DOE/IG-0528

AUDIT REPORT

STOCKPILE SURVEILLANCE TESTING

OCTOBER 2001

U.S. DEPARTMENT OF ENERGY
OFFICE OF INSPECTOR GENERAL
OFFICE OF AUDIT SERVICES

October 5, 2001

MEMORANDUM FOR THE SECRETARY

FROM: Gregory H. Friedman (Signed)
Inspector General

SIJBJECT: INFORMATION: Audit Report on "Stockpile Surveillance Testing"

BACKGROUND

In 1993, the President and Congress reaffirmed the moratorium on underground nuclear testing and directed that a science-based Stockpile Stewardship Program be developed to maintain the nation's stockpile of nuclear weapons. The Department of Energy's (Department) plan for the Stockpile Stewardship Program describes it as one of the most complex, scientific-technical programs ever undertaken. The program consists of surveillance, experimentation, computation, and production. Its focus is to maintain "high confidence" in the safety and reliability of the stockpile without nuclear testing.

The Department is required, based on activities conducted under the Stockpile Stewardship Program, to annually certify to the President that the nuclear weapons stockpile is, in fact, safe and reliable and that underground nuclear testing does not need to be resumed. Ultimately, the program's success is dependent upon developing an unprecedented set of scientific tools to better understand nuclear weapons, enhancing stockpile surveillance capabilities, and, in the process, extending the life of the weapons that comprise the stockpile. Responsibility for the Stockpile Stewardship Program rests with the National Nuclear Security Administration.

Surveillance testing, a key component of the Stockpile Stewardship Program, has been characterized as the first line of defense for maintaining high confidence in the stockpile and the linchpin between stewardship activities and the annual certification process. Each year, the Department randomly selects just under 100 weapons on which to conduct various surveillance tests. These include:

- *Flight tests* involving the actual dropping or launching of a weapon after removal of its nuclear components;

- *Laboratory tests* of non-nuclear weapon systems to detect defects due to handling, aging, manufacturing, or design; and,

- *Component tests* involving destructive analysis to identify defects or failures in individual nuclear and non-nuclear parts.

In February 2001, a Congressionally-appointed panel, established to review the reliability, safety, and security of the stockpile, reported that the only hope for sustaining confidence in the stockpile is to assure, through surveillance, that every effort is made to find any problems that may exist. In this vein, the objective of our audit was to determine whether the stockpile surveillance testing program was meeting scheduled milestones for testing.

RESULTS OF AUDIT

At least since 1996, the Department had not met many of its internally-generated milestones for flight, laboratory, and component tests. This has resulted in a significant testing backlog that, despite some efforts to expedite the testing regime, is projected to continue for several years. Flight and laboratory tests scheduled for five different weapon systems were significantly backlogged. In addition, there was a large number of untested components. Testing backlogs occurred primarily because of inadequate planning related to required safety studies; transfer of testing responsibilities between facilities; and, difficulties in coordinating tests with the Department of Defense. When tests are delayed or are not completed, the Department lacks critical information on the reliability of the specific weapons involved. Additionally, anomalies or defects within the weapon systems can go undetected since the likelihood of detecting anomalies decreases when fewer tests are conducted. Without needed test data, the Department's ability to assign valid reliability levels to some weapon systems is at risk.

In September 2000, the Office of Inspector General issued a related audit report on the *Management of the Nuclear Weapons Production Infrastructure,* (DOE/IG-0484, September 22, 2000). The audit disclosed that a deteriorating infrastructure had contributed to delays in weapons modification, remanufacture and dismantlement, and surveillance testing of weapon components. In our judgment, the state of the weapons production infrastructure placed current and future goals of the Stockpile Stewardship Program at risk. We currently have underway a complementary review of the Significant Finding Investigation Process, which is another key element of the Stockpile Stewardship Program.

Taken together, our recent audit work leads us to conclude that immediate and aggressive action should be taken to ensure the continued viability and credibility of the Stockpile Stewardship Program. Accordingly, we recommended that the Deputy Administrator for Defense Programs develop a management plan to address the backlog of flight, laboratory, and component tests.

MANAGEMENT REACTION

Management generally concurred with the report conclusions and recommendations. Actions, including plans for eliminating backlogs, are being initiated. Management advised that most of the backlogs are scheduled to be eliminated by the first part of
Fiscal Year 2003.

Attachment

cc: Deputy Secretary
Administrator, National Nuclear Security Administration

STOCKPILE SURVEILLANCE TESTING

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Overview

INTRODUCTION AND OBJECTIVE

The Department of Energy (Department) is responsible for providing the nation with nuclear weapons and ensuring these weapons remain safe, reliable, and available for the defense of the United States, should the need arise. Since the 1992 moratorium on underground nuclear testing, certification of the reliability and safety of the weapons stockpile has been based primarily on the annual surveillance and assurance tests conducted as a part of the Stockpile Surveillance Program. Under this program, the Department randomly selects, disassembles, inspects, and tests the nine active stockpile weapon systems for defects and problems. Test results serve, in part, as a basis for certifying to the President the safety and reliability of the nation's aging nuclear stockpile and that underground nuclear testing does not need to be resumed. This certification process includes a formal concurrence by the directors of the three weapons laboratories, the Commander-in-Chief of the United States Strategic Command, and the Nuclear Weapons Council.

Overall responsibility for the direction of the Stockpile Surveillance Program is vested in the National Nuclear Security Administration (NNSA). Stockpile surveillance tests are conducted primarily at the three weapons laboratories and four production facilities. These include the Lawrence Livermore, Los Alamos, and Sandia National Laboratories; Kansas City, Pantex and Y-12 Plants; and, the Savannah River Site.

Completion of required weapons testing has been a continuing problem for several years. A July 1996 General Accounting Office (GAO) review disclosed a backlog in surveillance testing.[1] Shortly thereafter, the Department committed to returning flight, laboratory, and component testing back to schedule to increase confidence in the reliability levels assigned to some nuclear weapons. Additionally, several internal studies were conducted to define approaches that would be most appropriate to assure the continued safety and reliability of the nation's nuclear stockpile. These included the Under Secretary's 30-Day Review (1999) and NNSA's 150-Day Report (2001) of the Stockpile Surveillance Program to define key issues and frame recommended actions. Officials believe implementation of recommended actions will improve the program (See Appendix 2 for a list of related reports). Further, about $4 million of additional funds were requested and approved as a supplement to the Department's Fiscal Year (FY) 2001 budget. These funds have been targeted to help eliminate the testing backlog.

[1] *Nuclear Weapons: Improvements Needed to DOE 's Weapons Stockpile Surveillance Program*, (GAO/RCED-96-216, July 1996).

The objective of our audit was to determine whether the stockpile surveillance testing program was meeting scheduled milestones for testing.

CONCLUSIONS AND OBSERVATIONS

The Department has not been meeting its schedule for some flight, laboratory, and component tests; and, backlogs are projected to continue for several years. Without a robust and complete surveillance testing program, the Department's ability to assess the reliability of some nuclear weapons is at risk. Five of nine weapon systems in the stockpile had significant flight or laboratory test backlogs. Additionally, there was a large number of untested components. Testing backlogs occurred primarily because of inadequate planning related to required safety studies; transfer of testing responsibilities between facilities; and, difficulties in coordinating tests with the Department of Defense (DoD).

To enhance the Stockpile Surveillance Program, we recommended that the Deputy Administrator for Defense Programs develop a management plan to address the backlog of flight, laboratory, and component tests; expedite the renewal of safety studies; and, establish a firm flight-test plan with DoD officials.

We discussed this report with the Assistant Deputy Administrator for Military Application and Stockpile Operations. Generally, he agreed with our recommendations and indicated that during FY 2001 the Department had begun to address some of the reasons for surveillance testing delays, including the need for updated safety studies at Pantex. A summary of management comments is set forth on pages 9-10.

Due to national security implications, the matters discussed in this report should be considered by management when preparing its yearend assurance memorandum on internal controls.

(Signed)
Office of Inspector General

STOCKPILE SURVEILLANCE TESTING

Backlogs in Surveillance Testing

The active stockpile consists of nine nuclear weapon systems launched, depending on the type, from aircraft, submarines, or the ground.[2] Surveillance tests for these weapons include:

- *flight testing*, which is the actual dropping or launching of a weapon from which the nuclear components have been removed;
- *laboratory testing*, which involves testing non-nuclear systems within a weapon, such as radar systems and fuzes, to detect defects due to handling, aging, manufacturing, or design; and,
- *component testing*, which is destructive analysis to identify defects in individual non-nuclear and nuclear component parts.

For all three types of tests, the Department faced backlogs and delays. Most of the nine systems were affected by these problems. Any missed or delayed test is a matter of some concern, and each has the potential to affect overall levels of confidence in the weapon system. Sandia National Laboratories defined a testing backlog of 25 percent as a "significant concern." The Department considered any backlog to be a concern. Unless priority attention is given to substantially reduce these backlogs, we believe that additional flight, laboratory, and component testing milestones are at risk.

Flight Testing

An analysis of flight tests planned and conducted over the last four years revealed that flight testing was significantly behind schedule. The following table sets forth the backlogs experienced in the last four years by weapon system.

Table 1—Backlog of Flight Testing

(Four-year period ending September 30, 2000)

Weapon System	Number Planned	Actual	Percent Backlog
W62	8	5	-38%
W80-1	16	11	-31%
W88	12	9	-25%
W87	8	7	-13%
W76	13	12	-8%

[2] Appendix 3 includes pictures of all weapon systems.

As indicated in the table, three weapon systems are already at the Sandia National Laboratories' defined level of "significant concern." Two others could reach that level if actions are not taken to return testing back to schedule. The best information available to us suggests that the backlogs may be several years in duration due to expired safety studies. The issue related to safety studies is discussed on page 6 of this report.

Department officials advised that ten flight tests, which have been reported as backlogged, were conducted but yielded no useful information. Such tests are referred to as "no tests" and are not considered a backlog until a determination has been made to reschedule these tests. Some tests will not be rescheduled because of existing data available for similar weapons and the high costs of retesting. Further, Department officials asserted that most flight test deliverables to DoD had been met even though no useful information was obtained from these tests.

The Office of Inspector General recognizes that modifications to schedules are sometimes necessary; however, "no tests" represent tests that were planned and not successfully completed. In our view, not identifying such tests as backlogged and reducing the number of tests planned, calls into question the adequacy of the sampling methodology used to determine the safety and reliability of the nuclear weapons stockpile.

Laboratory Testing

Over the past four years, at least five of the nine weapon systems have experienced laboratory testing backlogs as illustrated in the following table. Testing backlogs for two weapon systems exceeded the Sandia National Laboratories' threshold of "significant concern."

Table 2—Backlog of Laboratory Testing

(Four-year period ending September 30, 2000)

Weapon System	Number Planned	Actual	Percent Backlog
B61-7,11	30	22	-27%
W76	31	23	-26%
W62	36	30	-17%
B83-1	30	25	-17%
W80-0, 1	20	17	-15%

If current trends continue, three others could reach the level of "significant concern" unless actions are taken to restore testing to its schedule. Planned testing for the remaining four systems was generally on schedule. In regard to this matter, officials advised that plans were in process to eliminate these backlogs starting in FY 2002.

Component Testing

The Department tests many weapon components; however, pits, secondaries, detonators, gas transfer systems, and valves are considered key or critical components. At the end of FY 2000, there was a backlog in testing three of these key components. The table below shows the component, the number of tests normally conducted for each component, and the testing backlog.

Table 3—Backlog of Component Testing

(Four-year period ending September 30, 2000)

Component Type	Number Planned Annually	Number of Backlog
Gas Transfer Valves	22	61
Gas Transfer Systems	32	26
Pits	9	4

Backlogs for each of these components were discussed with Department officials. Management stated that the maximum number of valve tests performed by the laboratory in a year had been 22. Using this as a benchmark, we concluded that the untested valves represented a backlog of about three years. In response to the gas transfer systems backlog, Department officials advised that it planned to eliminate the backlog by FY 2005. With regard to pits, the Department planned to conduct 17 tests in FY 2000 even though only 9 such tests are normally scheduled each year. However, we found that only 13 tests were actually completed, resulting in a backlog. Officials advised that these four pits have been scheduled for testing in FY 2001.

Surveillance Testing Requirements

The Department is required to maintain the nation's active weapons stockpile to ensure its safety and reliability and meet the mission requirements developed with DoD. Specific requirements

governing the process are contained in the Stockpile Stewardship Plan and a number of related classified documents.

The Stockpile Stewardship Plan requires non-nuclear testing of the stockpile to ensure the safety and reliability of all weapon systems. Departmental policy requires that a sampling methodology be used to carry out this requirement. On average, eleven units of each of the nine weapon systems are randomly selected from the stockpile each year for testing and evaluation for a total sample size of about 99 weapons.

Criteria have been developed by the Sandia National Laboratories to measure progress in meeting planned flight and laboratory testing schedules. This criteria asserts the need for 100 percent testing of all selected weapon systems, but recognizes as an absolute minimum performance over a four-year period that at least 75 percent of planned tests be completed. When actual performance falls below this level, there is a "significant concern" that anomalies or defects in the stockpile might have been missed. Consequently, the confidence in the reliability, safety, and performance of the untested weapon systems is reduced. The Department had no such criteria and considered any backlog to be a concern.

Need for Planning and Coordination

The accumulation of backlogs occurred because of insufficient planning in the conduct of required safety studies and the transfer of responsibility for component testing between facilities. In addition, the Department had difficulties in coordinating flight tests with DoD.

Safety Studies

Officials did not adequately plan for the expiration of safety studies, which contributed to the testing backlog. Before surveillance tests can be conducted, weapons must first be disassembled, inspected, reassembled, and, in the case of flight tests, have the nuclear package replaced with telemetry. These activities are performed at the Pantex Plant, where the primary mission is nuclear weapons stockpile stewardship. Before Pantex can proceed, however, a valid safety study is required for each weapon system, certifying that conducting the operation is safe to the worker, facility, and environment. These studies are usually valid for five years. However, some portions of the studies must be reviewed annually and updated, if necessary.

We found that twelve weapons could not be disassembled, inspected, and tested in FY 2000 because the related safety studies had been allowed to expire. At least half of these disassemblies and inspections pertained to one weapon system. We further noted that safety studies for three other weapon systems will expire in FY 2002. Surveillance testing activities could be delayed for these weapon systems unless actions are taken to address the safety study issue.

In this regard, an August 2000 Departmental report noted that the contractor responsible at that time for operations at Pantex "lacked fully developed authorization basis documents such as safety analysis reports (SARs) and technical safety requirement documents. Progress in updating SARs has been limited by ineffective monitoring by [Defense Programs] and [Albuquerque Operations Office]...; inconsistent reviews by [Amarillo Area Office], [Albuquerque Operations Office], and [Defense Programs] staff, and difficulties experienced by [the contractor] in resolving technical issues." We noted that the Department changed contractors at Pantex in February 2001.

Transfer of Testing Responsibility

The Los Alamos National Laboratory (Los Alamos) and the Savannah River Site could not perform some component surveillance testing because consideration had not been given to the availability of capacity and funding during the transfer of testing responsibility to these facilities. In March 1995, the Department transferred the mission of gas transfer valves surveillance testing from the Mound Plant (Mound) in Ohio to Los Alamos as part of the Non-nuclear Reconfiguration Program. However, it did not transfer any incremental funding to Los Alamos to perform the testing. In addition, Los Alamos did not have the capacity to perform testing at that time. Los Alamos officials advised that because of funding issues, it took nearly four years after the mission was officially transferred to the site to start valve testing. We recognize that the transfer of a function of this magnitude carries with it inherent operational and technical challenges. However, we concluded that the delay associated with this transfer — nearly four years in duration — was unacceptable given the national importance of the testing program.

Similarly, gas transfer system testing was transferred to the Savannah River Site with the closure of Mound. Because Savannah River did not have adequate capacity to perform such tests, a backlog emerged. Initially, Department officials expected gas transfer testing to be back on schedule as of FY 2000, however, additional delays have occurred due to new testing requirements. Officials advised that actions have been taken to reduce backlogs, including increases in staff and facility efficiencies.

DoD Coordination

Flight tests are conducted in coordination with DoD and, therefore, are not entirely within the Department's control. Over the last four years, some flight tests scheduled for three weapon systems yielded no useful information. These tests were considered "no tests." The flight test program is intended to verify, among other things, weapon system capability to function in a normal stockpile-to-target environment, and to demonstrate continuing capability between the Department and DoD subsystems. The Department had not worked with DoD to determine whether additional flight tests were required to accommodate these "no tests." Because of classification concerns, additional information is not provided.

Effects Of Testing Backlogs

During the course of the audit, we spoke to both Federal and contractor officials at the national weapons laboratories involved in the annual reporting and certification of the stockpile. We were continually assured that, testing backlogs notwithstanding, the Department had met current military stockpile requirements. We noted, for example, that since the inception of the program, the Departments of Energy and Defense have certified the reliability of the stockpile. However, in our judgment, the failure to complete the regime of testing mandated by the Department's own stockpile stewardship criteria raises questions about its ability to assign reliability levels to some weapon systems. Clearly, when tests are delayed or not completed, the Department lacks essential information on the operating characteristics and reliability of the weapon. Further, anomalies or defects within the weapon systems could be missed.

As the stockpile continues to age, a rigorous and viable surveillance program becomes increasingly important. Currently, many warheads are over 30 years old and the average age is 17 years. As stated by a Congressionally-appointed review panel,[3] "Aging and unavoidable changes are already introducing uncertainties regarding component and system performance. As time passes, uncertainties inevitably will grow unless adequate new knowledge is gained through the Stockpile Stewardship Program."

The Department has taken the position that a science-based stockpile reliability program can successfully serve as an alternative to underground nuclear testing. To support its position, it devised an extensive program of reliability tests. The testing backlogs that were disclosed during this audit raise serious questions about whether the objective of the Department's effort can be satisfied.

RECOMMENDATIONS

We recommend that the Deputy Administrator for Defense Programs increase oversight and give attention to reducing backlogs of surveillance testing. At a minimum, the Deputy Administrator should:

- Develop and implement a management plan, with goals and milestones, to address the backlog of flight, laboratory, and component tests;
- Expedite the renewal of safety studies to assure testing will be completed as scheduled; and,
- Coordinate with military officials to determine reasons for "no tests" and whether additional tests are required.

MANAGEMENT COMMENTS

In general, management concurred with the report conclusions and recommendations. The Department advised that several actions have been initiated to address testing backlogs. Further, plans for eliminating the backlogs are being prepared. According to these plans, most of the laboratory and component backlogs are scheduled to be eliminated by the first part of FY 2003.

[3] *FY 2000 Report to Congress of the Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile*, February 1, 2001.

In regard to flight testing, management asserted that "no tests" do not constitute a backlog. When a "no test" occurs, Department managers consult with technical personnel at the appropriate laboratory, consider accumulated data on the weapon in question, and consider the future test schedules. Based on these factors, the Department makes a judgment as to whether the "no tests" should be made up. The vast majority of the current "no tests" will not be made up.

AUDITOR COMMENTS

Management's planned corrective actions are responsive to the audit report recommendations. However, we have continued to classify "no tests" as backlogs because they represent, in our judgment, a departure from the Department's sampling methodology. As indicated in the audit report, not identifying these tests as backlogged and reducing the number of tests planned calls into question the adequacy of the approach used to determine the safety and reliability of the nuclear weapons stockpile.

Appendix 1

SCOPE

The audit was performed from September 2000 through August 2001 at the Department of Energy in Washington, DC and Germantown, MD; Albuquerque Operations Office and Sandia National Laboratories in Albuquerque, NM; Los Alamos National Laboratory in Los Alamos, NM; the Pantex Plant in Amarillo, TX; Savannah River Site in Aiken, SC; and the Y-12 Plant in Oak Ridge, TN.

METHODOLOGY

To accomplish the audit objective we:

- Reviewed policies and procedures established to accomplish surveillance testing;
- Interviewed Departmental Headquarters officials concerning the weapons testing responsibilities, operating requirements, and testing backlogs;
- Interviewed Department and contractor officials at Albuquerque Operations Office, Los Alamos, Sandia, Pantex, Savannah River Site, and Y-12 Plant about testing responsibilities and backlogs;
- Reviewed testing data to assess whether backlogs existed in flight, laboratory, and component testing;
- Interviewed contractor statisticians about how the testing backlogs affect confidence and reliability;
- Reviewed applicable safety study requirements for both facilities and weapons disassembly; and,
- Reviewed performance measures established in accordance with the Government Performance and Results Act.

The audit was conducted in accordance with generally accepted Government auditing standards for performance audits and included tests of internal controls and compliance with laws and regulations to the extent necessary to satisfy the audit objective. Because our review was limited, it would not necessarily have disclosed all internal control deficiencies that may have existed at the time of our audit. We did not rely extensively on computer-processed data.

We held an exit conference with NNSA officials on September 25, 2001.

Appendix 2

RELATED AUDIT REPORTS

Office of Inspector General

- *Management of the Nuclear Weapons Production Infrastructure,* (DOE/IG-0484, September 22, 2000). The audit found that the nuclear weapons production infrastructure has not been adequately maintained and current and future goals of the Stockpile Stewardship Plan are at risk.

General Accounting Office

- *Nuclear Weapons: Improved Management Needed to Implement Stockpile Stewardship Program Effectively,* (GAO-01-48, December 2000). Although the Office of Defense Programs had taken steps to address principal challenges facing the Stockpile Stewardship Program, additional improvements were needed. Specifically, improvements were needed in order to: (1) remedy weaknesses in the program's planning process; (2) ensure that required budget information for effective cost management is available; (3) correct organizational and leadership deficiencies; and, (4) develop an effective management process for overseeing the life extension process for nuclear weapons.

- *Nuclear Weapons: Key Nuclear Weapons Component Issues Are Unresolved,* (GAO/RCED-99-1, November 1998). The Department's plans for reestablishing the production of pits at Los Alamos National Laboratory have changed and are still evolving. The Department expects to have only a limited capacity on-line by FY2007.

- *Nuclear Weapons: Improvements Needed To DOE' s Weapons Stockpile Surveillance Program,* (GAO/RCED-96-216, July 1996). The Department was behind schedule in conducting many of the stockpile surveillance tests including flight, laboratory, and component testing. As a result, the Department's confidence in the reliability levels assigned to some nuclear weapons had been diminished because some needed tests had not been carried out.

Other Reports

- *FY 2000 Report to Congress of the Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile,* (February 1, 2001). This Congressionally established panel found a disturbing gap between the nation's declaratory policy that maintenance of a safe and reliable nuclear stockpile is a supreme national interest and the actions taken to support this policy.

- *FY 1999 Report of the Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile,* (November 8, 1999). The Congressionally appointed panel reported that effective execution of both the Stockpile Stewardship Program and the Annual Certification Process offered the best hope for sustaining confidence in the nuclear stockpile, and its deterrent capabilities, into the future. The panel recommended strengthening and broadening the Annual Certification Process to provide assurance that potential problems are being sought out and reported.

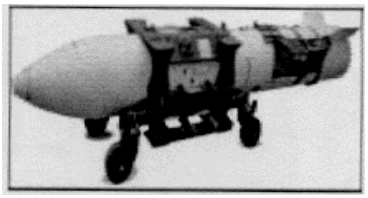
- *Strategic Review of the Surveillance Program 150-Day Report,* (January 1, 2001). This strategic review was initiated by NNSA to define the surveillance approach that would be most appropriate to assure the continued safety and reliability of the nation's nuclear stockpile. The team identified possible changes and improvements needed in the program to meet the needs of an aging stockpile with limitations on testing and an increasing need to preserve stockpile assets.

- *Stockpile Stewardship Program 30-Day Review,* (November 23, 1999). This comprehensive internal review to assess the continued confidence in the Stockpile Stewardship Program's structure, progress, and accomplishments found that the program works. The review identified the need for the Department and DoD to refine its process for prioritizing and scheduling stockpile refurbishments and other program requirements over the next several decades to take into consideration military, human, and budgetary needs.

Appendix 3

Enduring U.S. Nuclear Weapons Stockpile
Weapon System Groups for the
Active Stockpile

W80



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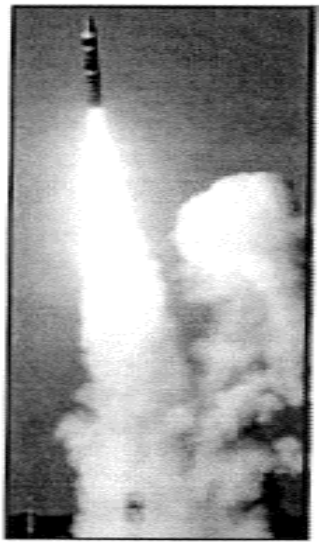
W76/W88



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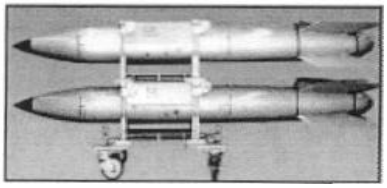

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B61-7/11

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