

ARTICLES

DOES THE U.S. NEED NEW NUCLEAR WEAPONS?

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For the past decade, the public has treated the danger from nuclear weapons as if it ended with the end of the Cold War. Never mind that the U.S. and Russia each still keep 2000 missile warheads ready to launch at each other within 15 minutes. To the extent that nuclear weapons appear in the news at all, it is via the concern that terrorists might acquire them.

In the meantime, the three U.S. nuclear-weapon laboratories, Los Alamos, Sandia and Livermore, are getting more money for nuclear-weapon R&D than ever. This money is for the “Science-based Stockpile Stewardship Program,” whose purpose is to assure that the nuclear warheads in the U.S. arsenal remain reliable (which means a yield close to the design yield) and that the U.S. retains its ability to design new nuclear warheads.¹ As a substitute for nuclear tests, the weapons labs have demanded costly installations with which to simulate and replicate on a small scale the physical conditions inside a nuclear explosion. These installations include ever-more-powerful supercomputers and the multi-billion dollar National Ignition Facility.²

The leaders of the laboratories have also been agitating for permission to develop new types of nuclear weapons to meet the challenges of the post-Cold War era. During 2000-2001, the senior weapons scientists of Los Alamos and Sandia both issued “white papers” calling for a new family of low-yield precision-guided nuclear weapons to enable the U.S. to make credible threats to attack key facilities in threatening states. The first lab white paper, *Nuclear Weapons in the Twenty-first Century*, was by Stephen M. Younger, who was Los Alamos Associate Laboratory Director for Nuclear Weapons in June 2000 when the paper was published.³ The second, *Pursuing a New Nuclear Weapons Policy for the 21st Century*, was put out in March 2001 by C. Paul Robinson, Director of Sandia National Laboratories. Judging from the recently leaked report of the *Nuclear Posture Review*, the labs seem to have found a sympathetic audience in the leadership of the new Bush Administration’s Department of Defense.

Younger: Reintroduce HEU gun-type designs

Younger argued for a new class of nuclear weapons that would offer both “arms control advantages to the United States, and the possibility that such weapons could be maintained with higher confidence and at lower cost than our current nuclear arsenal.”

This class turns out to be the “gun-type design” that was used in the Hiroshima bomb, which had a yield of about 15 kilotons TNT equivalent. This design involves one subcritical piece of highly-enriched uranium (HEU) being propelled into another to make a supercritical

¹ The Bush Administration budget request for stockpile stewardship in fiscal year 2003 is \$4.6 billion.

² Most of the money is, in fact, dedicated to maintaining U.S. nuclear-weapon design capabilities in the absence of testing. Robert Civiak, a physicist who was, during 1988-99, the official in the Office of Management and Budget responsible for reviewing the Department of Energy’s nuclear-weapons budget, outlines different possible approaches to stockpile stewardship in *Managing the U.S. Nuclear Weapons Stockpile: A Comparison of 5 Strategies* (Tri-Valley CAREs, July 2000, www.trivalleycares.org/reports.asp). A group of physicists at the Natural Resources Defense Council has produced a series of studies critiquing the stockpile stewardship program and the National Ignition Facility <http://www.nrdc.org/nuclear/nif/nifinx.asp>.

³ Younger was subsequently appointed Director of the DoD’s Defense Threat Reduction Agency.

mass. Its arms-control advantage is that it “might be maintained with high confidence without nuclear testing.” And its cost savings would stem from the fact that HEU is less costly and contaminating to process than plutonium. Younger added, however, that “some very hard targets require high yield to destroy them” and that high-yield weapons with yields of hundreds of kilotons or more would also have to be preserved for “traditional deterrent roles,” i.e. the ultimate threat to destroy a country’s cities. For such purposes, he indicated, it would be necessary to retain nuclear weapons of current designs. These designs have fusion “boosted” plutonium “pits,” which are imploded to achieve supercriticality. The energy of the resulting explosion then ignites thermonuclear reactions in the warhead’s “secondary.”

Unfortunately, would-be nuclear terrorists are also likely to recognize the simplicity of gun-type designs using HEU. To minimize the likelihood of nuclear terrorism, therefore, the number of locations in the world where HEU can be found should be greatly reduced.⁴

Robinson: More uses for nuclear deterrence

Robinson explained that he felt compelled to write his “white paper” because

“I recently began to worry that...far too many people...were beginning to believe that perhaps nuclear weapons no longer had value. It seemed to me that it was time for someone to step forward and articulate the other side of these issues for the public: first, that nuclear weapons remain of vital importance to the security of the U.S. and to our allies and friends...and second, that nuclear weapons will likely have an enduring role in preserving the peace and preventing world wars for the foreseeable future.”

Robinson then went on to urge that the U.S. maximize the leverage of its nuclear capabilities for “detering wider acts of aggression from any corner of the world, including deterring the use of nuclear, chemical or biological weapons.”

Robinson acknowledged that, as an inducement to non-nuclear-weapon states to remain non-nuclear, the U.S. has repeatedly committed that it will not use nuclear weapons against them unless they attack the U.S., its allies or its military forces in alliance with a nuclear-weapon state. However, he argued that “those who would advocate that we should not be allowed to consider deterring chemical or biological attacks with our nuclear arsenal must first show how such attacks might be deterred by other means.”

The Nuclear Posture Review orders up a new nuclear bunker buster

The Department of Defense – perhaps in response to such urgings from the weapons labs -- officially reopened the issue of new nuclear weapons in the December, 2001 report produced by its Nuclear Posture Review (NPR). The report called for the development of an improved earth-penetrating nuclear warhead to make it possible to attack deeply buried bunkers which might shelter infrastructure related to Weapons of Mass Destruction [WMD]:⁵

⁴ Frank von Hippel, “Recommendations for preventing nuclear terrorism,” *Federation of American Scientists Public Interest Report*, www.fas.org/faspir/archive.htm.

⁵ *Nuclear Posture Review*, classified report submitted to Congress, December 31, 2001, leaked excerpts available on www.globalsecurity.org.

"More than 70 countries now use underground facilities...for military purposes. In June 1998...approximately 1,100 UGFS were known or suspected strategic (WMD, ballistic missile basing, leadership or top echelon command and control) sites. Updated estimates from DIA [Defense Intelligence Agency] reveal this number has now grown to over 1,400...current conventional weapons are not effective for the long term physical destruction of deep, underground facilities...

"With a more effective earth penetrator, many buried targets could be attacked using a weapon with a much lower yield than would be required with a surface burst weapon. This lower yield would achieve the same damage while producing less fallout (by a factor of ten to twenty) than would the much larger yield surface burst. For defeat of very deep or larger underground facilities, penetrating weapons with large yields would be needed to collapse the facility..."

When are nuclear weapons useable?

The proposed new nuclear bunker buster has raised again the perennial question of whether nuclear weapons are useable except as a last resort to deter threats to the existence of the U.S. If not, what do we need new types of nuclear weapons for?

The U.S. has made nuclear threats in the past in connection with confrontations that did not threaten the existence of the nation. During the Korean War, both Presidents Truman and Eisenhower threatened to use nuclear weapons in an effort to force an armistice on China and North Korea. President Eisenhower later threatened to use nuclear weapons to stop Chinese artillery bombardment of the Taiwan-controlled offshore islands of Quemoy and Matsu. President Nixon similarly made barely veiled nuclear threats in his effort to obtain a face-saving end to the Vietnamese War. In the end, all three presidents realized, however, that the domestic and international political costs of breaking the nuclear taboo that had built up since 1945 vastly outweighed the military benefits from nuclear-weapon use.⁶

The view that nuclear weapons are not useable in ordinary warfare is shared by the general public, which believes that we have nuclear weapons only to deter the use of nuclear weapons by others against us.

The U.S. nuclear-weapons establishment argues, however, that nuclear weapons should be available as well not only to deter but also to preempt attacks with other so-called weapons of mass destruction, such as chemical or biological weapons. Indeed, a deep bunker filled with containers of chemical or biological agent has become the poster child used to justify the development of a better nuclear bunker buster.

The potential consequences of a chemical-weapon attack – although horrible – would not be in the same class as nuclear weapons. The worst-case toll from a biological weapons attack could potentially be comparable to that from a nuclear attack.⁷ But such an attack, if not by a terrorist group, would likely be from a country that the U.S. could easily defeat and occupy with conventional forces. And, if the U.S. can seize the area over a WMD bunker, it does not need a nuclear weapon to destroy it.

⁶ See the relevant sections of McGeorge Bundy, *Danger and Survival: Choices about the bomb in the first fifty years* (Random House, 1988).

⁷ *Proliferation of weapons of mass destruction: Assessing the risks* (Congressional Office of Technology Assessment, 1993, www.princeton.edu/~ota) pp. 53-54.

Thus the Pentagon's proposal for a new nuclear bunker buster has raised again the issue of the usability of nuclear weapons for more than deterring nuclear attack. In May, the Senate Armed Services Committee voted 13 to 12 not to provide the \$15.5 million requested for the development of a new nuclear earth penetrator. This was just the first round of what is likely to be a sustained debate.

Resumed nuclear testing?

A closely related front in this new debate is likely to be over nuclear testing. The NPR report warned that:

"The United States has not conducted nuclear tests since 1992 and supports the continued observance of the testing moratorium. While the United States is making every effort to maintain the stockpile without additional nuclear testing, this may not be possible for the indefinite future. Some problems in the stockpile due to aging and manufacturing defects have already been identified. Increasingly, objective judgments about capability in a non-testing environment will become far more difficult. Each year the DoD and DOE will reassess the need to resume nuclear testing and will make recommendations to the President. Nuclear nations have a responsibility to assure the safety and reliability of their own nuclear weapons."

In addition, the NPR states that the need for new nuclear warheads may require testing the new designs:

"To further assess ... nuclear weapons options in connection with meeting new or emerging military requirements, the NNSA [the National Nuclear Security Administration, which has responsibility for nuclear-weapons within the Department of Energy] will reestablish advanced warhead concepts teams at each of the national laboratories and at headquarters in Washington...DoD and NNSA will also jointly review potential programs to provide nuclear capabilities, and identify opportunities for further study, including assessments of whether nuclear testing would be required to field such warheads."

Here -- as throughout the NPR report -- its authors seem oblivious of the potential reactions of other countries to the proposed policy. Among the threatening messages that are conveyed by a nuclear-testing program are that "the nuclear weapons we have work and we are developing new more useable varieties." Such a message could only encourage other countries also to think of nuclear weapons as useable. That is certainly not in the interest of the United States.

Activist physicists needed

In the likely forthcoming national debates over new nuclear weapons and renewed nuclear testing, concerned physicists must once again become active and help educate the public about the continuing nuclear danger and about measures that could reduce it.

It has been almost two decades since we have had a national debate over nuclear weapons and most members of the general public have either never learned or forgotten the basics. There are also opportunities to use your physics in new ways. A recent analysis by a young astrophysicist, for example, showed that it is physically impossible for a kinetic earth penetrator to reach depths great enough to contain the radioactivity from a weapon with a yield as low as 0.1 kilotons.⁸ This analysis was heavily cited in the recent Congressional debate over funding for the development of a new nuclear bunker buster.

George Kistiakowski, who developed the implosion system for the first plutonium bombs and later became President Eisenhower's science advisor, ended up believing that the most effective way to change weapons policy was from the outside. Just before he died in 1982, he made the following statement in the *Bulletin of Atomic Scientists*:

“As one who has tried to change these trends, working both through official channels and for the last dozen years from the outside, I tell you as my parting words: Forget the channels...Concentrate instead on organizing...”

My own experiences as an insider and outsider have led me to the same conclusion.

The debate will have to be driven by activists of all types – not just physicists. Without activists of all types bringing the issues to the attention of the media and the politicians, there won't be an audience for the physicists. But without the physicists joining in to lend their credibility, the other activists are likely to have little impact in affecting policy. As the anti-nuclear activists used to say: “Better active now than radioactive later.”

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⁸ Robert Nelson, “Low Yield Earth Penetrating Nuclear Weapons,” *Federation of American Scientists Public Interest Report*, January/February 2001, p.1, www.fas.org/faspir/archive.htm; and *Science & Global Security* (forthcoming).