observations provide both insight to the "genesis" of DNFSB Recommendation 98-2 (hereafter referred to as "Recommendation 98-2" or "the Recommendation"), and insight to the Department's progress subsequent to the Recommendation.

Recommendation 98-2 describes actions the Board considers necessary to improve the safety of nuclear explosive operations conducted at the Pantex Plant. The Board recommended:

1. *"A practice be instituted that delivers the principle benefits now sought from the SS-21 process, but that promises to consume less time and resources. Use of this practice should start as soon as possible for all activities involving nuclear explosives at the Pantex Plant and the W62 activities in particular. To the extent possible, the Nuclear Explosive Safety Study in this practice should include reevaluation of the basis for and the current validity of previous safety judgments in light of new understandings and expectations.*
2. *An administrative process be instituted, similar to the Unreviewed Safety Question process used elsewhere by DOE, that would offer to tailor the nuclear explosive safety process when a change is proposed in tooling, procedures, etc. that would enhance safety assurance. This should permit enabling improved safety measures developed for operations with one weapons system to be used (if appropriate) for another weapons system without the need for a new nuclear explosive safety study*
3. *Practices for developing the authorization basis and associated control measures for an operation at Pantex be refined to ensure that the Pantex contractor assumes the position of the organization issuing the documentation and operational plan for operations at Pantex, and defending them before external review groups.*
4. *Instructions be issued that formal safety reviews by NESS groups should consider proposals for actions which have been made by the organization that will do the work and should advise as to perceived shortcomings but should not be empowered to dictate specific remedies. If a proposed action is not found by the independent review group to be acceptably safe, the organization making the proposal can always be requested to put forward an alternative for consideration.*
5. *DOE establish a standing committee of NESS reviewers to replace the ad hoc groups now used; the membership of this body being centered on individuals of emeritus status with experience and proven stature in the nuclear weapons field. This body would be expected to conduct the safety reviews of the future.*
6. *Work planning/safety planning processes for operations with nuclear explosives at the Pantex Plant be organized and pursued as linked components of Integrated Safety Management on the lines of implementation of the Board's Recommendation 95-2."*

2.0 Contributing Causes to Revision of the Implementation Plan

The Implementation Plan issued on April 23, 1999 contained 25 commitments (not counting the commitment for periodic briefings or progress reports to Board). Each of the twenty-five commitments

included one or more formal deliverables from the Department to the Board. Several of the commitments remain open with eight deliverables past due (see Section 6).

The Department has kept the Board informed of both the progress and the delays in achieving the previous commitments. However, the rate of progress and number of outstanding commitments warranted revision of the original Implementation Plan.

The following are underlying causes for the problems encountered:

- The scope of actions necessary for the Department and the Pantex Plant Operating Contractor to rectify a number of problems cited by the Board in Recommendation 98-2 were either unknown at the time the original Implementation Plan was developed, or were underestimated in terms of complexity and resources required. Both the Department and the Pantex Plant Operating Contractor committed to completing some actions within a prescribed timeframe without the full scope of work completely defined.
- The Department and the Pantex Plant Operating Contractor modified both processes and organizational responsibilities related to the safety of nuclear explosive operations, particularly development of hazard analyses and readiness reviews. These changes were put into effect on ongoing activities, effectively "mid-stream", such as the W62, W76, and W88 nuclear weapon programs. As the Department and Pantex Plant Operating Contractor strove to implement these improvements, delays were naturally encountered as personnel learned new roles and responsibilities, and applied new requirements.
- The Department and the Pantex Plant Operating Contractor have not yet achieved the "end-state" of several process definitions. This has resulted in both Department and contractor personnel "learning-as-they-go", resulting in some natural inefficiencies and performance problems. Additional definition is warranted both in Department directives and in contractor standards and manuals to achieve the level of prescription and guidance necessary to achieve consistent, repeatable processes. This is true in a number of areas ranging from hazard analysis development to preparation for and execution of readiness reviews. The Department is committed to continual feedback and improvement of its directive system by incorporating changes based upon lessons learned through field application.
- In some cases, a single deliverable may be outstanding which is required to complete or "close" multiple commitments (e.g., DOE-STD-3015 revision and issuance). In other cases, a deliverable has been transmitted to the Board, but the Department did not consider the "spirit and intent" of the commitment fully satisfied. These situations represent examples where the structure of the original commitments could have been better, and constitute an opportunity for improvement through this revision to the Implementation Plan.

3.0 Baseline Assumptions

The Department made the following assumptions in revising the original Implementation Plan:

- The Department does not anticipate the Pantex Plant operating budget to significantly increase above current funding levels in the foreseeable near-term (i.e., within the next five years). The Department has evaluated the potential for investing significant resources in terms of additional tooling engineers, procedure writers, hazard analysts, etc. at the Pantex Plant. Although a significant increase in available Pantex Plant resources could potentially provide some gains, the Department does not believe these are the only factors limiting the rate of SS-21 implementation. Critical resources within the design laboratories are also limited in terms of weapon system expertise. Thus, application of additional resources solely at the Pantex Plant would not be sufficient to rectify the problems with the rate of SS-21 implementation. Lawrence Livermore National Laboratory (LLNL) and Los Alamos National Laboratory (LANL) can each support only 2-3 weapon programs concurrently that are undergoing SS-21 process redesign. The Department does not consider it feasible to rectify these problems near-term solely through the investment of additional funding resources. This fundamental assumption is reflected in the Integrated Weapons Activity Plan (IWAP) as discussed in Section 4.0.

Particularly in the case of the Pantex Plant, the Department also does not want to increase the number of tooling engineers, procedure writers, and hazard analysts near term only to face potential staffing reductions as the workload diminishes after the bulk of SS-21 implementation is completed. The Department considers a more prudent management approach is to sustain SS-21 process redesign at the maximum rate afforded by current staffing levels in these key areas of expertise. This does not mean the Department will not seek to increase these staffing levels to ensure attrition does not exceed the rate of replacement, or add staff to achieve a satisfactory level of expertise. It simply means the Department does not consider a rapid and significant ramp-up in these critical areas of expertise either feasible or advisable.

- The Department has an obligation to national security to support the enduring stockpile. In addition, the Department has made substantial investments in the programs to dismantle W56 and W79 units. The Department intends to meet its national security obligations and also protect the investment made in the programs to dismantle W56 and W79 units. The Department believes continued dismantlement of older weapon systems improves the overall safety posture for the weapons program. The Department is committed to sustaining some rate of dismantlement concurrently with SS-21 implementation. Therefore, the Department will not divert resources from dismantlement processes to accelerate SS-21 implementation without careful consideration of the overall benefits achieved.
- This Implementation Plan establishes commitments to institutionalize improved safety management processes. The Department will manage these commitments in accordance with the processes described in Section 5.2. This implementation plan also refers to schedules for implementation of SS-21 processes for specific weapon systems and improving hazard analysis and controls for all weapon systems.

4.0 Safety Issue Resolution

In 1993, the Department established the concept of seamless safety for the 21st century ("SS-21") for nuclear weapon systems. The major objective of SS-21 was to achieve safety through design of processes used at the Pantex Plant for assembly, disassembly, and testing of nuclear weapon components. SS-21 was envisioned to evolve the nuclear weapons community away from the historical approach of simply reviewing a process in order to determine the relative safety. Such reviews traditionally occurred just prior to authorization of the work by the DOE. This approach afforded little or no time to accommodate changes at the end of process design, particularly in terms of engineering solutions through changes to tooling and equipment. The original technical safety objectives established for SS-21 in 1993 were:

- Prevent the application of unauthorized/unanalyzed external energy sources to the weapon so as to prevent release of internal energy sources in the weapon. This means all forms of mechanical, electrical, electro-mechanical, and thermal energy. Lifting and transport operations are considered to be potential and kinetic energy sources.
- No single point failure in operations will cause energy sources in the weapon to be activated or released, abnormal radioactive contamination, or serious injury to operating personnel. This means energy sources even if self-contained, radioactive contamination above thresholds set in procedures, and lost workday injuries to operating personnel.
- Exposure to radiation and hazardous substances will be "as low as reasonably achievable (ALARA)."

The Department considers the original safety objectives established for SS-21 still technically sound, and they have been expanded upon during the past few years. Through AL Supplemental Directive 56XB, Development and Production Manual, Chapter 11.5, "Target Level of Controls," the Department established the following general expectations for controlling hazards associated with nuclear explosive operations:

- Elimination of hazards where practical using an iterative process of analysis and design.
- Preference for relied upon engineered safety features versus administrative controls.

- Preference for relied upon passive engineered features versus active features (i.e., requiring human intervention).
- Reliance upon design and control features for prevention of accidents versus mitigation.

In the original version of this implementation plan, the Department attacked the problem of simplifying and improving the efficiency of implementation by closely examining all of the various steps of the SS-21 process. This included not only the iterative analysis and design aspects, but also leadership and composition of project teams, hazard analyses, derivation of operational controls, and subsequent reviews to evaluate the adequacy of the proposed controls and their implementation.

The initial approach applied by the Department and the Pantex operating contractor was to attack redesign of each weapon process on its own merit, focusing on systems with conventional high explosives (CHE) first to obtain the greatest reduction in risk. This approach effectively limits the safety improvements to "one system at a time." The resource constraints, in terms of tooling engineers, procedure technical writers, hazard analysts, and design laboratory engineers limits the ability of the Department to gain improvements across multiple weapon programs simultaneously. The Department anticipates these constraints on key resources will not be alleviated over the next several years. As a result, the Department will not complete SS-21 for all nuclear weapon programs in the enduring stockpile until 2005. As SS-21 is defined above, this means re-design of each nuclear explosive process used for assembly, disassembly, and testing of components at the Pantex Plant. However, the Department believes substantial safety improvements can be accelerated in nuclear explosive operations at the Pantex Plant in a "generic," or "across-the board" fashion, as explained in the following paragraphs.

Until such time weapon systems with conventional high explosives (CHE) could undergo SS-21 process redesign, the Department committed to performing systematic hazard analyses of the existing process. Development of a systematic hazard analysis report (HAR) was planned for each existing CHE weapon program. Each HAR was intended to establish a technical basis for line management to derive the appropriate set of operational controls. In this manner, subsequent reviews performed by the nuclear explosive safety study group (NESSG) could serve as independent reviews to confirm the adequacy of proposed controls, rather than the historical approach where such reviews served to establish the required controls.

The Department attempted to accomplish the development of HAR for the existing CHE weapon processes in parallel with developing safety analyses and operational controls (technical safety requirements) for all Pantex Plant nuclear explosive facilities. Attempts to develop the HAR, safety analyses and technical safety requirements (TSR) in parallel led to a complex authorization basis configuration at Pantex. The parallel efforts also represented significant challenges in terms of timing and integration. A number of problems resulted, including duplication of analytical effort, inconsistencies in analytical approach, and gaps caused by reliance upon other scheduled analyses which failed to occur within the anticipated time frame. With multiple hazard analysis efforts ongoing simultaneously, the Department and Pantex Plant Operating Contractor struggled to establish a foundation upon which to build.

Because no foundation of analyses or controls existed upon which to build, each weapon program HAR was developed as a "stand alone" analysis. In doing so, the collection of HAR developed for various weapon programs soon represented overlapping analyses, using different analytical approaches or yielding different conclusions for the same or similar potential accident scenarios. With multiple HAR being developed in parallel with the facility analyses, project teams frequently derived slightly different approaches in terms of operational controls. This resulted in confusion and implementation problems.

Initial development of a HAR for CHE systems was intended to establish a sound technical basis for the safety of the "existing" process. It was never envisioned that such "Step 1" HAR plans would incorporate time for project teams to completely redesign the existing process. Although project teams were expected to identify any major safety concerns with current tooling and equipment, they were not given the latitude to essentially start with a "clean sheet of paper." This approach effectively limited the project team's ability

to propose engineering solutions to further improve safety. In many cases the project teams compensated by imposing more rigorous administrative controls on existing aspects of the process to minimize hazards. Project teams were expected to have the full latitude to pose engineering solutions through total process redesign in "Step 2" using the "Step 1" HAR as a valuable input tool. In other words, fully apply the objectives of SS-21 using information from the Step 1 HAR on those areas of the process which pose major hazards.

With the recent implementation of site-wide TSR, the Department and Pantex Plant operating contractor have finally established a foundation upon which to build. The TSR represent operational controls that are generically applicable to all nuclear explosive operations. These controls address hazards that are common to all nuclear explosive operations: fire, lightning, electrical energy, and mechanical impacts due to tooling failures and human error.

Through the site-wide TSR, the Department and Pantex Plant operating contractor are achieving tangible improvements in safety. These safety improvements are being achieved through better tooling and equipment designs, and greater rigor in administrative controls as defined in written operating procedures.

Examples of recent safety improvements achieved through tooling and equipment:

- Hoisting and lifting devices provide insulation or isolation for nuclear explosive configurations from potential sources of large electrical energy (such as a direct lightning strike to the facility);
- Bonding or surge suppression of physical and electrical penetrations into the bays and cells used for nuclear explosive operations preclude potential pathways for large electrical energy sources;
- Insulation/isolation devices are installed in physical configurations where equipment attaches to the nuclear explosive for testing or evaluation of components to afford protection from large electrical energy sources;
- Transportation carts establish an effective "Faraday cage" around nuclear explosive configurations, providing insulation from potential sources of large electrical energy.

Examples of safety improvements planned through changes to facility systems and weapon processes:

- Ultra-violet (UV) sensors capable of activating a water-based deluge system within seconds (15-20) of detecting a fire in Pantex Plant operating bays and cells used for nuclear explosive operations;
- Reduction in the usage of flammable solvents and combustible materials in assembly, disassembly, and testing processes and facilities through a risk-cost benefit assessment of flammable solvent and combustible material elimination, minimization or substitution to further minimize the potential for fire in proximity to nuclear explosives;
- Transportation carts designed to afford protection of partially assembled (or disassembled) nuclear weapons from potential sources of mechanical insults such as collisions; and
- Re-design of lifting configurations that require cranes and hoists to either eliminate or further minimize the potential for catastrophic load-path failures that could result in kinetic energy being imposed on the nuclear explosive through mechanical insult.

The Department and Pantex Plant operating contractor have either completed or are pursuing the above improvements "generically" across all nuclear explosive operations and weapon programs. The Department considers this approach will result in accelerating many of the safety improvements originally envisioned by SS-21 in a much faster time frame than otherwise would be achieved "one program at a time."

Thus, the Department's revised approach, as further described in the remaining sections of this Implementation Plan, is to pursue accelerating the rate of safety improvements through a "two-pronged" approach. The Department will place increased emphasis and priority on generic improvements being gained through the efforts outlined above. These efforts are already yielding substantial safety improvements for all nuclear explosive operations conducted at the Pantex Plant. The Department believes pursuit of these generic safety improvements will more rapidly fulfill the original intent of SS-21.

In parallel with these efforts, the Department will continue emphasis and efforts to re-design existing weapon program processes in accordance with the established schedule for SS-21, as identified in the integrated weapons activity plan (IWAP). The Department considers by placing increased emphasis and priority on generic safety improvements that project teams can be allowed to focus on the original intent of SS-21: elimination or further minimization of hazards through process re-design. In this manner, the Department and the Pantex Plant operating contractor will not be dependent upon each weapon program project team to develop unique solutions for all hazards. By establishing a generic basis upon which to build, the project teams can focus on eliminating remaining hazards or building upon the generic baseline of tooling, equipment, and controls.

The Department completed a number of actions identified in the original Implementation Plan. The following sections describe those achievements within the framework of the core functions and guiding principles of integrated safety management, and their relevance in accelerating the rate of safety improvements at the Pantex Plant. A discussion is provided in each section for situations where the Department considers original commitments or deliverables provided marginal effect in accelerating safety improvements. In some instances, the Department has future actions planned, including new or revised commitments and deliverables that are warranted to fulfill the spirit and intent of Recommendation 98-2. Section 6 includes a cross-reference between the commitments contained in the original version of the Implementation Plan and those contained in this revision.

4.1 Define Scope of Work

Actions Completed:

The Department recognized the lack of an effective mechanism to establish priorities and define work scope detail for safety improvements needed in nuclear explosive operations. Previous efforts were focused at various organizational levels and involved weapon processes and facilities, but were not integrated into a single plan. The lack of an integrated organizational approach led to competing resources, inefficiencies, and numerous project start and stops with minimal safety enhancements achieved.

The Department developed an Integrated Weapons Activity Plan (IWAP) to serve as a tool to improve planning and prioritization. The Department established requirements for the IWAP in Albuquerque Operations Office (AL) supplemental directive 56XB, Chapter 11.2, *Integrated Weapons Activity Plan*. (AL supplemental directive 56XB is commonly referred to as the "Development and Production Manual" or "D&P Manual"). The IWAP consists of project plans for generic safety improvements across multiple weapon program processes, and safety improvements for individual weapon processes. The IWAP includes a resource-loaded schedule for accomplishing the improvements.

The Department is using the IWAP and associated project plans to set clear expectations for each improvement initiative. The Department is also using the IWAP schedule to establish the priority of safety improvement initiatives. Safety improvements for weapon processes are sequenced based upon the type of high explosive in the weapon, the degree of intrusion into the weapon required by the work, and the quantity or frequency of the work. For example, priority is given to enhancing process safety for weapons containing conventional high explosive (CHE) before those containing insensitive high explosive (IHE). Similarly, the Department is sequencing generic safety improvements for those tasks or processes providing the largest potential safety improvements scheduled earliest (e.g., improved controls for lightning protection and fire protection that are applicable to multiple weapon programs and nuclear explosive operations). This approach enables acceleration of safety improvements across multiple weapon programs to be achieved simultaneously versus "one program at a time."

The Department recognized the responsibility for various aspects of nuclear explosive operations is vested in different organizations. The Pantex Plant Operating Contractor is responsible for the safety of operations and the adequacy of the technical basis for associated controls, the design laboratories are responsible for evaluation of weapon response to accident stimuli, and the Department is responsible for risk acceptance decisions. Previously, these roles were not clearly defined. The Department delineated these organizational responsibilities by issuance of D&P Manual Chapter 11.3, *Seamless Safety (SS-21) for Assembly and Disassembly of Nuclear Weapons at the Pantex Plant*.

The Department did not have an effective mechanism in place to enable leadership of this multi-organizational effort and to ensure balanced priorities. The Department established a Standing Management Team (SMT) consisting of senior managers from DOE, the design laboratories, and the Pantex contractor. Representatives from the laboratories and Pantex contractor serve both as advisors and as representatives to provide institutional commitments on behalf of their organizations. The Chairman of the SMT is the Director, Weapon Programs Division (WPD). The Co-Chairman is the Area Manager, Amarillo Area Office (AAO). The SMT provides the DOE line managers (WPD Director for weapon processes, AAO Area Manager for site operations) a mechanism to execute their line management responsibilities for safety and balanced priorities. The SMT Charter was delineated through issuance of D&P Manual Chapter 11.1, *Standing Management Team*. The Department is using the IWAP to identify resource conflicts for safety improvement tasks, and the SMT Chair and Co-Chair make decisions on which work to complete first based upon advice and feedback from the contractor representatives on the SMT.

The Department issued D&P Manual Chapter 11.3, *Seamless Safety (SS-21) for Assembly and Disassembly of Nuclear Weapons at the Pantex Plant*, to establish the high level expectations for SS-21. The Department approved interagency technical business practice (TBP)-901, *Integrated Safety Process for Nuclear Weapons Operations and Facilities*. Development of TBP 901 was facilitated by Sandia National Laboratory and replaced engineering procedure (EP) 401110, *Integrated Safety Process for Assembly and Disassembly of Nuclear Weapons*. TBP-901 clarifies expectations for SS-21 by incorporating experience gained from application of EP401110. TBP-901 simplifies the SS-21 process and eliminates prescription for the myriad of functional sub-teams.

Taken in combination, the above changes in project team roles and responsibilities and the SS-21 process had little or no effect in accelerating safety improvements. However, the Department considers these actions were necessary to establish consistency with the guiding principles of integrated safety management: clear roles and responsibilities, and line management responsibility for safety. Similarly, although not yet perfected, the IWAP provides an important mechanism for the Department, Pantex Plant operating contractor, and the design laboratories to establish balanced priorities.

Future Actions:

Although the IWAP currently includes the program plan for generic safety documentation upgrades (e.g., SAR facility modules and associated TSR), it does not include the associated plans and schedules necessary for implementation of the improved controls. The IWAP and BIO/SAR Program Plan do not include commitments and schedules for engineering improvements such as fire detection and suppression system upgrades (UV-activation capability), transportation carts, or eliminate, minimize, or substitute flammable solvent and combustible material. The Department will rectify this problem through commitment 4.1.1 and the commitments in section 4.3.

Commitment 4.1.1

The Department will revise the BIO/SAR Program Plan to include all of the project plans, schedules and resources necessary to accomplish generic safety improvements. This includes

out-year schedules to achieve full compliance with DOE Order 5480.22 and 5480.23, and the associated resource estimates and schedules for implementation of safety improvements needed in administrative controls and tooling, or equipment upgrades. The BIO/SAR Program Plan will also include schedules for performing nuclear explosive safety (NES) master studies aligned with the upgrade modules.

Lead Responsibility: Area Manager, AAO
Deliverable: BIO/SAR Program Plan
Due Date: August 2000

Further changes are anticipated to TBP-901, *Integrated Safety Process for Nuclear Weapons Operations and Facilities*, to address remaining organizational comments or issues. The Department will assess the adequacy of contractor and design laboratory implementation of the changes to SS-21 as delineated in TBP-901.

Commitment 4.1.2

Lead Responsibility: Director, WPD
Deliverable: Assessment of TBP-901 Implementation
Date Due: November 2001

4.2 Analyze Hazards

Actions Completed:

For nuclear facilities, the Department requirements for hazard analyses are defined in DOE Order 5480.23, *Nuclear Safety Analysis Report*. Guidance for compliance with DOE Order 5480.23 is provided through DOE-STD-3011-94, *Guidance for Preparation of DOE 5480.22 (TSR) and DOE 5480.23 (SAR) Implementation Plans*, and DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*.

Efforts are ongoing to upgrade the current Pantex Plant Basis for Interim Operation (BIO) to a SAR that is compliant with DOE Order 5480.23. As part of the IWAP effort, a program plan was developed for the BIO upgrade. The program plan identifies the individual project activities required to upgrade the BIO, in modular fashion, to a SAR. The upgrade modules are structured around the predominant hazards (fire, lightning, etc.) that affect all nuclear explosive processes, and the different types or classes of facilities at Pantex (bays, cells, etc.). Similarly, the program plan includes the development of operational controls that are compliant with DOE Order 5480.22. The Department and Pantex Plant operating contractor have transitioned previous controls found in the Critical Safety System Manual (CSSM) and the BIO to TSR. As discussed earlier, this provides the foundation upon which future analyses and operational controls can be built.

For specific nuclear explosive operations, the Department established requirements for hazard analysis through DOE Order 452.2A, *Safety of Nuclear Explosive Operations*, and provided guidance through DOE-DP-STD-3016-99, *Hazard Analysis Reports for Nuclear Explosive Operations*. In addition to the general format and content guidance provided in DOE-DP-STD-3016-99, AL provided further guidance through D&P Manual Chapter 11.4, *Authorization Basis for Pantex Plant Nuclear Explosive Operations*.

The Pantex contractor developed process-specific hazard analysis reports (HAR) for the W56, W87, W62, W76, and W88 programs. DOE has approved the HAR for the W56, W87, W62, W76 and W88 (with conditions of approval specified on the W76 and W88). The Department has conducted "lessons learned" workshops following the development of a number of HAR. Information garnered from the workshops has translated into additional guidance in the form of changes to AL supplemental directives, improved procedures for review and approval, and a manual developed by the Pantex Plant operating contractor. The Department plans to develop

HAR for all other weapon programs in the enduring stockpile, consistent with the schedules in the IWAP.

AL established a review process for the HAR that parallels the approach used elsewhere in the DOE complex for SAR. The review team works for the approval authority. This approach enables the approval authority to provide timely direction and guidance to the review team, and to resolve technical issues raised during the review. The review approach is intended to provide continuity and build upon lessons learned through each development and review process by using a core group of personnel to perform such reviews. The review team documents their results in a safety evaluation report (SER). The SER contains the conclusions reached from the review and serves as the basis for DOE approval of the contractor HAR. The SER is developed using the guidance of DOE-STD-1104-96, *Review and Approval of Nonreactor Nuclear Facility Safety Analysis Reports*. AL defined the review process, including roles and responsibilities, in D&P Manual Chapter 11.4, *Authorization Basis for Pantex Plant Nuclear Explosive Operations*.

As AL undertook implementation of this review process, the need for additional resources and a formal training and qualification program were recognized. Qualification standards were established for AL personnel involved in the review of authorization basis documents to provide competence commensurate with responsibilities. Additional staffing positions were created within the appropriate AL organizations involved in the reviews. Where appropriate, AL has used the Department's authority to establish excepted service positions, in order to recruit the requisite level of experience and talent. An excepted service level staff position was established and filled in 1999 at AAO.

Personnel are currently working to achieve full qualification and AL is tracking the status of qualification in accordance with DOE Order 360.1, *Training*. The Department included these actions as commitment 5.8.4 in the original implementation plan. Given the actions taken and the tracking system in place, the Department considers the previous commitment satisfied.

The AL Manager delegated approval authority for HAR and weapon-specific TSR to the Area Manager, AAO on March 9, 2000. Combined with the previous delegation of authority from the Office of Defense Programs (through the AL Manager) for nuclear facility safety analyses and controls, this will consolidate approval authority at the Area Manager, AAO. The Department believes consolidation of approval authority at the Area Manager will promote better integration between the facility-level and process-specific analyses and the operational controls derived therefrom. The Department also considers it important that personnel who are assigned to perform such reviews are located closest to the work. In this manner personnel can perform walk-downs of facilities or processes to validate the accuracy of the hazard analyses and the adequacy of proposed operational controls. AL has transferred two (2) additional positions to AAO to implement this approach. AL is establishing an additional excepted service position at AAO to support review of authorization basis documents for nuclear explosive operations.

The Department issued D&P Manual Chapter 11.7, *Nuclear Explosive Operations Change Control Process*, to define expectations for evaluating potential hazards of proposed changes. The process defined in Chapter 11.7 enables the evaluation of proposed changes, irrespective of whether a particular weapon process has an approved HAR. Chapter 11.7 reinforces use of the process defined in DOE Order 5480.21, *Unreviewed Safety Questions* to evaluate the impacts of a proposed change on the existing authorization basis, whether it includes a HAR, or is at the facility or site level (e.g., Basis for Interim Operation, site-wide TSR). As a sub-element of commitment 5.3.2 in the original IP, the Department committed to combining the requirements on change control from AL supplemental directive 452.2A and D&P Manual Chapter 11.4 into a single "manual". Instead, the Department developed D&P Manual Chapter 11.7 to address all aspects of change control, in an effort to better integrate the traditional change control process used by the nuclear explosive safety community with the USQ process traditionally used in other DOE nuclear facilities.

In parallel with the efforts taken by the Department, the Pantex Plant Operating Contractor established a task force to address the continuing problems associated with development of authorization basis (AB) documents for nuclear explosive operations (e.g., HAR). The AB Task Force produced a report in May 1999, which contained an extensive number of recommendations for improvements. The recommendations were structured around six major categories of identified needs: (1) definitions, terms, and communication; (2) processes, methodology, tools, and techniques; (3) leadership and management; (4) training and professional development; (5) funding and budgeting; and (6) business execution. Some of the corrective actions taken include:

- Development of a Master Authorization Agreement for all hazard category 2 nuclear operations and activities at the Pantex Plant defining the authorization basis for each activity,
- Development of a Pantex Plant Integrated Safety Management Authorization Basis (AB) Manual to provide site-specific guidance on form and content for all authorization basis documents and to define organizational roles and responsibilities,
- Establishment of AB training for risk analysts, Project Team members, reviewers and other plant personnel.

The Pantex Plant Operating Contractor completed a number of the corrective actions identified by the AB Task Force. The contractor recruited a senior technical advisor and established an organizational element specifically responsible for the development of authorization basis documents. Additional personnel with hazard analysis experience have been hired and support contractors are being used to augment staff for critical projects.

Future Actions:

A number of the actions described above have served to reduce the complexity and time required for developing hazard analyses for nuclear explosive operations. The Department now has a hazard analysis development, review, and approval process for nuclear explosive operations that closely parallels processes used elsewhere in the complex for nuclear facilities. The quality and rate of HAR development has gradually improved. As noted previously, the Department attempted to apply expectations for developing a HAR (and TSR) effectively "mid-stream" to a number of weapon processes simultaneously. As a result, the project teams and the weapons community were afforded little if any opportunity to apply the lessons learned except in a "real time" environment. The Department believes as the process established for HAR (and TSR) development, review, and approval matures, further efficiencies will be gained in terms of reduction in the time required.

The Department acknowledges further work is required to achieve the level of high quality analysis envisioned. One area of particular importance is the fidelity of weapon response to hypothetical accident environments and stimuli. Each of the respective design laboratories applies a slightly different approach to evaluating weapon response. Additionally, there is great variability in the degree of supporting documentation that serves as the technical basis for conclusions drawn by laboratory experts. The Department has tasked the design laboratories and MHC to jointly develop a consistent approach and to provide consensus expectations for supporting documentation.

Commitment 4.2.1

The Department will issue formal guidance on developing and classifying controls for nuclear explosive operations at the Pantex Plant.

Lead Responsibility: Area Manager, AAO

Deliverable: D&P Manual, Chapter 11.8

Due Date: October 2000

Commitment 4.2.2

Further guidance on expectations for the evaluation and documentation of weapon response to potential accident environments and stimuli will be issued through a TBP.

Lead Responsibility: Area Manager, AAO
Deliverable: TBP guidance on weapon response
Due Date: January 2001

Commitment 4.2.3

The Department will ensure the requirements for weapon response evaluation are incorporated into the management and operating contract for the Pantex Plant. The Department will require the Pantex Plant operating contractor to develop an impact analysis and implementation plan for compliance with the D&P 11.8 and TBP requirements. As part of this commitment the Department will track contractor implementation until completion.

Lead Responsibility: Area Manager, AAO
Deliverable: 11.8 and TBP Impact Analysis and DOE-approved Implementation Plan
Due Date: March 2001

The Pantex Plant operating contractor plans to provide additional training on the USQ process and to transition the performance of such reviews more to line management and personnel intimately familiar with the work being proposed. For example, this would include tooling engineers, weapon program engineers, project managers, maintenance package planners and others. This will allow the operating contractor to evolve from a centralized USQ review group that has traditionally functioned in a support role to increased responsibility on line management for evaluating (and documenting) the safety of a proposed activity prior to authorization. By increasing the number of plant personnel who are knowledgeable and proficient with the USQ process, the Department believes the contractor will be more efficient at evaluating proposed improvements in safety and in implementing such improvements. This is the major item remaining from corrective actions taken in response to the AB Task Force report (commitment 5.3.1 in the original implementation plan).

Commitment 4.2.4

The Pantex Plant operating contractor will complete transition of the USQ process to line management and personnel. The Department will assess the adequacy of contractor actions and the effectiveness of the USQ process used at the Pantex Plant.

Lead Responsibility: Area Manager, AAO
Deliverable: Assessment of the USQ process
Due Date: January 2001

Commitment 4.2.5

The tooling and procedure assessment performed by the Pantex Plant operating contractor identified the need to ensure failure analyses performed on tooling provide suitable input for hazard analyses. Integration of these analyses is required to ensure appropriate operational controls are derived for safety features or aspects of the tooling design that prevent accidents.

The Pantex Plant Operating Contractor developed an Integrated Safety Management Authorization Basis Manual to provide more detailed guidance to hazard analysts and other plant personnel. Although the Department agreed the manual is adequate for initial application and use, a number of areas require additional improvement. The Department will work with the Pantex Plant Operating Contractor to revise the manual. This will include additional guidance on the integration of fire hazard analyses and tooling failure analyses with the overall safety analyses for nuclear explosive operations.

Lead Responsibility: Area Manager, AAO

Deliverable: Revision #2 to the Integrated Safety Management Authorization Basis Manual

Due Date: October 2000

Commitment 4.2.6

With the promulgation of D&P Manual Chapter 11.7, the Department attempted to integrate elements of the nuclear explosive change control process with the USQ process. As the Department, design laboratories, and Pantex Plant operating contractor applied the requirements of D&P Manual Chapter 11.7, a number of problems have arisen. The Department will evaluate Chapter 11.7 for improvements. Specifically, establishment of clearer criteria/guidance for the NES Change Evaluation process, better linkage to the USQ process, and more explicit processing of new safety information will be considered for incorporation into Chapter 11.7. The Department will consider recent experiences, such as the command disablement operation of the B61-10, in this review

Lead Responsibility: Director, WSD

Deliverable: Revision to D&P Manual Chapter 11.7

Due Date: November 2000

4.3 Develop and Implement Controls

Actions Completed:

Perhaps the most difficult problem associated with the rate of SS-21 implementation is the time and resources required for the iterative re-design and analysis of each weapon process. The lead-time required for design and procurement or fabrication of new tooling, coupled with the time required to develop written procedures become the key limiting factors for successful SS-21 implementation.

The Pantex Plant operating contractor performed an assessment of their processes for tooling and procedure development in an effort to identify potential inefficiencies or needed enhancements. A number of opportunities for improvement were identified with corresponding recommendations. These included both short term and long term actions. Some of the changes implemented were:

- Expedited process for raw material procurement (to improve the rate of in-house tooling manufacture)
- Doubled the number of tooling planners (to improve coordination of material needs, tooling repair or redesign scheduling, etc)
- Development of the capability to electronically transmit tooling drawings to prospective manufacturers or suppliers (to accelerate the bid and selection process for vendor fabrication of tooling)
- Consolidation of previous multiple writers guides into a single guide

The Pantex Plant Operating Contractor also identified the need to improve the process knowledge of procedure writers (to improve their ability to assess and determine needed changes with less input required from the weapon engineers). Resource reviews were included as part of the assessment and additional staffing needs were identified for key positions. The Pantex Plant operating contractor has either completed action or is taking additional action to fill these critical positions within the limitations of the current fiscal year funding.

Previous Pantex Plant operational controls established in the BIO and the critical safety systems manual (CSSM) were converted into site-wide TSR. The Department approved the Lightning BIO and the associated TSR on April 17, 2000. The Pantex Plant Operating Contractor completed

implementation of the new TSR. For selected controls, an adequate technical basis was established by previous analyses. For other controls, the technical basis needs to be strengthened or established by additional analyses. The modular improvements of the BIO/SAR upgrade program are intended to provide the requisite analyses and improved controls. The TSR controls established through the BIO/SAR upgrade efforts would be applicable to multiple facilities and weapon processes.

In conjunction with the development of HAR for a given weapon process, the Department required development of an activity based control document (ABCD). The ABCD identifies all of the controls required to either prevent or mitigate the effects of potentially serious accidents identified in the HAR. The controls contained in the ABCD are intended to meet the format and content requirements of DOE Order 5480.22 (i.e., TSR). ABCD have been developed and approved for the W79, W56, W87, W62, W76, and W88 programs. Ultimately, those TSR specific to a given weapon operation will simply represent an addendum to the site-wide TSR for Pantex. Previous ABCD attempted to serve as a compensatory measure by identifying all of the requisite controls.

AL defined requirements for ABCD in the D&P Manual Chapter 11.4, *Authorization Basis for Pantex Plant Nuclear Explosive Operations*. AL is applying the same review process described above on both the HAR and ABCD. To assist both contractor personnel who prepare ABCD and DOE personnel involved in the review, AL provided additional guidance in D&P Manual 11.5, *Target Levels of Controls*. The target levels of control (TLC) concept provides a tool for personnel to gauge the relative level of defense-in-depth incorporated into a proposed set of operational controls (i.e., site-wide TSR coupled with weapon-specific TSR). Fundamental to the TLC concept is the desired hierarchy of controls and precedence for selection: (1) re-design the process to remove the hazard, (2) reliance upon passive engineered features, (3) reliance upon active engineered features, and (4) reliance upon administrative controls.

Future Actions:

The BIO/SAR upgrade program will serve to establish the technical and analytical basis for the site-wide TSR. This program is anticipated to result in changes to the existing site-wide TSR, in the form of new or improved controls. A BIO/SAR module is ongoing to address hazards associated with fire in areas containing nuclear explosives. Another BIO/SAR module is ongoing to address hazards associated with the on-site transportation of nuclear explosives. The scope of this module was expanded to analyze both full-up and partial weapon configurations. Additional BIO/SAR modules are planned to address other hazards posed to nuclear explosive operations conducted in bays, cells, and special purpose facilities.

Commitment 4.3.1

Develop improved site-wide TSR controls for fire protection.

Lead Responsibility: Area Manager, AAO

Deliverable: DOE-approved BIO Module on Fire Protection and associated TSR and Develop a resource-loaded schedule for implementation of improved TSR controls for fire protection.

Due Date: October 2000

Commitment 4.3.2

The Department will validate implementation of the improved site-wide TSR controls for fire protection.

Lead Responsibility: Area Manager, AAO

Deliverable: DOE RA Report

Due Date: Upon completion of the DOE RA identified by the Implementation Plan schedule under Commitment 4.3.1 above.

Commitment 4.3.3

Develop improved site-wide TSR controls for on-site transportation of nuclear explosives

The Department will develop site-wide TSR controls for on-site transportation of nuclear explosives through a BIO module. Some work has already been completed with respect to transportation hazards analysis, but additional weapon response information is required. As an interim compensatory measure, DOE will establish some additional controls based on the work already completed. These controls will be incorporated into the site-wide TSR until the BIO module is completed.

Lead Responsibility: Area Manager, AAO

Deliverable: DOE-approved BIO Module for On-Site Transportation and associated TSR and DOE-approved Implementation Plan for transportation controls

Due Date: February 2001

Commitment 4.3.4

The Department will validate implementation of the improved site-wide TSR controls for on-site transportation of nuclear explosives.

Lead Responsibility: Area Manager, AAO

Deliverable: DOE RA Report

Due Date: Upon completion of the DOE RA identified by the Implementation Plan schedule under Commitment 4.3.3 above.

Commitment 4.3.5

The experience gained through the development of weapon-specific HAR and the performance of Nuclear Explosive Safety Master Studies has demonstrated the need for additional "generic" TSR applicable to nuclear explosive operations involving multiple weapon programs. The Nuclear Explosive Safety Master Studies identified a number of positive measures. Some of these positive measures may warrant inclusion as TSR controls prior to completion of all BIO/SAR module upgrades. Therefore, in parallel with the BIO/SAR upgrade modules, the Department will review previous NES Master Studies to determine if any controls warrant inclusion in the site-wide TSR. These include controls either explicitly or implicitly credited in the NES Master Studies. The Department will apply the criteria and guidance of DOE Order 5480.22 and DOE-STD-3009-94, in order to determine if any of the credited controls warrant inclusion in the TSR.

Lead Responsibility: Area Manager, AAO

Deliverable: Additional DOE-approved TSR controls derived from the NES Master Studies.

Due Date: November 2000

Based upon the analytical work performed through several CHE weapon program HAR, the Department has identified the need to place increased emphasis and priority to eliminate, minimize, or identify and implement suitable substitutes through a risk-cost benefit assessment for flammable solvents and combustible materials currently used in proximity to and in nuclear explosive operations. The flammable solvents targeted are those with flashpoints less than 140 F corrected to a barometric pressure of 760-mm Hg. As an example, the Department has noted a historical tendency to use isopropyl alcohol in several applications where it is relatively ineffective as solvent. In this situation, the isopropyl alcohol should be eliminated, minimized, or replaced with a more suitable, non-flammable solvent to further minimize the potential for fire. Another recent example involved the W62 program. The rubber floor mats used to cushion the impact from the assembly being potentially dropped on the floor were found to be combustible in conjunction with the presence of alcohol. A suitable replacement floor mat design was successfully found, tested, and determined to be fire retardant. The Department will work with the Pantex Plant operating contractor and the design laboratories to pursue more expeditious

elimination, minimization, or evaluation, testing, and replacement of flammable solvents and other materials used in nuclear explosive processes for assembly, disassembly, and testing.

Commitment 4.3.6

Develop a plan to systematically reduce the usage of flammable solvents and combustible materials used in proximity to and in nuclear explosive operations through a risk-cost benefit assessment of solvent and combustible material elimination, minimization or substitution. The plan will require identification of operations where those flammable solvents and combustible materials used in proximity to and in nuclear explosive processes for two weapon programs on a trial basis. Based upon a risk-cost benefit assessment, the plan will then provide proposed actions that will need to be initiated to eliminate, minimize or substitute those flammable solvents and combustible materials.

Lead Responsibility: Area Manager, AAO

Deliverable: Flammable Solvent and Combustible Material Reduction Plan

Due Date: October 2000

Based upon needs identified through recent analyses, the Department will pursue improved transportation carts for various nuclear explosive configurations. Carts have already been designed, fabricated, and put into use on several weapon systems to provide a "Faraday cage" that affords partially assembled nuclear weapons protection against large electrical energy sources such as a direct lightning strike to the surrounding facility or structure. The Department will pursue design, fabrication and use of additional carts to provide similar protection for all other nuclear warhead weapon systems. Sandia National Laboratory is currently evaluating the protection afforded nuclear weapons in their special shipping containers and "full-up" or completely assembled weapon configurations outside their shipping container. The SNL analysis is expected to conclude such configurations provide some level of protection equivalent to a "Faraday cage." Therefore, the Department anticipates continued focus of transport cart design on protection for partially assembled weapon configurations. These configurations would be more vulnerable to large electrical energy sources, such as lightning strikes.

The draft transportation SAR/BIO module indicates several partial weapon configurations are similarly vulnerable to mechanical insult from collisions that might occur during transport, or accidental discharge of firearms carried by security personnel. The Department will pursue design, fabrication and use of carts suitable to provide protection against such mechanical insults. Currently, several design concepts or "families" of transportation carts are envisioned to fulfill this need. Every attempt will be made to design and fabricate the carts using commonality and economy of scale considerations. This approach should yield the most rapid deployment.

Commitment 4.3.7

The Department will develop a plan for the design, fabrication, and use of carts for partially assembled nuclear weapons affording protection against the range of potential hazards envisioned in transport at the Pantex Plant (e.g., electrical, mechanical).

Lead Responsibility: Area Manager, AAO

Deliverable: Plan for transportation carts

Due Date: October 2000

The draft fire SAR/BIO module, coupled with several weapon-specific HAR, indicates the need to establish UV-activated deluge capability for a number of areas at the Pantex Plant involved in the assembly and disassembly of nuclear explosives. The response time of the current system for heat detection and activation of suppression is not adequate for the potential situation where a fire might be initiated in a bay or cell containing a nuclear weapon with conventional high explosive. For the majority of affected facilities, the ongoing project to upgrade the capability and reliability of the fire detection and suppression systems has been expanded to include UV detection as the

actuator of deluge systems. In this manner, the speed of detection and actuation can be rapid enough to prevent propagation of a fire. Rapid detection and suppression activation would prevent all fire scenarios except those initiated in very close proximity from potentially causing a thermal reaction in the high explosive of a nuclear weapon. However, the Building 12-44 cells are not encompassed by the current upgrade and a separate project will be required. The Department will develop and complete a project for upgrading the fire detection and suppression system in Building 12-44 to provide UV-activated deluge capability.

Commitment 4.3.8

The Department will develop a project design statement (PDS) to upgrade the fire detection and suppression system in Building 12-44 to provide UV-activated deluge capability.

Lead Responsibility: Area Manager, AAO
Deliverable: PDS for 12-44 Fire Protection Upgrade
Due Date: December 2000

Commitment 4.3.9

The Department will modify the fire detection and suppression system in Building 12-44 to provide UV-activated deluge capability.

Lead Responsibility: Area Manager, AAO
Deliverable: Completion of physical modifications to Building 12-44
Due Date: December 2002

As discussed above, the draft fire SAR/BIO module and weapon-specific HAR indicate the need for a safety class (or safety significant) fire detection and suppression system in a number of Pantex Plant facilities used for the assembly and disassembly of nuclear weapons. The required reliability of the fire detection and suppression systems must be determined through further analyses. However, the current maintenance backlog for the fire alarm system indicates the need for increased attention, particularly with respect to the number of components designed or provided by a previous vendor. A number of system components are no longer available. A project is needed to systematically identify the upgrades needed to rectify this problem and to ensure the reliability required to support the intended safety function.

In the interim (i.e., until a line item capital project can be funded and physical replacements completed), the Department will replace fire alarm panels and components no longer vendor supported in nuclear explosive facilities (based upon failure rate histories) through the preventive maintenance program. These obsolete components will provide a limited inventory of spare parts for less critical facilities at the Pantex Plant until such time replacements can be made through the capital line item. In conjunction with this effort, the Department will develop potential contingencies for the obsolete vendor computer portion of the fire alarm system. This component is recognized as the most critical and potentially vulnerable aspect of the overall fire alarm system.

Commitment 4.3.10

The Department will develop a conceptual design report (CDR) for a project to replace the Pantex Plant fire alarm system. The replacement system will provide the needed reliability for fire protection of nuclear explosive areas involved in the assembly and disassembly of nuclear explosives.

Lead Responsibility: Area Manager, AAO
Deliverable: CDR for fire alarm system replacement
Due Date: April 2001

Commitment 4.3.11

The Office of Defense Programs (DP) will authorize a line item construction project for the fire alarm replacement in the budget for fiscal year 2003. In the interim, the Department will maintain the reliability of the Pantex Plant fire alarm system through preventive maintenance for critical facilities, such as those used for assembly, disassembly, testing, and storage of nuclear explosives. Selective replacement of facility fire alarm panels and high failure rate components will be used to establish an inventory of spare parts for less critical facilities.

Lead Responsibility: DP-20

Deliverable: DP authorization of Title I

Due Date: June 2001

4.4 Perform Work

Actions Completed:

The original Implementation Plan included specific commitments for the W62 weapons program. The Department implemented compensatory actions identified in the W62 Step 1 Project Plan to realize part of the potential SS-21 benefits as soon as possible on the W62. These benefits included some improvements in the safety and function of key tooling used to hoist and handle the partially assembled nuclear explosive and improved procedures more conducive to reader understanding and adherence. The commitments for the W62 weapons program are complete and the disassembly and inspection process has safely restarted.

The Department has reduced the number of independent reviews conducted to ensure the contractor has adequately prepared a safe process to assemble, disassemble, or test a nuclear explosive prior to authorizing startup or resumption. These are a readiness assessment and a nuclear explosive safety (NES) review. (As discussed in section 4.2, the Department conducts a review to approve the hazard analysis and proposed operational controls, prior to implementation and final preparations to startup or restart.) The Department is conducting the readiness assessment in accordance with DOE Order 425.1A, *Startup and Restart of Nuclear Facilities*. AL has promulgated additional guidance on readiness assessments through AL supplemental directive 425.1A, *Startup and Restart of AL Activities*, and D&P Manual Chapter 11.6, *Coordinated Review Process for Nuclear Explosive Operations at the Pantex Plant*.

One of the key purposes of the readiness assessment as defined in DOE Order 425.1A, is to validate DOE approved operational controls to ensure safety are effectively implemented. The purpose of the NES review is to question whether the proposed operation is adequately controlled from a NES perspective. The NES review serves as an additional layer of defense for activities with potential nuclear explosive safety consequences.

The Department has revised the requirements for the nuclear explosive safety review process to ensure the proper role of an independent review. DOE line management is responsible for decisions regarding the need for and type of corrective actions stemming from review findings. The Department has clarified the delineation of roles and responsibilities through revision of AL supplemental directive 452.2A and D&P Manual Chapter 11.7. Proposed revisions to DOE Order 452.2A and DOE-STD-3015-97 (beyond those comments incorporated into the draft released December 2, 1999) are in process to accomplish similar clarifications.

The Department also recognized the need to align the NES review scope to match with that of the authorization basis developed by line management (i.e., HAR, BIO/SAR, and TSR). This allows the NES study to serve as an independent review to confirm the safety of the proposed operation. This approach corrects the historical practice of using the NES study as the primary basis for why the operation is safe enough. The Department granted temporary relief to NES expiration dates for systems with insensitive high explosive, and restructured the current scope of NES Master

Studies to align with the scope of programmatic elements established in the Pantex BIO/SAR upgrade program. The BIO/SAR Program Plan will be updated to include schedules for the corresponding NES Master Studies, consistent with this approach (see Commitment 4.1.1).

The qualification of the NES review group is key to addressing quality and consistency of the studies. To achieve the guiding principle of competence commensurate with responsibilities, the structure and qualification requirements for the nuclear explosive safety study group (NESSG) are being strengthened. This is being accomplished through revision of DOE-STD-3015.

Future Actions:

The allowance for revalidation will be deleted from DOE Order 452.2, DOE-STD-3015, and AL SD 452.2. It should be noted that the Department plans to use the revalidation process for the W88 program. This review will use the same approach as the revalidation of the W62 operation conducted in November-December, 1999. The W88 review will be the last revalidation conducted.

The minimum core membership for the Nuclear Explosive Safety Study Group (NESSG) will be an AL or Nevada Operations Office (NV) chairman (depending upon study topic and/or site location of nuclear explosive operation), members from each of the design laboratories (SNL, LANL, and LLNL), and involvement by senior members. For the studies at Pantex Plant, the operating contractor will also have a member on the NESSG. This will be specified in a revision to DOE-STD-3015.

AL has taken steps towards implementing the use of senior personnel on the NESSG. A list of potential candidates was developed by AL with input from the Air Force, HQ, the DNFSB, SNL, LLNL, and LANL. The Department will establish a pool of four senior members. The AL Manager will interview and select four senior members from the list of potential candidates.

More explicit qualification requirements shall be included in the next version of DOE-STD-3015 for NES Study chairmen and members. Each organization will be responsible for establishing a process to ensure their NES personnel meet these requirements prior to participation on an NESSG. Further, in order to preserve NV NES expertise, a requirement shall be added that NV maintain a minimum of two individuals proficient as NESSG members.

Commitment 4.4.1

The Department will develop revisions to DOE Orders 452.1, 452.2, and DOE-STD-3015. The proposed revisions to these directives will be coordinated with the DNFSB prior to submission into the Department's directives system for formal review, in accordance with DOE Manual 251.1-1A.

Lead Responsibility: DP-20

Deliverable: Proposed revisions submitted into directives system for formal review

Due Date: August 2000

Commitment 4.4.2

The Orders and Standard will be processed and issued concurrently, and consistently with DOE Manual 251.1-1A which affords a 30 - 60 day comment period followed by a 30 - 60 day comment resolution period.

Lead Responsibility: DP-20

Deliverable: Revisions to DOE Orders 452.1, 452.2, and DOE-STD-3015 issued

Due Date: November 2000

Commitment 4.4.3

AL will issue revisions to supplemental directives to align with the changes to DOE Orders 452.1, 452.2, and DOE-STD-3015. The Department will invoke applicability of the revised directives through the existing contract structure for the Pantex Plant. The management and operating contractor will provide an impact analysis and an implementation plan, if warranted, to achieve compliance with the new requirements.

Lead Responsibility: AL Manager

Deliverable: Revisions to AL Supplemental Directives 452.1 and 452.2 issued and Impact Analysis and DOE-approved Implementation Plan (as required)

Due Date: February 2001

Commitment 4.4.4

Nevada Operations Office (NV) will issue revisions to the NV Orders to align with the changes to DOE Orders 452.1, 452.2, and DOE-STD-3015. The Department will invoke applicability of the revised directives through the existing contract structure for the Nevada Test Site. The management and operating contractor and the design laboratories will provide an impact analysis and implementation plan, if warranted, to achieve compliance with the new requirements.

Lead Responsibility: NV Manager

Deliverable: Revisions to NV Orders issued and Impact Analysis and DOE-approved Implementation Plan (as required)

Due Date: February 2001

A number of deliverables contained in section 4.3 of this implementation plan are intended to demonstrate the Department's commitment to achieving accelerated safety improvements that affect multiple weapon programs (i.e., generic improvements or "across the board"). Consistent with the approach taken in the original version of the implementation plan, the Department believes the startup (or restart) of one or more individual weapon systems will be required to demonstrate changes made to the "SS-21 process" have been effective in promoting the acceleration of safety improvements.

Commitment 4.4.5

The Department will authorize startup of the W78 SS-21 process. The startup will reflect improvements in tooling and process design, and successful execution of all other aspects of the SS-21 process for a weapon system with conventional high explosive (CHE).

Lead Responsibility: AL Manager

Deliverable: W78 SS-21 Startup Authorization

Due Date: December 2002

Commitment 4.4.6

The Department will authorize startup of the B83 SS-21 process. The startup will reflect improvements in tooling and process design, and successful execution of all other aspects of the SS-21 process for a weapon system with insensitive high explosive (IHE).

Lead Responsibility: AL Manager

Deliverable: B83 SS-21 Startup Authorization

Due Date: May 2002

4.5 Feedback and Improvement

Completed Actions:

The Department has conducted a number of workshops with several aimed specifically at applying lessons learned from one project to another. These included such topics as HAR development, weapon response information, nuclear explosive safety study group (NESSG) structure and membership, and readiness reviews. Using the feedback gained from the workshops, the Department has revised or issued a number of directives, including D&P Manual Chapters, AL Supplemental Directives (425.1A, 452.2A), and DOE-STD-3015. As discussed earlier in this plan, the Department anticipates additional directive changes will be required to incorporate lessons learned through field application.

In addition to these workshops, the Department has used feedback from the Pantex Plant integrated safety management system verification (ISMSV) review conducted between July and August 1998. The ISMSV review identified a number of the same problems and issues later contained in Recommendation 98-2. In response to the ISMSV findings, the Amarillo Area Office and the Pantex Plant operating contractor have made an extensive number of changes to their procedures and standards. These include areas such as: (1) project management; (2) prioritization of work; (3) organizational roles and responsibilities; (4) hazard analyses development, review and approval; (5) readiness preparation and reviews; and, (6) development and use of performance measures. The Department completed a repeat Phase I ISMSV review, April 3-14, 2000, and approved the Pantex Plant Operating Contractor's ISMS Description on May 12, 2000. The Department also completed a repeat Phase II ISMSV review at the Pantex Plant, June 19-27, 2000, and the team noted significant improvement from the verifications conducted in 1998. (Reference previous commitments 5.6.1 and 5.6.2)

Future Actions:

The Department included commitment 5.3.3 in the original implementation plan to evaluate the effectiveness of the review and approval process for the W88 HAR and the transportation SAR/BIO module. DOE has not approved either the W88 HAR or the transportation SAR/BIO module. The intent of the original commitment was to gauge the effectiveness of changes made in the DOE review and approval processes. This included the qualification and composition of review teams, review approach used, and adequacy of review documentation and conclusions.

In March 1999, the Albuquerque Operations Office conducted a self-assessment of the authorization basis document review and approval process. This self-assessment was followed by an assessment by the Office of Defense Programs in April 1999. On May 26, 1999, the Assistant Secretary for Defense Programs delegated approval authority of authorization basis documents to the AL Manager for nuclear explosive facility operations. On May 28, 1999, the AL Manager further delegated approval authority to the Area Manager, AAO.

On March 9, 2000, the AL Manager delegated approval authority of authorization basis documents to the Area Manager, AAO, for nuclear explosive processes. With this delegation, the approval authority for all Pantex Plant authorization basis documents is now vested with the Area Manager, AAO.

The Office of Oversight, Environment, Safety and Health (EH-2) recently conducted an authorization basis evaluation specific to the Pantex Plant. The review was a follow-up evaluation by the Office of Environment, Safety and Health stemming from "opportunities for improvement" identified during an earlier review (*Independent Oversight Evaluation of Headquarters and Albuquerque Operations Office Management of Environment, Safety, and Health Programs at the Pantex Plant*, October 1996). The recent assessment evaluated management systems

associated with the development, approval and maintenance of the authorization basis at the Pantex Plant. Given the recent EH assessment, the Department does not consider an additional assessment of authorization basis review is warranted.

Upon completion of all the actions identified in this plan, the Department will perform a final comprehensive assessment. The intent of the assessment will be to gauge how effective the actions were at accelerating safety improvements at the Pantex Plant. Obviously, not all safety improvements are anticipated to be complete at that time. SS-21 projects will be ongoing for several IHE weapon systems for several years thereafter. However, the Department believes such an assessment should serve as an important indicator to determine the effectiveness of the approach described within this implementation plan.

Commitment 4.5.1

The Department will complete a comprehensive assessment of the actions taken in response to Recommendation 98-2.

Lead Responsibility: DP-20

Deliverable: Final Assessment Report

Due Date: June 2003

5.0 Organization and Management

5.1 Organization

The Department has designated the Deputy Assistant Administrator for Military Applications and Stockpile Operations (DP-20) as the responsible manager for the Recommendation 98-2 Implementation Plan. Responsibilities for execution of commitments identified in this Implementation Plan are assigned to senior managers responsible for the specific activity

5.2 Management Systems

5.2.1 Change Control

Complex, long-range plans require sufficient flexibility to accommodate changes in commitments, actions, or completion dates that may be necessary due to additional information, improvements, or changes in baseline assumptions. The Department's policy is to:

- bring to the Board's attention any substantive changes to this IP 98-2 as soon as identified and prior to the passing of the milestone date;
- have the Secretary approve all revisions to the scope and schedule of plan commitments; and,
- clearly identify and describe the revisions and bases for the revisions.

Fundamental changes to the plan's strategy, scope, or schedule will be provided to the Board through formal revision of the IP 98-2. Other changes to the scope or schedule of planned commitments will be formally submitted in appropriate correspondence approved by the Secretary, along with the basis for the changes and appropriate corrective actions.

The Department previously provided information copies of several action plans to give the Board additional insight to the approach the Department is taking to address safety

management concerns at Pantex. The Department will continue to provide the Board with periodic updates of these plans.

5.2.2 Reporting

To ensure that the various Department implementing elements and the Board remain informed of the status of plan implementation, the Department's policy is to provide periodic progress reports until IP 98-2 commitments are completed. For this plan, the Department will provide quarterly briefings to the Board and/or its staff, within 1 month of the close of each quarter during plan implementation. Quarters will coincide with the calendar and fiscal year quarters: January-March, April-June, July-September, and October-December. The AL Manager will transmit the quarterly status report to the Board. The frequency of reports and briefings may be revised pursuant to mutual agreement of the parties.

The Department will continue to provide quarterly briefings and reports

Lead Responsibility: AL Manager
Deliverables: Briefing and written report
Due Date: Each quarter

6.0 Implementation Plan Commitment Crosswalk

Crosswalk between commitments contained in the original Implementation Plan, and commitments contained in this revised Implementation Plan

Outstanding Actions Carried Over or Revised as a Result of 98-2 Revision					
98-2 Implementation Plan (April 1999)			Revised 98-2 Implementation Plan (June 2000)		
Deliverable No.	Description	Status	New Commitment Number	Description	98-2 Revision Status
5.3.1-#3	AB Actions Complete	Forward	4.2.4	Assessment of USQ process	See Section 4.2
5.4.2-#3	Issue revised DOE Order 452.2	Forward	4.4.1 4.4.2 4.4.3 4.4.4	DOE Order 452.1A and 452.2A Revisions Submitted Formal Review Cycle & Orders Issued Issue Revised Site Directives, Impact Analysis & AL Approved IP Revisions to NV Orders Issued, Impact Analysis, NV Approved IP	See Section 4.4
5.5.1-#4	Issue DOE-STD-3015	Forward	4.4.1 4.4.2 4.4.3 4.4.4	DOE-STD-3015-97 Revisions Submitted Formal Review Cycle & Orders Issued Issue Revised Site Directives, Impact Analysis & AL Approved IP Revisions to NV Orders Issued, Impact Analysis, NV Approved IP	See Section 4.4
5.6.3-#3	Approved BIO/TSR Upgrade for transportation hazards	Forward	4.3.3 4.3.4	DOE-Approved BIO Module/TSR for On-Site Transportation and DOE-Approved IP for On-Site Transportation Controls DOE RA Report for On-Site Transportation	See Section 4.3
5.6.4-#2	Authorization of an SS-21 process for the W78 in accordance with the tasks and time interval identified in the IWAP	Forward	4.4.6	W78 SS-21 Start-up Authorization	See Section 4.4
5.6.5-#1 & 2	Review plan and criteria for final assessment of 98-2 actions and Final report	Forward	4.5.1	IP 98-2 Final Assessment Report	See Section 4.5
NA	New Commitment	New	4.1.1	BIO/SAR Program Plan	See Section 4.1
NA	New Commitment	New	4.1.2	Assessment of TBP-901 Implementation	See Section 4.1
NA	New Commitment	New	4.2.1	D&P Manual Chapter 11.8—Weapon Response Guidance	See Section 4.2
NA	New Commitment	New	4.2.2	TBP Guidance on expectations & documentation of weapon response (Follows 11.8)	See Section 4.2
NA	New Commitment	New	4.2.3	11.8 & TBP Impact Analysis & DOE-Approved Implementation Plan	See Section 4.2
NA	New Commitment	New	4.2.5	Revise ISM AB Manual	See Section 4.2
NA	New Commitment	New	4.2.6	Revise D&P 11.7—Nuclear Explosive Operations Change Control Process	See Section 4.2
NA	New Commitment	New	4.3.1	DOE-Approved BIO Module/TSR for Fire Protection and DOE-Approved Implementation Plan for Fire Protection Controls	See Section 4.3
NA	New Commitment	New	4.3.2	DOE Readiness Assessment Report for Fire Protection	See Section 4.3
NA	New Commitment	New	4.3.5	Additional DOE-Approved TSR controls derived from the NES master Studies	See Section 4.3
NA	New Commitment	New	4.3.6	Flammable Solvent and Combustible Material Reduction Plan	See Section 4.3
NA	New Commitment	New	4.3.7	Plan for Transportation Carts	See Section 4.3
NA	New Commitment	New	4.3.8	PDS for 12-44 Fire Protection Upgrade	See Section 4.3
NA	New Commitment	New	4.3.9	Completion of physical Modifications to Bldg. 12-44 Completed	See Section 4.3
NA	New Commitment	New	4.3.10	Conceptual Design for Fire Detection and Suppression Systems Upgrades	See Section 4.3
NA	New Commitment	New	4.3.11	ESAAB Authorization for Title 1	See Section 4.3
NA	New Commitment	New	4.4.6	B83 SS-21 Start-up	See Section 4.4

Outstanding Actions Suggested for Removal—Dependant on another process or implemented through another action						
98-2 Implementation Plan (April 1999)				Revised 98-2 Implementation Plan (June 2000)		
Deliverable No.	Description	Status	Remarks	New Commitment Number	Description	98-2 Revision Status
5.2.3-#2	Implement process improvements (tooling/procedure processes)	Remove	90% complete as of 6/30/00. 98-2 Revision addresses this and suggests removal of this item.	NA	NA	See Section 4.0
5.3.3-#2	Assessment for review of transportation BIO upgrade	Remove	EH-2 is conducting an authorization basis evaluation. In light of the extent and scope of the EH-2 review and the April 1999 Office of Defense Program review, the Department does not consider further evaluations warranted. 98-2 Revision addresses this and suggests removal of this item.	NA	NA	See Section 4.5
5.6.4-#1	Re-authorization of the existing W88 process in accordance with the tasks and schedule identified in the IWAP	Remove	W88 is discussed in 98-2 Revision as last revalidation. Final result will be reported to the Board. However, 98-2 Revision suggests removal of this item since not effective measure of process improvements.	NA	NA	See Section 4.3 and 4.4
5.8.1-#3	Long term personnel plan for project management.	Remove	The course development was completed on 4/28/00. The core team has received training. Project and Program Managers due to complete training in June. This is the last action. 98-2 Revision discusses and suggests removal of this action.	NA	NA	See Section 4.5
5.8.2-#2	Complete defined actions	Remove	This is the last action. 98-2 Revision discusses and suggests removal of this action. ECD for completing training is 10/1/2000	NA	NA	See Section 4.2

Completed Actions Prior to Approval of the 98-2 Revision					
98-2 Implementation Plan (April 1999)			Revised 98-2 Implementation Plan (June 2000)		
Deliverable No.	Description	Status	New Commitment Number	Description	98-2 Revision Status
5.1.1	Plant Standard 7401 & 7403	Delivered 5/30/99	NA	NA	See Section 4.1
5.1.2	Issue D&P Manual Chapter 11.1, Rev. 1	Delivered 6/30/99	NA	NA	See Section 4.1
5.1.3	Issue TBP 901	Delivered 2/10/00	NA	NA	See Section 4.1
5.1.4	Project Plans and Schedules (IWAP)	Delivered 2/7/00	NA	NA	See Section 4.1
5.2.1-#1	Issue D&P Manual Chapter 11.3	Delivered 4/19/99	NA	NA	See Section 4.1
5.2.1-#2	Issue TBP 901	Delivered 2/10/00	NA	NA	See Section 4.1
5.2.2	Modify associated plant documents to meet new TBP 901 standards	Delivered 4/28/00	NA	NA	See Section 4.1
5.2.3-#1	Review report with recommendations (tooling/procedure processes)	Delivered 5/30/99	NA	NA	See Section 4.0
5.3.1-#1	AB Task Force Report	Delivered 5/30/99	NA	NA	See Section 4.2
5.3.1-#2	AB Action Plan	Delivered 6/30/99	NA	NA	See Section 4.2
5.3.2-#1	Issue AL SD 452.2A	Delivered 6/30/99	NA	NA	See Section 4.2
5.3.2-#2	Revise D&P Manual Chapter 11.4	Delivered 6/30/99	NA	NA	See Section 4.2
5.3.2-#3	Combine requirements into one manual	Delivered 6/30/99	NA	NA	See Section 4.2
5.3.3-#1	Assessment for review of W88 HAR	Delivered 12/13/99	NA	NA	See Section 4.5
5.4.1	D&P Manual Chapter 11.6	Delivered 6/30/99	NA	NA	See Section 4.4
5.4.2-#1	Initial issue of DOE-AL SD 452.2A	Delivered 6/30/99	NA	NA	See Section 4.4
5.4.2-#2	Submit revisions to DOE Order 452.2	Delivered 6/30/99	NA	NA	See Section 4.4
5.4.3-#1	Develop NESS process changes & provide recommendations	Delivered 6/30/99	NA	NA	See Section 4.4
5.4.3-#2	Revise DOE STD-3015	Delivered 12/10/99	NA	NA	See Section 4.4
5.5.1-#1	Provide NESS recommendations	Delivered 5/28/99	NA	NA	See Section 4.4
5.5.1-#2	Senior level workshop	Delivered 6/30/99	NA	NA	See Section 4.4
5.5.1-#3	Decision Report	Delivered 8/23/99	NA	NA	See Section 4.4
5.5.2-#1	Recommendations (NESS)	Delivered 5/28/99	NA	NA	See Section 4.4
5.5.2-#2	Revise & Issue DOE-STD-3015	Delivered 12/10/99	NA	NA	See Section 4.4
5.6.1-#1	ISMSV Phase 1 Review Plan	Delivered 9/10/99	NA	NA	See Section 4.5
5.6.1-#2	ISMSV Phase 1 Review Report	Delivered 4/13/00	NA	NA	See Section 4.5
5.6.1-#3	Approved ISMS Description	Delivered 6/30/00	NA	NA	See Section 4.5
5.6.2-#1	ISMSV Phase II Review Plan	Delivered 6/30/00	NA	NA	See Section 4.5
5.6.2-#2	ISMSV Phase II Report	Delivered 6/30/00	NA	NA	See Section 4.5
5.6.3-#1	CSSM to TSR Conversion	Delivered 3/13/00	NA	NA	See Section 4.2
5.6.3-#2	Approved BIO/TSR Upgrade for lightning hazards	Delivered 4/17/00	NA	NA	See Section 4.3
5.7.1	Reauthorization of the existing W62 process in accordance with the IWAP project plan.	Delivered 1/6/00	NA	NA	See Executive Summary
5.8.1-#1	SWOT analysis (project management)	Delivered 5/30/99	NA	NA	See Section 4.5
5.8.1-#2	Compensatory measure action plan (project management)	Delivered 6/30/99	NA	NA	See Section 4.5
5.8.2-#1	Revise training programs and complete training	Delivered 6/30/99	NA	NA	See Section 4.5
5.8.3-#3	Long term personnel plan for project management.	Delivered 2/7/00	NA	NA	See Section 4.2
5.8.3-#1	SWOT analysis (AB personnel)	Delivered 5/30/99	NA	NA	See Section 4.2
5.8.3-#2	AB Compensatory measure action plan	Delivered 6/30/99	NA	NA	See Section 4.2
5.8.4-#1	Complete staffing actions	Delivered 2/5/00	NA	NA	See Section 4.2
5.8.4-#2	Complete qualification standards	Delivered 2/5/00	NA	NA	See Section 4.2
5.8.4-#3	Complete qualification	Delivered 4/28/00	NA	NA	See Section 4.2

7.0 Appendices

7.1 APPENDIX A: Abbreviations and Acronyms

AAO	Amarillo Area Office
ABCD	Activity Based Control Document
AL	Albuquerque Operations Office
BIO	Basis for Interim Operation
CSSM	Critical Safety Systems Manual
DNFSB	Defense Nuclear Facilities Safety Board
DOE	Department of Energy
DP	Office of Defense Programs
D&P	Development & Production (Manual)
EH	Office of Environment, Safety and Health
HAR	Hazard Analysis Report
ISMS	Integrated Safety Management System
ISMSV	Integrated Safety Management System Verification
ISP	Integrated Safety Process
IWAP	Integrated Weapons Activity Plan
LANL	Los Alamos National Laboratory
LLNL	Lawrence Livermore National Laboratory
MHC	Mason and Hanger Corporation
MIC	Management, Integration and Control
NES	Nuclear Explosive Safety
NV	Nevada Operations Office
OAK	Oakland Operations Office
SBRT	Safety Basis Review Team
SD	Supplemental Directive
SIRR	Single Integrated Readiness Review
SMT	Standing Management Team
SNL	Sandia National Laboratory
S/RID	Standards/Requirements Identification Document
SS-21	Seamless Safety for the 21 st Century
TBP	Technical Business Practice
TSR	Technical Safety Requirements
WPD	Weapon Programs Division, AL
WSD	Weapons Surety Division, AL
WSS	Weapon Safety Specification

7.2 APPENDIX B: History--DNFSB Board Recommendations and Letters

This appendix provides additional background on Board recommendations and correspondence issued before and after the Department's acceptance of Recommendation 98-2.

Previous Board Recommendations

Elements of Recommendation 98-2 are closely related to several earlier recommendations made by the Board.

- Recommendation 93-1, *Standards Utilization in Defense Nuclear Facilities*, was transmitted by the Board on January 21, 1993, and was accepted by the Department on February 2, 1993.
 - In the Implementation Plan to Recommendation 93-1, the Department committed "to undertake a formal program to evaluate and enhance, where appropriate, the standards that govern nuclear weapon assembly, disassembly, and testing operations."
 - The Department has completed all of the specific actions committed to in response to Recommendation 93-1.
- Recommendation 93-3, *Improving DOE Technical Capability in Defense Nuclear Facilities Programs*, was transmitted by the Board on June 1, 1993, and was accepted by the Department on July 23, 1993. The Board stated "*the most important and far reaching problem affecting the safety of DOE defense nuclear facilities is the difficulty in attracting and retaining personnel who are adequately qualified by technical education and experience to provide the kind of management, direction and guidance essential to safe operation of DOE's defense nuclear facilities.*"
 - Through the Implementation Plan for Recommendation 93-3, the Department is revising technical qualification programs for Federal employees that will increase confidence that these employees have competence commensurate with responsibility. Recommendation 93-3 is directly related to Recommendation 98-2. In addition to updating the technical qualification program as it applies to Federal NESSG members, the same competencies will be applied to non-Federal NESSG members and codified in the revised DOE-STD-3015.
- Recommendation 93-6, *Maintaining Access to Nuclear Weapons Expertise*, was transmitted by the Board on December 10, 1993, and was accepted by the Department on February 2, 1994. Among the eight sub-recommendations made by the Board under Recommendation 93-6, three were precursors to similar elements in Recommendation 98-2. Under Recommendation 93-6, the Board identified the following needs:
 - "(1) A formal process be started to identify the skills and knowledge needed to develop or verify safe dismantlement or modification procedures specific to all types of U.S. nuclear weapons (retired, inactive, reserve, and enduring stockpile systems). Included among the skills and knowledge should be the ability to conduct relevant safety analyses...
 - (4) DOE and its defense nuclear contractors negotiate the continued availability (through retention, hiring, consulting, etc.) of those personnel scheduled to depart whose skills and knowledge have been determined to be important in accordance with the above...
 - (6) Procedures for safe disassembly of weapons systems be developed while the personnel with system-specific expertise on the original development of the weapons are still available. Likewise, analyses of the possibility of hazard from degradation of

remaining nuclear weapons with time should be expedited, while these individuals are available. In addition, the current participation of design laboratory experts in the safety aspects of disassembly of weapons at the Pantex Site should be strengthened."

Through the Implementation Plans for Recommendations 93-1 and 93-6, the Department established a formal process (known as Seamless Safety for the 21st Century or "SS-21") that specifies the safety criteria for developing weapon operation processes. However, the pace of SS-21 implementation has been slow and affected in part by the lack of clear standards and criteria, as identified under Recommendation 93-1. Additionally, the Department has struggled to integrate the design laboratory personnel into appropriate roles for the hazard analysis process.

- Recommendation 95-2, *Safety Management*, was transmitted by the Board on October 11, 1995, and accepted by the Department on January 17, 1996. In response to Recommendation 95-2, the Department established a model for integrated safety management consisting of five core functions:
 - define the scope of work,
 - analyze the hazards,
 - develop and implement hazard controls,
 - perform work within controls, and
 - provide feedback and continuous improvement.
- The Department established the following guiding principles related to integrated safety management:
 - line management responsibility for safety,
 - clear roles and responsibilities,
 - competence commensurate with responsibilities,
 - balanced priorities,
 - identification of safety standards and requirements,
 - hazard controls tailored to work being performed, and
 - operations authorization.

The Department conducted an Integrated Safety Management System Verification (ISMSV) review at the Pantex Plant on July 27-31, and August 17-28, 1998. The purpose of the review was to verify that the Mason and Hanger Corporation (MHC) ISMS:

- fulfilled the expectations of the DOE-AL Manager,
- met the requirements of the Department of Energy Acquisition Regulations (DEAR) and the DOE Policy for Safety Management Systems, and
- is implemented, through selected sampling of facilities and activities.

A number of opportunities for improvement were identified as a result of the review. The opportunities for improvement that were identified during the ISMSV are consistent with the Recommendation. The actions described in this implementation plan are intended to be sufficient to address the fundamental findings of the ISMSV relating to nuclear explosive operations.

Prior Board Letters to the Department

The following letters (with staff trip reports identified where applicable) include several issues closely related to Recommendation 98-2 and indicate precursor interest by the Board. The letters are listed in chronological order from earliest to the most recent. The excerpts are provided to illustrate their relevance in establishing the basis for Recommendation 98-2.

- April 19, 1996 - The letter summarizes Board observations on the revalidation of prior Nuclear Explosive Safety Study (NESS) for W76 and B61 modification 3/4/10 operations at Pantex. *"Revalidation, as presently implemented, does not provide a technical review*

of the potential impact of changes that have occurred since the last NESS and does not appear to consistently require resolution of potential safety issues before operations are authorized to continue.

- April 30, 1996 – The letter summarizes Board observations relative to Department actions taken to improve the Nuclear Explosive Safety Study (NESS) process. *“Although corrective measures have been developed, they have not been implemented. The Board urges that the identified improvements in the nuclear explosive operations safety management process, including the NESS, be implemented expeditiously. Implementing actions needed include the issuance of revised Orders, standards, and guides that govern the integrated safety of nuclear explosive operations.”*
- March 14, 1997 – The letter transmitted Board comments on the application of interagency engineering procedure (EP) 401110, Integrated Safety Process for Assembly and Disassembly of Nuclear Weapons. *“It is not clear that all organizations with a role in developing a weapon process and its safety basis are represented on the SS-21 project/task teams or at the Milestone Reviews. It is also not clear how the process will ensure that all appropriate organizations provide institution-level commitment to, rather than simply representation during, the process. ... The EP does not clearly state that an expectation of the hazard analysis is to provide data that would allow line management to make informed decisions on the development of controls, such as tooling and equipment design and procurement requirements.”*
- July 25, 1997 – The letter summarizes Board observations regarding the W69 authorization basis. *“The performance of the hazard analysis needs to be better integrated into the SS-21 process... The interface between the activity-based (HAR) and facility-based (Safety Analysis Report/Basis for Interim Operations) hazard analysis documents needs to be better defined. Taken together, the HAR and the SAR/BIO would constitute the authorization basis for the activities, and ideally would identify a complete set of controls that need to be implemented for safe operation.”*
- August 8, 1997 - The letter summarizes Board observations based upon a review of the W69 Dismantlement Hazard Analysis Report (HAR). *“First, the performance of the hazard analysis does not appear to have been smoothly integrated into the SS-21 process. As a result; the HAR does not appear to have the support of all the different agencies involved in its production. Second, some potentially significant hazards in the W69 dismantlement process were not fully analyzed. Without a comprehensive analysis, it is uncertain whether the appropriate set of safety controls has been identified.”*
- September 5, 1997 - The letter summarizes Board observations concerning the Single Integrated Readiness Review (SIRR) for the W79 dismantlement program. *“It was clear that the Project Team for the W79 Dismantlement Program had declared its readiness to proceed (prior to the SIRR) without adequate validation ... appears to have undermined the utility of the SIRR as a confirmatory review. The hope that time might be saved through coincident reviews clearly was not realized; the Board believes that such a finding would be common, and this belief underlies the Board’s emphasis on the preference for serial processes.”*
- September 16, 1997 - The letter summarizes Board observations on the W78 SS-21 Milestone I review. *“The DOE-AL Assistant Manager recognized that there was a great deal of variation in the understanding and knowledge of guidance contained in EP 401110, Integrated Safety Process for Assembly and Disassembly of Nuclear Weapons, among meeting participants...”*
- December 5, 1997 - The Board expressed a general concern with the rate of progress in implementing improved directives for nuclear explosive operations. In the letter, the Board expressed specific concern with the lack of progress in the development and

implementation of a hazard analysis report (HAR) standard referenced by the 452-series directives.

- December 31, 1997 – The letter summarizes Board concerns with the Nuclear Explosive Safety Evaluation (NESE) process. *“However, in using this NESE process, the Albuquerque Operations Office has created a new type of nuclear explosive safety study group evaluation that is inconsistent with both DOE Order 452.2A and DOE Standard 3015-1997, Nuclear Explosive Safety Study Process.”*
- June 1, 1998 - The Board requested additional information on the process by which the Department performs change control for its nuclear explosive operations at the Pantex Plant. *“The DOE-AL memorandum authorizing the plan to use the NESE [Nuclear Explosive Safety Evaluation] process states that the complexity of a proposed change is to be the criterion for determining whether an NESE is the appropriate vehicle for evaluating and recommending approval of a new process or piece of equipment for a nuclear explosive operation. However, a very simple change could have a dramatic impact on nuclear explosive safety, whereas a relatively complex change could have no effect. Therefore, complexity is questionable as the sole criterion for selecting the level of analytical rigor and approval authority against which a change will be evaluated. ... The Board believes a USQ-like process for evaluating the nuclear explosive safety implications of proposed changes to weapons activities is appropriate and necessary.”*

Subsequent Board Letters to the Department

Subsequent to the issuance of Recommendation 98-2, the Board transmitted the following letters to the Department:

- November 30, 1998 - The letter summarizes Board observations relative to the ongoing W87 and W62 disassembly and inspection operations, and the Nuclear Explosive Safety Master Study of the electrical equipment control program. *“During the study, it appeared that Mason & Hanger Corporation (MHC) was abdicating its line management responsibilities to the nuclear explosive safety study group by asking them to perform a line management function. In passing issues to the nuclear explosive safety study group, line management appeared to have been uncertain about the adequacy of the authorization basis for the electrical control program. This compromises the independence of the nuclear explosive safety study group. ... The major issues appear to be (1) lack of clear guidance from the Department of Energy (DOE) on what an authorization basis for nuclear explosive operations should contain, and (2) a lack of sufficient technical expertise at MHC to perform the analysis. ... The Board notes that a number of the specific issues discussed in the enclosed reports relate to more fundamental issues previously communicated in the Board's Recommendation 98-2, Safety Management at the Pantex Plant.”*
- January 6, 1999 – In this letter, the Board re-iterated their concerns relative to the Department's progress in issuing a standard for Hazard Analysis Reports for nuclear explosive operations. *“This standard is critical to ensuring a comprehensive, defensible, and repeatable hazard analysis process for the selection and preservation of the operation-unique controls needed to define the authorization basis for nuclear explosive operations at Pantex and the Nevada Test Site.”*
- January 15, 1999 – The letter transmitted Board observations concerning the readiness review program at the Pantex Plant. *“The Board's staff noted that both reviews [readiness reviews for W56 and W87] were conducted prior to satisfying the Department of Energy (DOE) prerequisites for starting the reviews. ... This situation is inconsistent with the intent of DOE Order 425.1, Startup and Restart of Nuclear Facilities, which applies to the readiness review process for nuclear explosive operations. ... Thus, this W56 and W87 experience should be considered by DOE in defining plans for addressing issues*

raised by Recommendation 98-2 and in strengthening the readiness review process at Pantex.”

- March 12, 1999 - The letter transmitted three trip reports containing staff observations related to nuclear explosive operations at the Pantex Plant. The reports raise issues with certain elements of the integrated safety process: identification of hazards, derivation of controls, and readiness assessment. *“In general, the Board’s staff concluded that the HA [hazard analysis] process did not adequately meet its objective – it did not provide systematic assurance that the hazards associated with the W62 D&I [disassembly and inspection] had been identified in a manner that would allow development of a comprehensive integrated set of controls.... The staff’s principal concern with the W56 dismantlement program involved the process of deriving, characterizing, and preserving the controls for this activity. An Activity Based Controls Document (ABCD) was initially developed that included hundreds of controls derived from the hazard analysis. This first set of controls did not place any special emphasis on those controls upon which the greatest reliance is placed... Derivation of controls should be an iterative process in which controls for each category of risk are identified and evaluated to assess whether the control effectively reduces the estimated risk to acceptable levels.....“DOE has not consistently applied a process to develop, validate, and start nuclear weapon dismantlement activities...The documentation governing the Integrated Safety Process is ad hoc and vague in its description of the necessary line management reviews, as well as the scope of independent readiness reviews...The Pantex contractor was not involved intimately enough or early enough in the development of the W79 Dismantlement Program, even though it performs the dismantlement operations and is the sole contractor responsible for assembly and disassembly of nuclear weapons at Pantex...In contrast, it is a principle of integrated safety management that those doing the work should plan the work and identify the hazards.”*
- March 25, 1999 – The letter transmitted Board staff observations related to lightning protection at Pantex. The Board expressed concern with rate of progress in improving lightning protection controls. *“The Board’s staff has reported considerable progress on some upgrade initiatives, such as the electrical bonding of Zone 12 facilities. Overall, however, the upgrade effort has been lagging. In a recent review by the Board’s staff of the lightning protection systems and the lightning warning and detection system at the Pantex Plant, it was seen that progress has been slow in resolving many open lightning protection issues.”*
- May 18, 1999 – The letter transmitted Board staff observations on the readiness review process at Pantex. The Board acknowledged ongoing DOE efforts to improve the readiness process. *“Over the past few months, the staff has noted several issues while observing readiness reviews at Pantex. These issues, detailed in the enclosed issue report, should be considered as you revise your readiness review process and move forward to ensure the adequacy of the “confirm readiness” safety function at the Pantex Plant.”*
- July 30, 1999 – The letter transmitted Board staff observations on the W62 disassembly and inspection program at the Pantex Plant. The Board expressed concern with a number of technical issues, and the rate of progress. *“In response to Defense Nuclear Facilities Safety Board (Board) Recommendation 98-2, Safety Management at the Pantex Plant, the Department of Energy (DOE) has been working to improve the safety basis and controls for nuclear explosive operations at Pantex, particularly the W62 Disassembly and Inspection (D&I) Program. It is vital that these efforts be completed in a timely and effective manner to support safe and reliable operations of the nations enduring nuclear weapons stockpile. To achieve this objective, DOE needs to ensure the quality of each individual initiative to analyze operations and develop controls, and also to carefully coordinate the interdependence among safety improvement initiatives.”*

- August 10, 1999 – The letter transmitted Board staff observations on the W79 dismantlement program. “The Defense Nuclear Facilities Safety Board (Board) is encouraged by recent observations of the W79 Dismantlement Program being conducted at the Pantex Plant.... As a result of the considerable effort to develop a safe and controlled process and to implement that process in practice, the W79 operations were started safely on June 3, 1998. It appears that the W79 Dismantlement Program continues to be conducted with the appropriate attention to safety.”
- September 21, 1999 – The letter transmitted Board staff observations on lightning protection controls for nuclear explosive operations at Pantex. “The Department of Energy (DOE) and its contractor at Pantex during the past year have responded in a very substantial way to Defense Nuclear Facilities Safety Board (Board) observations and suggestions for the upgrading of lightning protection measures during operations with explosives. However, as indicated by the enclosed Board staff report, further upgrade efforts appear warranted.”
- September 22, 1999 – The letter transmitted Board staff observations from a review of the weapon safety specifications (WSSs) for the W76, B83, and W56 nuclear weapon programs. “...the WSSs reviewed by the Board’s staff appear to fall short of meeting the requirements set by the D&P Manual. In particular, these WSSs appear to have limited value for use in performing hazard analyses for nuclear weapon operations. The WSSs capture design agency data, but data from lessons learned at the production plants and substantive archival data are lacking. Additionally, even though the WSS is intended to form the technical foundation for the safety basis for a particular nuclear weapons operation, there is no effective provision to ensure that the authorization basis is updated following a revision of the WSS.”
- October 15, 1999 – The letter was in response to the DOE proposal regarding changes to the membership and structure of Nuclear Explosive Safety Study Groups (NESSGs). “The level of detail contained in this proposal is not yet sufficient for the Board to ascertain that the intent of its recommendation of NESSG membership has been adequately addressed. Therefore, the Board will examine the details of actual implementation of this proposal to see whether the resulting structure and operation of the NESSGs in the future will effectively use the knowledge and talents of the broad base of emeritus personnel who may be able to provide significant value to the reviews. The Board remains hopeful that DOE’s proposal will result in a standing committee of highly-experienced personnel with significant stature in the nuclear weapons community or related ones (such as the commercial nuclear or explosive industries).”
- November 22, 1999 – The letter expressed Board concern with problems threatening the schedule for stockpile stewardship. “The Board and its staff have maintained an interest in the schedule for such safety reviews of operations at the Pantex Plant, in part to ensure that it is compatible with the schedule for planned operations. More than a year ago, it began to be clear that the schedule for safety reviews during the next few years could not be met because of conflicts in demands for separate reviews and a general shortage of DOE and contractor technical personnel familiar with nuclear explosive systems and skilled in safety practices. The Board concluded that a large part of the problem was attributable to the complexity of the processes used. Furthermore, the delays caused by the cumbersome and time-consuming process resulted in deferment of safety improvements and a prolonged reliance on less reliable or less robust safety controls and processes.”
- December 1, 1999 – The letter transmitted Board staff observations from reviews of the W62 disassembly and inspection program and the transportation module of the basis for interim operation (BIO) at the Pantex Plant. “Instead of becoming simpler, the safety basis at Pantex is actually becoming more complex. Significant issues associated with the integration and completeness of the various hazards analyses and associated

controls are being observed. In some cases, voids exist in which one analysis depends on another to assess the activity, but it is later discovered that the follow-on analysis has not been completed or implemented.... In addition, both enclosed reports highlight deficiencies with information on warhead response being provided to the Pantex contractor by the nuclear design laboratories for use in determining the hazards and resulting controls associated with nuclear explosive activities.”

- December 6, 1999 – The letter transmitted DNFSB/TECH-24, Safe Handling of Insensitive High Explosive Weapon Subassemblies at the Pantex Plant. "...the Board's staff notes that the technical basis for performing operations on composite IHE and CHE weapon subassemblies does not fully support the assumptions used in establishing safety controls.”
- January 11, 2000 – The letter transmitted Board staff observations on lightning protection controls for nuclear explosive operations at the Pantex Plant. The Board noted, "...significant improvement has occurred in the Pantex lightning protection program in response to the Board's suggestions and encouragement. In particular, the recently approved Evaluation of Lightning Hazards and Justification for Continued Operation of Nuclear Explosive Operations, if properly implemented, represents a sound initial effort at providing a set of uniform, technically justified controls for all nuclear explosive operations at Pantex. The Department of Energy should consider the additional improvements discussed in the enclosed staff issue report as the Basis for Interim Operation for lightning protection is finalized. As discussed in the enclosed staff issue report, the Department of Energy and its Pantex contractor should give careful consideration to increasing the utilization of subject matter experts in lightning protection during the development of authorization bases for specific weapon activities.”
- March 8, 2000 – The letter transmitted Board staff observations on the W62 disassembly and inspection program and continued problems in the implementation of DOE Order 425.1A, Startup and Restart of Nuclear Facilities. The Board expressed concern with repeated premature declaration of readiness by line management. “It appears that this problem is often due to line management's failure to develop and apply a well-defined set of prerequisites for certifying readiness. Often the prerequisites are little more than a reiteration of the “core requirements” of DOE Order 425.1A. Lacking is a reasonable set of executable actions under each applicable “core requirement” that, when performed by line management could be expected to bring the operation into a state of readiness for that area. The application of the prerequisites by line management has also been problematic. Satisfaction of the prerequisites has not been tracked and verified with the rigor necessary for senior managers to declare readiness with confidence.
- March 29, 2000 – The letter transmitted Board staff observations on fire protection at the Pantex Plant. The Board noted two issues of special concern. “The plant-wide fire alarm system at Pantex is deteriorating because it no longer has vendor support. It is the Board's understanding that no funding has been provided in fiscal year 2000 and beyond to replace the obsolete alarm system. Because the alarm system at Pantex is safety-significant, it must remain functional during nuclear explosive operations. While the contractor is making efforts to prevent this problem from affecting the safety and continuity of operations, action is needed by DOE to solve this problem on a long-term basis. Further delay in replacing this system could result in curtailment of operations and a potential impact on national security programs. As a result of an extensive review of the fire protection programs at Pantex, conducted by a team from Mason and Hanger Corporation and design laboratory experts, DOE decided to reconnect the ultraviolet (UV) detection system as the actuator of deluge systems in high explosive operations areas. This safety enhancement, however, is not currently possible for some older facilities such as Building 12-44, which is not equipped with an UV detection system. The Board understands that subsequent to its staff's visit to Pantex, DOE decided to install an UV detection/deluge activation system in Cells 2-6, in Building 12-44. The Board supports

this decision and believes that nuclear explosive operations involving conventional high explosives will significantly benefit from this safety enhancement if the upgrade is completed in an expeditious manner.”

- May 2, 2000 – The letter transmitted Board staff observations on fire hazard analyses of Pantex Plant operations involving nuclear explosives. The Board noted two issues of concern. “Analyses performed at the Y-12 Plant indicate that the canned subassembly (CSA) for certain weapon systems may react energetically in thermal environments less severe than those evaluated for high explosives at Pantex. However, none of the safety analyses at Pantex considers the CSA as a potential hazard or as an initiator for scenarios involving the high explosive... The administrative controls currently in use do not provide for limitations on all combustible materials in the bays and cells; therefore, fires may be larger or more intense than those analyzed. The fire hazard analysis also appears to underestimate the heat content of the process combustibles... Review of fire hazard analyses for other weapon systems reveals that these are generic issues for the fire hazard analyses performed at Pantex.”