

Alterations, Modifications, Refurbishments and Possible New Designs For the US Nuclear Weapons Stockpile

Article VI of the 1970 **NonProliferation Treaty** (NPT) mandated the five nuclear powers (the US, USSR, U.K., France and China) to "pursue negotiations in good faith on effective measures relating to the cessation of the nuclear arms race at an early date and to nuclear disarmament ." At the May 2000 NPT Review Conference, this pledge was renewed as "an unequivocal undertaking by the nuclear-weapons States to accomplish the total elimination of their nuclear arsenals leading to nuclear disarmament" and a commitment to "practical steps for the systematic and progressive efforts to implement Article VI." NPT Preparatory Committees will be convened in each of the next three years in advance of another full NPT Review Conference in 2005. These Preparatory Committees (with representatives from over 100 countries) will be looking for demonstrable progress toward multilateral nuclear disarmament. While the overall number of nuclear weapons is gradually being reduced over time, government documents concretely demonstrate that the US is qualitatively moving in a direction opposed to disarmament.

Under the Department of Energy s (DOE s) so-called **Stockpile Stewardship Program**, now being implemented by the semi-autonomous **National Nuclear Security Administration** (NNSA), funding for core nuclear weapons programs has risen from a Cold War yearly average of an estimated \$4 billion (constant 2001 dollars)¹ to \$5.3 billion for FY 2002 (which Congress will likely further substantially augment). NNSA Defense Programs are to receive a 4.6% increase, but under that **Directed Stockpile Work** will specifically receive a 14% funding increase.² Extensively planned **Stockpile Life Extension Programs**³ for each of the existing weapons systems in the "enduring" stockpile are being implemented to preserve the operational life of each weapons system for at least 30 years.⁴ Far from the stated program rationale of merely maintaining the safety and reliability of the stockpile in the absence of full-scale testing, these programs are aggressively introducing major modifications and possible new designs that will improve accuracy and military effectiveness in order to meet "changing military requirements." The weapons labs themselves now describe the stockpile as "evolving,"⁵ in contrast to simply enduring. One of the stated objectives of Directed Stockpile Work is to "provide the capability to realize new weapons, if they are needed."⁶ Increasingly, top nuclear weapons labs officials are suggesting that the US needs new nuclear weapons, in large part to create a new "capability #2" to counter "new, emerging threats" ("capability #1" remains the existing arsenal targeting Russia)⁷.

Historically the life cycle of US nuclear weapons has gone through seven phases, from conceptual development to eventual retirement and/or storage. According to DOE, "since all enduring stockpile weapons are currently in Phase 6 [Quantity Production and Stockpile Phase, presence in the stockpile before and after the refurbishment project] an expanded process has been established to extend the life of the weapons in the stockpile."⁸ This is the new expanded "Phase 6.X" process:

- Phase 6.1 Concept Assessment
- Phase 6.2 Feasibility study
- Phase 6.2A Design Definition and Cost Study
- Phase 6.3 Development Engineering
- Phase 6.4 Production Engineering
- Phase 6.5 First production
- Phase 6.6 Full-Scale Production



B61 Bomb

Known current and future alterations, refurbishments, modifications and possible new designs for the US nuclear stockpile are listed by the weapons types below or in related nuclear weapons activities. Stockpile Life Extension Programs (SLEPs) with major refurbishments are active today for the B61, W76, W80 and W87.⁹ SLEPs for the other weapons-types are presently on hold pending "Administration strategic review," which is due before the end of 2001 with a new **Nuclear Posture Review**. In addition, eleven alterations (Alts) are now underway,¹⁰ some of which may substantially expand the military capabilities of some weapons.

- **B61-3, 4, 10:** A strategic and/or tactical bomb with four "dial-a-yield" settings estimated between 10 to 500 kilotons. This B61 "family" is currently in Phase 6.3 to change the bomb fin angle (Alt 354) and for safety enhancements and surety upgrades (Alts 335 and 339).¹¹
- **B61-7,11:** This B61 "family" was created four years ago when the B61-7 was modified into the earth-penetrating B61-11 and fast tracked to the stockpile for deployment on B-2 stealth bombers (as a substitute for the 9 megaton B-53 surface—burst weapon). A "Stockpile Modernization" goal for FY 2001 is to "complete certification of the B61-11 as an unlimited stockpile weapon."¹² Despite the major modification of four years ago, feasibility and design studies (of a not revealed type) will accelerate in FY 2002,¹³ with full production to start in FY 2004.¹⁴ Additionally, the B61-11 is now receiving structural enhancements (Alt 349). "This Alt will improve the bomb survivability during earth penetration."¹⁵ The B61-7/11 will also have electrostatic safety upgrade kits (Alt 336) and will have secondaries refurbished beginning in FY 2002.¹⁶ [Secondaries are the second-stage thermonuclear components in modern weapons, often called canned subassemblies.]
- **W62:** Warhead for the Minuteman III ICBM; estimated yield 170 kilotons. Tritium reservoirs are now being modified (tritium is a radioactive isotope of hydrogen used to boost a weapon's yield). However, the W-62 is the one weapon system in the enduring stockpile that DOE is apparently not aggressively seeking to extend its life. "The decision on a course of action for the W62 must be made in the near future. If it is to remain in the inventory, there will be a need to address surety issues."¹⁷ The W-62 is being gradually replaced by the W78 and W87.
- **W76:** MIRVed warhead for the submarine-launched Trident 1 missile; estimated yield 100 kilotons; each sub can carry up to 24 missiles with up to 8 warheads each. Currently in Phase 6.3/6.4¹⁸ for "W76 Block 1 initial development work," which includes "the refurbishment of the nuclear package and the AF&F [arming, firing and fuzing]."¹⁹ This new AF&F "upgrade" could provide a near-surface burst capability to knock out hardened, buried targets (thereby increasing its perceived first-strike threat). The W76 is receiving new tritium reservoirs and neutron generators (Alt 317).²⁰
- **W78:** MIRVed warhead for the Air Force's Minuteman III ICBM; estimated yield 335 kilotons. "Starting and continuing retrofit with modified gas [tritium] transfer system (Alt 351)."²¹
- **W80:** Warhead for sea/sub-launched and air-launched cruise missiles; estimated yield 150 kilotons. Currently in Phase 6.3/6.4²² to extend operational life, which may include a new tritium reservoir. There is a pending, unspecified W80-1 modification, but a recent weapons lab document has referred to "Mods 2 and 3, as well as potential future Mods."²³ There is to be "uninterrupted refurbishment" with an "aggressive interlinked schedule — compressed in half."²⁴
- **B83:** Strategic bomb for low-level supersonic flights against "hardened" targets (concrete missile silos and command and control centers), huge estimated yield between 1 - 2 megatons. Mod 1 incorporating an encrypted firing set, new spin rocket motor and new radar antenna was completed in FY98.²⁵ Tritium transfer system is in Phase 6.1. Alt 750 adds common radar and Alt 752 "incorporates a new cable for revised radar heights of burst."²⁶

This last alteration, perhaps analogous to the W76 AF&F alteration, could potentially increase its perceived first-strike threat.

- **W87:** MIRVed warhead for the Air Force's "Peacekeeper" ICBM; estimated yield 300 kilotons. The W87 is currently undergoing "full-scale refurbishment"²⁷ which "requires disassembly of the nuclear explosive package" and "refurbishment of the secondary."²⁸ Retrofits are continuing to improve structural integrity (Alt 342) and new tritium reservoirs are being installed (Alt 345).²⁹ "FY02 initiates the assessment and certification for the W87 Safety Enhanced Reentry Vehicle replacement."³⁰

- **W88:** MIRVed warhead for the submarine-launched Trident II missile; estimated yield 475 kilotons; each sub can carry up to 24 missiles with up to 8 warheads each. The W88 is considered to be the US's most advanced nuclear weapon. Its plutonium pit is scheduled to be the first to go back into stockpile production with the newly refocused "W88 Pit Manufacturing And Certification Campaign" (\$217.7 million in FY 2002),³¹ with full production scheduled for 2004.³²

Related Nuclear Weapons Activities and Programs

Baselining: A program whose aim is that "the legacy-stockpile knowledge of the Cold War period be captured in an organized, preservable manner to provide a baseline of information and serve as a foundation for the evolution of the Stockpile Stewardship Program." This is for the "younger workers [who] will become stewards of the stockpile."³³ Baselining is to be accomplished through the compilation of archival full-scale testing data, the development of 3-D weapons codes (see ASCI below) and extensive hydrotesting (also see below). DOE plans to have all weapons systems baselined by the end of FY 2004. Baselines will then be used as tools to evaluate proposed alterations, modifications and refurbishments.³⁴

"Mininukes" and low-yield weapons: Future new design work will likely center on low-yield weapons in the five kilotons or below range (including so-called "mini-nukes"). These weapons would inherently be more dangerous because they are more likely to be used. The Warner-Allard provision of the FY 2001 Senate Defense Authorization Bill required DOE to undertake mini-nuke research and development, a direction that has been legislatively barred since 1994 (funding for that provision was not appropriated in House/Senate conference). SNL Director Paul Robinson has urged that the US develop low-yield weapons, most specifically for forward-based submarine-launched strategic and cruise missiles that would use GPS guidance systems for precise accuracy. He has also proposed using "dummy" secondaries in existing designs so that only single-stage (plutonium pit-only) yields would be obtained.³⁵ Steve Younger, LANL Associate Director for Nuclear Weapons Technologies, has proposed low-yield weapons based on existing HEU designs. These would have the advantage of requiring neither full-scale testing nor a massive plutonium infrastructure.³⁶

Submarine Warhead Protection Program: The weapons labs are planning for a "replacement warhead design for the Submarine Launched Ballistic Missile Warhead Protection Program."³⁷ In Spring 2000 Sandia Labs conducted a flight test of a new warhead concept that "investigated potential future replacement options."³⁸

Supporting Research and Development: "General supporting R&D [under Directed Stockpile Work] pursues technologies which are used to support the nuclear weapons stockpile, but are not designed for a specific weapons system. Activities include military characteristics as issued by the Nuclear Weapons Council, technology development/material studies, and advanced development systems engineering."³⁹ This may well be a source of funding (\$32.5 million in FY00⁴⁰) for new design work.

Threat Reduction Programs: The labs are investing heavily in so-called Threat Reduction Programs, which they often describe as nonproliferation programs (and which receive funding separate from the NNSA weapons budget account). Rather than being non-proliferation-oriented, their aim is largely to "provide technologies and assessments to counter weapons of mass destruction, terrorism and proliferation." (Emphasis added.). This includes "support [for] DoD in dealing with such priority issues as detecting and defeating hard and deeply buried targets."⁴¹ These "Threat Reduction Programs" may have supported the development of the B61-11 earth-penetrator four years ago and may support likely future earth-penetrator research and development.

Future Plutonium Pit Production: As already stated, DOE NNSA is spending \$217.7 million at LANL in FY02 for plutonium pit production. However, it is becoming increasingly clear that LANL's limited capabilities are not sufficient for the future pit production rates that NNSA believes is necessary for the "enduring" nuclear weapons stockpile. In FY01, NNSA requested \$2 million for conceptual design activities for a "modern" pit facility that could have production rates of up to 450 pits annually (roughly half of Cold War levels). For FY02, the request is \$4 million.⁴² Senior government officials have recently described LANL's pit production capabilities as a mere "interim, R&D effort" and have stated that concrete planning for the super facility must begin immediately.⁴³ It can hardly be overstated that US plans for a new and modern plutonium pit production facility is evidence enough of the lack of genuine US commitment to NPT Article VI.

The National Ignition Facility (NIF): DOE has touted the NIF as a vitally needed dual-use (both weapons and physics R&D) inertial confinement fusion facility. It is currently far over budget and way behind its construction schedule. Among other future weapons applications, one of its future missions is to "conduct laser/fireball test in National Ignition Facility (NIF) to improve understanding [of] in-tunnel blast."⁴⁴ This is likely related to ongoing work on earth-penetrating nuclear weapons and/or low-yield weapons under Directed Stockpile Work and Threat Reduction Programs.

Joint Test Assemblies (JTAs): JTAs are real warheads minus their nuclear parts and real delivery systems launched through their entire warfighting "Stockpile to Target Sequence." New, high-fidelity JTAs are now being developed for the W76, W80 and W87. JTAs are a major component of the benign-sounding Stockpile Surveillance Program. DOE conducted 43 JTA flight tests in 1999.⁴⁵

Magnetized Target Fusion (MTF): LANL and the Air Force are attempting to super compress deuterium-tritium into a high-density plasma which burns as nuclear fusion, all in a cylinder the size of a beer can. While MTF research is being advertised for future energy production, empirical demonstration would likely have immediate and profound weapons applications. If MTF was ever successful, pure fusion weapons could be possible. The implication is that fission triggers (plutonium pits) would no longer be necessary for initiating fusion in thermonuclear weapons. This, in turn, could lead to "mini-nuke" development. LANL has projected that several billion dollars of research will be spent on MTF.⁴⁶

Accelerated Strategic Computing Initiative: "The objective of this campaign is to develop the capability to transition from nuclear-test-based methods to simulation-based methods for certifying the safety, performance, and reliability of the nuclear weapons in the enduring stockpile."⁴⁷ In December 1999 the first-ever 3-D computer simulation of an imploding plutonium pit was achieved.⁴⁸

Hydrodynamic testing: Hydrodynamic testing has always been the principal experimental tool for nuclear weapons designers. It involves radiography (x-ray pictures) of simulated plutonium/HEU pits (either using non-fissile isotopes and/or below critical masses) imploded by high explosives. The prefix "hydro" is used because plutonium/HEU behave like fluids under the intense pressures and temperatures that are achieved. During the testing moratorium of the early 1960s, an aggressive hydrotesting campaign was conducted at LANL. Today, the lab

is planning to triple the present number of its hydrotests with the completion of the Dual Axis Radiographic Hydrotest Facility (\$280 million). Before DARHT is even finished, the FY02 DOE budget request has added \$15 million for the conceptual design of the Advanced Hydrotest Facility (estimated cost \$2 billion). This facility will be designed to provide 3-D motion pictures of imploding plutonium/HEU pits, a weapons designer's dream come true.

Department of Defense (DoD) Nuclear Weapons Programs: DoD nuclear weapons programs are outside the scope of this paper. As a general note, most of DoD's costs for nuclear weapons are for the various nuclear weapons delivery systems (bombers and land and submarine-based missiles). DoD also conducts weapons effects studies on the survivability of nuclear weapons in the event of nuclear war. DoD costs associated with nuclear weapons are currently estimated to be approximately \$30 billion annually.⁴⁹

The Single Integrated Operational Plan and Nuclear Posture Review: DoD sets what it believes is the necessary nuclear force structure to implement its highly-classified Single Integrated Operational Plan (SIOP), which is the nuclear warfighting plan and target list. DoD then directs DOE to supply the needed nuclear weapons. DOE, in turn, sets the parameters of the nuclear weapons complex that it believes is necessary to support the SIOP. Projected DoD nuclear force structures and DOE capabilities are formalized through Nuclear Posture Reviews (NPRs). Congress has legislated that DoD complete a new NPR before the end of this year.

Some observers believe that the SIOP targeting list is being expanded to meet "new, diverse threats" while still maintaining some 2,000 targets in Russia alone. In the same paper that SNL Director Paul Robinson proposes expanding the "deterrence" into "capability # 1" and "capability #2" he worries that "far too many people (including many in our own armed forces) are beginning to believe that nuclear weapons no longer have value. I regret that we have not yet captured such thinking in our public statements as to why the U.S. will retain nuclear deterrence as a cornerstone of our defense policy, and urge that we do so in the upcoming Nuclear Posture Review."⁵⁰

The SIOP, if ever executed, would obviously be the most fateful decision this country could ever make. Yet Congress has had little formal access to the SIOP. In addition, while it has legislated a new NPR, Congress has historically refrained from undertaking probing review of any Nuclear Posture Review. This may change in the future. There is currently movement in the US Senate to request access to the SIOP and to hold hearings on the new NPR.⁵¹

End Notes:

¹ From *Atomic Audit*, Steve Schwartz editor, The Brookings Institution, 1998.

² DOE FY02 Congressional Budget Request, NNSA, p.36.

³ Mr. Thomas Hunter, Senior VP for Defense Programs, SNL, has publicly stated (paraphrased) that "The Stockpile Life Extension Programs are the tangible work for the NNSA. They represent clarity. They are the heart of what is meaningful." Nuclear Security Decisionmakers Forum, Albuquerque, NM, March 27, 2001.

⁴ FY01 Stockpile Stewardship Plan (AKA the "Green Book"), DOE NNSA. The Green Book was made available through FOIA by the Western states Legal Foundation of Oakland, CA.

⁵ FY01 LANL Institutional Plan, p.32.

⁶ FY01 Green Book, p. II-2, DOE NNSA.

⁷ "Pursuing a New Nuclear Weapons Policy for the 21st Century," SNL Director Paul Robinson, early 2001.

⁸ DOE FY02 Congressional Budget Request, NNSA, p.34.

⁹ DOE FY02 Congressional Budget Request, NNSA, p.45.

¹⁰ DOE FY02 Congressional Budget Request, NNSA, p.12.

¹¹ DOE FY02 Congressional Budget Request, NNSA, pp.34 & 46.

¹² FY01 Green Book, p. 1-11, DOE NNSA.

¹³ "The FY 2002 Department of Energy Budget — A Principled and Responsible Request," p. 43, DOE. Note that in this "responsible" request and during this purported energy crisis, DOE cut national lab research into renewable energies by 36% in favor of "clean

coal and advanced nuclear technologies."

- (p. 4)
- 14 DOE FY02 Congressional Budget Request, NNSA, p. 47.
15 FY01 Green Book, p. 1-6, DOE NNSA.
16 DOE FY02 Congressional Budget Request, NNSA, p. 43.
17 FY01 Green Book, p. 1-6 & 1-10, DOE NNSA.
18 DOE FY02 Congressional Budget Request, NNSA, p. 46.
19 DOE FY02 Congressional Budget Request, NNSA, p. 43.
20 DOE FY02 Congressional Budget Request, NNSA, p. 46.
21 Id.
22 Id.
23 "Agreement on Assignment of W80 Responsibilities," LANL, LLNL, SNL, 1/04/01. This document and the one below was made available through FOIA by Tri-Valley Cares of Livermore, CA.
24 "Overview of the W80," LLNL, August 1999, pp. 2 & 3.
25 FY01 Green Book, p. 1-6, DOE NNSA.
26 DOE FY02 Congressional Budget Request, NNSA, p. 46.
27 DOE FY02 Congressional Budget Request, NNSA, p. 33.
28 FY01 Green Book, p. 1-7, DOE NNSA.
29 DOE FY02 Congressional Budget Request, NNSA, p. 46.
30 DOE FY02 Congressional Budget Request, NNSA, p. 40.
31 DOE FY02 Congressional Budget Request, NNSA, p. 154. Includes \$128.5 million for the Campaign and additional funding for plutonium pit production facilities under "Readiness in Technical Base & Facilities."
32 FY01 Green Book, p. 2-2, DOE NNSA.
33 FY01 Green Book, p. 6-1, DOE NNSA.
34 FY01 Green Book, p. 6-3, DOE NNSA.
35 "Pursuing a New Nuclear Weapons Policy for the 21st Century," SNL Director Paul Robinson, early 2001.
36 "Nuclear Weapons in the 21st Century," Steve Younger, LANL, June 2000.
37 FY00 LANL Institutional Plan, p. 30.
38 Sandia Lab News, January 26, 2001.
39 DOE FY02 Congressional Budget Request, NNSA, p. 41.
40 Id.
41 FY00 LANL Institutional Plan, pp. 49 & 50.
42 DOE FY02 Congressional Budget Request, NNSA, p. 154.
43 Remarks made by General Gordon, NNSA Administrator; John Foster, chair of the Foster Commission; and A. Earl Whiteman, DOE NNSA Albuquerque; Nuclear Security Decisionmakers Forum; Albuquerque, NM; March 27, 2001.
44 "Defense Technology Area Plan," p. XI-14, Department of Defense, February 1999. This document was made available through FOIA by the Western States Legal Foundation of Oakland, CA.
45 FY01 Green Book, p. 4-10, DOE NNSA.
46 "Physics Division Technology Review," LANL (LALP-95-156), no date given.
47 FY00 LANL Institutional Plan, p. 32.
48 DOE FY02 Congressional Budget Request, NNSA, p. 13.
49 From Holding the Line: US Defense Alternatives for the Early 21st Century , Chapter 5, p. 119, David Mosher, JFK School of Government, Harvard University, 2001.
50 "Pursuing a New Nuclear Weapons Policy for the 21st Century," SNL Director Paul Robinson, early 2001.
51 As stated in an April 5, 2001, letter from Senator Jeff Bingaman (D-NM) to the Director of Nuclear Watch of New Mexico.

General nuclear weapons descriptions and yields are from The Secret History of U.S. Nuclear Weapons , Chuck Hansen, Orion Press, 1988.

Acronyms: AF&F = arming, firing and fuzing, DOE = Department of Energy, FOIA = Freedom of Information Act, FY = fiscal year, HEU = highly enriched uranium, LANL = Los Alamos National Laboratory, LLNL = Lawrence Livermore National Laboratory, MIRV = Multiple Independently-targeted Reentry Vehicle (means each warhead can hit different targets), NPR = Nuclear Posture Review, NNSA = National Nuclear Security Administration, SIOP = Single Integrated Operational Plan, SNL = Sandia National Laboratories.

Corrections, additions, suggestions are welcomed. Please write to:
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