

**[DNFSB LETTERHEAD]**

October 3, 1995

The Honorable Victor H. Reis  
Assistant Secretary for Defense Programs  
Department of Energy  
Washington, D.C. 20585

Dear Dr. Reis:

The Defense Nuclear Facilities Safety Board (Board) continues to follow the Department of Energy's (DOE) efforts to correct the deficiencies identified by the Nuclear Explosive Safety Study (NESS) independent review team in its report of May 6, 1994. These activities are being integrated with other DOE efforts associated with implementation of the Board's Recommendation 93-1, Standards Utilization in Defense Nuclear Facilities.

Throughout 1994 and 1995, the Board's staff has observed a majority of the NESS meetings for operations at both the Pantex Plant and the Nevada Test Site. The enclosed memorandum includes our staffs observations from three NESS meetings and is provided for your information and use. As noted in this memorandum, significant progress has been made in enhancing the NESS process; however, more progress still needs to be made.

Please contact Mr. Steve Krahn of the Board's staff at (202) 208-6580 if you require any additional information or assistance.

Sincerely,

John T. Conway  
Chairman

c: Mr. Mark Whitaker  
Mr. Bruce Twining, ALOO Manager  
Mr. Robert M. Nelson, Jr., NVOO Manager

Enclosure

---

**DEFENSE NUCLEAR FACILITIES SAFETY BOARD**

July 20, 1995

**MEMORANDUM FOR:** G. W. Cunningham, Technical Director  
**COPIES:** Board Members  
**FROM:** Joe Sanders  
**SUBJECT:** Nuclear Explosive Safety Studies (NESS)

1. **Purpose:** This memorandum documents observations by the Defense Nuclear Facilities Safety Board's (Board) staff regarding three NESS Group (NESSG) meetings: the W48 Dimethyl Sulfoxide (DMSO) Dissolution Process NESS at Pantex (November 1-4, 1994 - Von Holle), the Device Assembly Facility (DAF) Security Addendum NESS at Nevada Test Site (NTS) (January 17-18, 1995 - Roarty), and the B61 mod 0, 2, and 5 Disassembly NESS at Pantex (May 22-26, 1995 - Sanders).
2. **Summary:** Since the Board's original letter on NESSs of December 8, 1993, significant progress has been made in enhancing the NESS process--especially regarding the quality and content of the Input Document and its associated risk assessments and the utilization of independent technical advisors. However, the staff believes improvements are still required. While semi-quantitative risk assessments were used to evaluate accident scenarios for the disassembly NESSs and proved to be effective risk reduction tools, there seems to be movement toward abandonment of risk assessment in nuclear explosive operations. Furthermore, the amount of time dedicated to NESSG presentations has not always been sufficient .
3. **Background:** Requirements for conducting NESSs are contained in DOE Order 5610.11, *Nuclear Explosive Safety*, which is being revised in response to Recommendation 93-1. The revision attempts to address, among other things, weaknesses in the NESS process pointed out in earlier Board letters of December 8, 1993, and February 3, 1995, and the NESS Independent Review Team Report. Interim guidance on conducting NESSs issued by DOE DP-20 on February 22, 1994, will continue to remain in effect until the revised version, DOE Order 5610.11A, is implemented. This report provides a compilation of the staffs evaluation of several recent NESSs against the existing requirements/guidance.
4. **Discussion:** The B61 disassembly NESS is the first review of a process developed using the Seamless Safety (SS-21) concept. As applied to disassembly, SS-21 differs from previous programs because it begins by developing safety criteria in areas including tooling, facility interfaces, and procedures. These criteria are evaluated and formally documented throughout the process. At the time of this review, SS-21 included concurrent development of two risk assessments, a qualitative assessment to evaluate general disassembly hazards, and a quantitative assessment of accident frequency to evaluate those accident scenarios which could lead to plutonium dispersal. While there has been some indication that the stringency of future plutonium dispersal. While there has been some indication that the stringency of future disassembly analyses may be reduced, new DOE guidance on weapons safety analyses (Draft DOE Order 5610.11A, *Safety of Nuclear Explosive Operations*, dated July 17, 1995, and Draft Standard DOE-STD-XXXX-95, *Preparation Guide for the U.S. DOE Hazard Analysis Reports for Nuclear Explosive Operations*, dated July 11, 1995) seems to support a level of rigor consistent with that applied to the B61 disassembly operation.

The resources dedicated, analyses performed, and scrutiny received by a disassembly process using SS-21 have resulted in an operation that is well designed, analyzed, and documented. The risk assessments provide a prioritized set of hazards that were utilized as effective risk reduction tools. As a result, very few inquiries by NESS

members and technical advisors went without adequate resolution. Downgrading the evaluation to hazard analyses is likely to reduce its effectiveness as a tool for risk reduction.

Further comments applicable to all three studies are included below while other specific observations and comments are included in the enclosures.

- a. Areas of Continuing Improvement: The Board's staff observed the following areas of improvement:
  1. The NESS Input Documents were thorough and technically rigorous in most areas. Input Documents have evolved from lacking adequate technical detail to becoming somewhat voluminous. This is due to unnecessary material--a proper balance needs to be achieved.
  2. NESS members and advisors are progressively becoming more technically inquisitive; however, some members continue to provide little or no commentary. There are fewer instances where NESS members or advisors attempted to respond to questions or comments made by another member or advisor. In most cases, the chairpersons attempted to have representatives from the M&O contractor and the laboratories resolve questions.
  3. The NESS members effectively utilized independent technical advisors who provided specific expertise on issues evaluated during the reviews. In the case of the W48 DMSO and B61 disassembly NESSs, this included experts in risk analysis and high explosives.
  4. NESS attendees included additional personnel in training on the NESS process. Furthermore, in the case of the B61 disassembly NESS, the chairman was advised by a person with prior chairmanship experience since this was his first time in this role.
  
- b. Areas of Deficiency Requiring Improvement: The Board's staff continues to observe the following areas of deficiency--including several that were previously noted in the Board's December 8, 1993, and February 3, 1995 letters:
  1. The execution of the NESS process (i.e., preparation of the Input Document, presentation of briefing materials, evaluation by individual NESS members, deliberations, and preparation of NESS Final Report) still reflects a lack of general agreement over what is necessary and sufficient to yield appropriate analysis and documentation of all relevant risks. Presumably this will be rectified by the new directives being developed in response to Board Recommendation 93-1.
  2. Certain portions of the NESS process seem too rushed and are frequently

driven by the overall schedule. Specifically, the amount of time dedicated to presentations is not always sufficient; important discussions were observed to be squeezed into a few minutes at the end of a long day.

#### **5. Future Staff Actions:**

- a. The staff will continue to observe NESS activities at both Pantex and NTS.
  - b. The staff will continue to evaluate the integration of DOE activities to improve the safety of nuclear explosive operations including Recommendation 93-1, Recommendation 93-6, the NESS Corrective Action Plan, and the SS-21 Program. These activities are culminating, in part, with the forthcoming update to DOE Orders 5610.10 and 5610.11, and their associated guides and standards.
- 

### **ENCLOSURE 1**

#### **Observations from the Nuclear Explosive Safety Study for the W-48 DMSO Dissolution at the Pantex Plant**

##### Process Comments:

1. The NESS members were nearly the same as the previous year's NESS on the same subject. However, the meeting was much larger because technical advisors assisted in disciplines including high explosives, risk assessment, criticality, and metallurgy. NESS trainees and DOE reviewers were also present--all of which made the observations in the bay difficult. The members often relied on their advisors for guidance on technical issues. Several Lawrence Livermore National Laboratory (LLNL) and Mason and Hanger (M&H) presenters and managers were also present for much of the group discussions and deliberations.
2. M&H and LLNL were better prepared for this study than a year ago. All members received the NESS Input Document on time; however, last minute changes were submitted and discussed by the group and published as appendices to the Final Report. The most significant changes were to the Risk Analysis Report. The probability of detonation of parts of explosive falling to the floor was changed during the NESS meeting by several orders of magnitude upon consultation with the lab expert present at the meeting.
3. The study group chair repeatedly criticized M&H in two areas: errors in the disassembly procedures and configuration management. The Board's staff shared these same concerns.
4. The process was rushed. More time should have been allotted to discuss the issues and the Input Document. One day for presentations was not enough; for example, important discussions on risk assessment were squeezed into a few minutes at the end of the day. NESS deliberations on the issues of concern and report writing were also done at the end of long days.

5. The plutonium dispersal risk assessment seemed accurate and complete, providing a prioritized set of hazards for which adequate mitigation was demonstrated. The problem again was in the apparent separation of the risk assessment from the technical input. The preparer from LLNL was not an expert in high explosives, where many of the hazards reside, and had to rely on experts for input. In one instance, this input was modified at the meeting (as noted above), changing the probability of one otherwise significant accident scenario to insignificant. There were some questions regarding the NESS requirement for performing a plutonium dispersal risk assessment. However, most of the NESS members recognized that only a Level I-type probabilistic risk assessment is currently required and that the W-48 DMSO Dissolution risk assessment was adequate.

Technical Comments:

1. As mentioned above, the plutonium dispersal risk assessment was changed to reflect a lower probability of explosion/detonation for dropping the high explosive on the floor. Skid test results, which are presumed to be worst case conditions, are not expected to apply in a cell with special resilient flooring material. LLNL has data on drops on such flooring material, and the probability of detonation used in the risk assessment was changed to reflect this data. Nevertheless, this issue should have been resolved earlier in the process.
2. Questions arose regarding cell grounding and lightning protection. M&H was criticized for inadequate configuration management for allowing unauthorized equipment in the cell in proximity to the cell grounding cable. Also, in the contingency procedures, the cell is complicated by many hoses and power cables running in complex patterns in contact with metallic portions of the contamination tent and dissolution vessel. M&H committed to fix these problems and appropriately change the procedures.

---

**ENCLOSURE 2**

**Observations from the Nuclear Explosive Safety Study for the Device Assembly Facility  
Security Addendum at the Nevada Test Site**

Process Comments:

1. A senior member of the NESS expressed concern over the current emphasis on Chapter IX of DOE Order 5610.11, *Nuclear Explosive Safety*, regarding the quantitative risk analysis of plutonium dispersal. He believed this was a distraction to the assessment of operational hazards associated with high explosive detonation, which this member believed to be the real safety issue. This position may be understandable at the present time when one recognizes that the weapons community's track record of success is largely based on deterministic analyses of hazards through application of traditional engineering principles. The staff believes that increased use of risk assessment will identify risk drivers that can be eliminated or mitigated during process development or review.

2. A noticeable distraction in the NESS review of Device Assembly Facility (DAF) Security was the relegation of various issues to be raised in a future facility Master Study. Most electrical systems needing to be analyzed for their potential adverse impact on nuclear explosive safety were considered outside the scope of this study as they do not occur as a result of security operations.

Technical Comment: The most significant NESS finding in the review was the need for tempering the enthusiasm of security personnel to provide an armed protective force in the vicinity (visual sight) of a weapon. This finding was amicably resolved by developing additional procedural controls, including covering the weapon.

---

### **ENCLOSURE 3**

#### **Observations from the Nuclear Explosive Safety Study for the Disassembly of the B61 Mod 0, 2 and 5**

Process Comments:

1. For this disassembly, a semi-qualitative risk assessment was performed that evaluated all disassembly hazards for the centercase (which contains the physics package); the nose, preflight, and tail were excluded. In addition, a more detailed risk assessment was performed to evaluate most plutonium dispersal accident scenarios for the bomb during the disassembly process. This effort is commendable because although the absolute numbers (i.e., event frequency per weapon disassembly) may have a great deal of uncertainty, the relative results of the assessments were used as risk reduction tools. However, certain NESS members and advisors expressed serious concern over the accuracy and possible misinterpretation of the absolute numbers as well as the overall utility of the risk assessments.
2. All mod 0 disassemblies will be completed before beginning mod 2, and all mod 2s will be completed before beginning mod 5s. In addition, there are only a small number of each modification type that have not been inerted--eliminating many significant hazards during the disassembly.

Technical Comment: Areas of significant uncertainty in the risk assessments identified by the preparers include the sensitivity of aged high explosive and human reliability. Also, an advisor noted and questioned why the NERA did not include analyses of electrical pathways that could introduce sufficient electrical energy into the weapon at a main detonator. This condition could lead to a nuclear or high explosive detonation, especially during certain periods of the disassembly where the electrical components are exposed to possible external environments. Earlier guidance was given by DOE/AL Nuclear Explosive Safety Division to not perform what is essentially inadvertent nuclear detonation analyses as part of the plutonium dispersal risk analysis. These issues remain to be resolved.