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Looking for New Ways to Use Nuclear Weapons: U.S. Counterproliferation Programs, Weapons Effects Research, and "Mini-Nuke" Development

Despite claims by the United States government that it is de-emphasizing its nuclear arsenal, research continues in government research laboratories to make nuclear weapons more useable. This research mainly is aimed at exploring ways to use small nuclear warheads to destroy or disable hardened targets such as tunnels and underground bunkers, and to attack facilities where chemical or biological weapons are made, stored, or deployed in ways which will destroy chemical or biological agents rather than dispersing them. Research of this kind threatens to blur the distinction between conventional and nuclear warfare by lowering the political obstacles to the use of nuclear weapons. It makes it more likely that nuclear weapons will be used against states that do not possess nuclear weapons, for example where U.S. forces are fighting in a regional war and military and political decision makers believe those troops are threatened by chemical or biological warfare.

The refinement of nuclear weapons and the techniques of nuclear warfare to counter biological and chemical weapons by the state with the world's most powerful military and provides arguments for those who wish either to keep or obtain a nuclear arsenal that nuclear weapons are both useful and legitimate. As the National Academy of Sciences Committee on International Security and Arms Control recognized,

> A policy of nuclear deterrence of CBW [Chemical and Biological Weapons] would provide incentives and an easy justification for nuclear proliferation, which is inimical to U.S. security. Many other countries face far more plausible and immediate CBW threats than the United States. If U.S. policy points to nuclear weapons as the ultimate answer to CBW, other states could have an increased motivation to acquire nuclear arsenals. Highlighting new or continuing missions for nuclear forces could damage the nuclear nonproliferation consensus throughout the world.[1]

The Post-Cold War Search for New Nuclear Missions

Soon after the fall of the Berlin Wall, nuclear weapons strategists began looking for other uses for their weapons and their skills, seeking to justify a continuing need for nuclear weapons by painting a picture of a world still full of dangerous adversaries. By 1990, the Joint Chiefs of Staff was invoking "increasingly dangerous Third World threats" in its Military Net Assessment, as a rationale for retaining both strategic and non-strategic nuclear weapons.[2]

The use of nuclear weapons to threaten nations suspected of possessing weapons of mass destruction [WMD], including non-nuclear weapons states, became policy both in word and in deed during the 1990's. By the mid-nineties, use of nuclear weapons against a broad range of potential WMD targets was being discussed in detail in the nuclear weapons doctrine documents of the U.S. military services. The Joint Chiefs of Staff *Doctrine for Joint Theater Nuclear Operations* stated that

> As nations continue to develop and obtain WMD and viable delivery systems, the potential for US operations in such a lethal environment increases. In addition to

> proliferation of WMD among rogue states, proliferation may also expand to include non-state actors as well.... [3]
>
> Enemy combat forces and facilities that may be likely targets for nuclear strikes include WMD and their delivery systems, ground combat units, air defense facilities, naval installations, combat vessels, nonstate actors, and underground facilities.[4]

And as the post-Cold War era took shape without any substantial national debate over the role of nuclear weapons in U.S. policy, nuclear weapons doctrine continued to drift towards broader definitions of the threats which must be deterred, and of the types of actions which "deterrence" might encompass:

> While there will certainly be long-term effects from the use of a nuclear device against any target, counterforce strategy focuses on the more immediate operational effect. *Nuclear weapons might be used to destroy enemy WMD before they can be used,* or they may be used against enemy conventional forces if other means to stop them have proven ineffective. This can reduce the threat to the United States and its forces and could, through the destruction of enemy forces, bring an end to the conflict.[5]

The United States has made assurances to non-nuclear weapons states which are parties to the Nuclear Non-Proliferation Treaty and to regional nuclear free zones that nuclear weapons would be used only against nuclear weapons states or states acting in alliances with them.[6] Nonetheless, nations without nuclear weapons apparently also are considered legitimate targets for nuclear attack where chemical and biological weaponry is concerned. Concerning the 1997 Presidential Decision Directive-60 on nuclear weapons policy, The Washington Post reported that according to special assistant to the President Robert Bell,

> Clinton's nuclear targeting directive reflects 'much greater sensitivity to the threats' posed by chemical and biological attacks since the previous directive was issued. But he added that it only reiterates what senior administration officials already have said about the issue during the past year - namely, that if any nation uses weapons of mass destruction against the United States, it may 'forfeit' its protection from U.S. nuclear attack under the 1995 pledge [reaffirming negative security assurances].

Bell, however, later explicitly rejected any possibility of pre-emptive nuclear weapons use against WMD stockpiles, stating that

> We have no plans, no planning, no intention, no policy of using nuclear weapons preemptively to go after, take out, whatever you want to call it, WMD [weapons of mass destruction] storage or production facilities.... We have every conventional option we need to deal with our ability to target facilities that store or produce weapons of mass destruction. And that is distinct, then, from the use of such weapons by an adversary in a conflict where our negative security assurance policy stands.[7]

Yet Bell's later pronouncement came against the background both of the calculated ambiguity of the public face of U.S. nuclear weapons use doctrine and the recent history of U.S. threats to use nuclear weapons. It is generally acknowledged that the United States threatened to use nuclear weapons against Iraq in the 1990-91 Gulf War.[8] The U.S. made ambiguous threats to use nuclear weapons against Iraq again in early 1998, in response to allegations by UNSCOM Chief Inspector Richard Butler that Iraq possessed biological weapons.[9] Defense department officials also raised the possibility of nuclear weapons use against an alleged Libyan underground chemical weapons plant in 1996. In this instance, as in the 1998 brandishing of nuclear weapons against Iraq, defense department officials referred to a nuclear warhead with a new earth penetrating capacity as a possible weapon for use against alleged WMD

facilities.[10] The weapon referred to is the B61-11, a gravity bomb modified to add increased earth penetrating capability, the first significant upgrading of a nuclear weapon achieved without underground testing using the Department of Energy's (DOE) laboratory test and simulation facilities (discussed further below).[11]

Although both the 1996 and 1998 threats against Libya and Iraq were later disavowed (or, in modern spin-speak, 'clarified'), in essence the damage had been done, and arguably the pattern of threat and retraction is itself a tactic, part of the intentional ambiguity of U.S. nuclear weapons policy.[12] And it remains clear that threat or use of nuclear weapons against the chemical, biological, and even conventional forces of regional adversaries is official U.S. policy:

> Deterring aggression and coercion on a day–to–day basis requires the capabilities needed to respond to the full range of crises, from smaller–scale contingencies to major theater wars. It also requires the maintenance of nuclear forces sufficient to deter any potential adversary from using or threatening to use nuclear, chemical, or biological (NBC) weapons against the United States or its allies, and as a hedge against defeat of U.S. conventional forces in defense of vital interests....[13]

Just Don't Call them New Weapons: Nuclear Weapons Test Techniques and Warhead Redesign for New Military Capabilities.

The pattern of U.S. nuclear weapons research and development during the nineties mirrored the ambiguity of declared nuclear weapons policy--although for somewhat different reasons. Many in Congress and the Administration felt some discomfort with continued nuclear weapons development despite the lack of visible threats, and about the inconsistency between vigorous nuclear weapons programs and U.S. public commitments to complete a Comprehensive Test Ban Treaty and to move forward towards elimination of nuclear arsenals as required by Article VI of the Nuclear Non-Proliferation Treaty.[14] The result was a publicly declared policy of no "new" design nuclear weapons production[15] and a Congressional restriction on low-yield nuclear weapons development.[16] But throughout the decade, a major focus of research across the Department of Energy and Department of Defense laboratories was the effort to make nuclear weapons more useable, an effort which continues to this day. This research proceeds along two distinct but related lines: modification of existing nuclear warheads for lower yields and effects tailored to reduce "collateral damage," and research on the effects of nuclear weapons when used or delivered in innovative ways.

Smaller Bombs for Smaller "Threats"

The effort to use nuclear weapons to target regional adversaries and facilities where weapons of mass destruction might be made, stored, and deployed received new impetus after the Gulf War. The U.S. military found in that conflict that it wanted new weapons to attack certain difficult to destroy targets, especially deeply buried, hardened facilities and chemical and biological weapons, which pose a danger if dispersed rather than destroyed. Along with these new missions came a push for new technology, for it was evident that the massive city and silo-busting nuclear warheads which predominated in the long-range nuclear arsenal were unuseable in the regional expeditionary warfare considered likely by the U.S. military in coming decades:

> ...[T]he Gulf War focused attention on the need to attack very specific Third World sites (bunkers, nuclear laboratories) with massive but geographically confined force.
>
> The technology is now in hand to develop power projection weapons and very low yield nuclear weapons in earth penetrators with precision guidance to meet this need.
>
> All of these technologies merit immediate attention.[17]

A Navy strategic planning document from the same period emphasized the political obstacles to using existing nuclear warheads against many types of targets, and reiterated the call for smaller warheads and delivery methods with tailored effects:

> Nuclear warhead options are attractive against hard targets (e.g., hardened underground bunkers and storage sites) and area targets (e.g., airfields, troops/armored vehicles). While existing nuclear warhead technology is generally sufficient to fulfill these missions, advanced technology concepts are designed to minimize the political and economic factors associated with the maintenance and deployment of nuclear weapons. *The most appealing concepts focus on nuclear weapons with very small yields and with design and delivery techniques that minimize fallout, residual radiation, and collateral damage.*[18]

The Department of Energy nuclear weapons laboratories set to work on nuclear weapons designs to meet these needs. The labs researched a wide range of new or modified warhead designs in the early 1990's, including a Precision Low-Yield weapon, a radio-frequency weapon intended to disrupt or destroy electronic equipment, and various replacements for cruise missile warheads and for gravity bombs, several of the latter concepts being based on the B61, a versatile design with several variants already in the arsenal.[19] But in the FY 1994 Defense Authorization Act, Congress passed legislation placing what appeared to be sharp limits on further "mini-nuke" development, banning research "which could lead to the production by the United States of a low-yield nuclear weapon [of less than five kilotons yield], which, as of the date of the enactment of this Act, has not entered production."[20] This legislation, however, included exceptions for modifying existing warheads to meet "safety or reliability" or "proliferation" concerns.

Research aimed at developing more useable nuclear weapons continued, however, sometimes carefully skirting the edges of the "no new weapons" policy and the limits on mini-nuke development, sometimes contradicting them in all but name. In late 1996, the military began deployment of the B61-11, an earth penetrator bomb with a variable yield. The minimum yield is estimated by some analysts at 5-10 kilotons and by others to be as low as .3 kilotons.[21] The laboratories and the military claimed that the B61-11 was not a "new" weapon, because it was a modification of an existing design, and billed it as a "safety" improvement, intended take the role in the arsenal of the B53, a mammoth nine megaton bomb with fewer modern safety features.[22] But at the same time, the military enthusiastically promoted the new capabilities provided by the B61-11:

> Operational considerations clearly favor the B61-11 over the B53. Due to its size and weight, the B53 could only be delivered by the B52 bomber. The B61-11 is compatible with both the F-16 and B-2 [stealth bomber]. The B61-11 produces far less collateral damage and has the same effectiveness against deeply buried targets as the B53 with less than one twentieth the yield. Implementation of the program was performed in a remarkably short time -- only 16 months from initial verbal authorization to delivery of the first retrofit kits. Four complete B61-11 retrofit kits were delivered to the Air Force in November 1996, two weeks ahead of schedule. The military personnel and laboratory representatives who comprise the B61-11 Project Officers Group should be justifiably proud of their accomplishments. They have not only made the stockpile safer, they have also skillfully and effectively met a difficult military requirement. *The B61-11 is an outstanding example of using an existing weapon in a new way to hold at risk robustly defended, deeply buried targets."*[23]

The B61-11, was not enough for some in the weapons establishment. Shortly after its deployment, a little-noticed National Research Council report on future weapons for the Navy and Marines reiterated the need for weapons

capable of destroying or disabling deeply buried targets with minimum "collateral damage." Concerned that "programs to bury and harden many important military targets " might "make U.S. Navy force projection doctrines more difficult to pursue," the panel recommended studying a variety of high-tech conventional and nuclear options for hard target defeat.[24] The panel noted that

> The United States does have a penetrating weapon designated the B61 Mod 11. This weapon was intended as an interim design and, at the time of design freeze, did not incorporate all of the attributes that might be considered desirable to support the concept of operations considered here. Future nuclear penetrating weapons can be designed (as modest modifications of nuclear devices developed in the past) that may be able to penetrate to depths that avoid venting and fallout.[25]

The panel noted that "an already developed and tested nuclear artillery shell could be packaged into a penetrating munition," without a nuclear test, but still requiring component testing to assure that it would function "after earth penetration." According to the panel, "The technology for more optimum designs requiring smaller quantities of fissile material is also known but would probably require nuclear testing."[26]

The Weapons Panel dutifully noted the "the many political and operational problems associated with producing and using a new nuclear weapon," and recommended a broad program of research comparing various penetrating weapons and their effects, including conventional explosive earth penetrators, ballistic missile delivered kinetic kill devices, and low-yield nuclear warhead penetrators.[27]

Throughout the 1990's, efforts to make nuclear weapons more useable continued, but it became more difficult for the public to determine the extent of actual nuclear weapons design or modification these programs entailed. Studies for the Precision Low-Yield Warhead, a "low collateral damage weapon," and the High Power Radio Frequency Weapon officially were completed in fiscal years 1994 and 1995.[28] But at the same time, new efforts were getting underway to target tunnels and buried structures as well as nuclear, chemical, and biological weapons facilities. The Hard and Deeply Buried Target Defeat program and the Agent Defeat Weapon program (seeking ways to destroy chemical and biological weapons facilities without catastrophic releases of chemical or biological agents) are broad initiatives exploring a variety of technologies, but both are looking at nuclear weapons effects as one means to meet the "mission need." [29]

It is unclear exactly, how much actual nuclear weapons design work has been conducted in the past few years in support of these programs. DOE weapons laboratories have continued to do "concept studies" which they claim do not violate the restrictions on low-yield nuclear weapons design:

> There is a legislative ban on the design and development, leading to the production, of low-yield nuclear weapons. These concept studies are not in violation of this ban. Two studies currently under way are the Air Force Agent Defeat Study and the Hard and Deeply Buried Target Defeat Study.
>
> The Agent Defeat Study is to identify weapon concepts that could interdict chemical and biological threats. The DOE is providing generic nuclear and advanced conventional concepts for use in effectiveness analysis and are investigating lethality and collateral damage issues. No design work on new nuclear weapon concepts is being conducted under this study.[30]

The restrictions on low-yield nuclear weapons development, however, have come under attack over the last two years. In the course of the debate over the unsuccessful ratification of the Comprehensive Test Ban Treaty, Treaty opponents argued that it would place limits on the development of new or modified nuclear weapons

which they thought necessary for missile defense, attacks on hard and deeply buried targets, and destruction of chemical and biological weapons facilities.[31] Sandia National Laboratories Director C. Paul Robinson joined the chorus, arguing that new nuclear weapons designs were likely to be necessary in the future, expressing doubt about the ability of the U.S. nuclear weapons laboratories to meet requirements for new nuclear weapons capabilities without testing, and implying that even under a CTBT regime, the U.S. should test a new nuclear weapons design when one is 'needed:'

> Although I believe all of us would wish that the U.S. will never need new nuclear weapon designs; based on the past, this is quite unlikely. The U.S. will undoubtedly require a new nuclear weapon, either for a different delivery mode or vehicle or, quite likely, because it is realized that the yields of the weapons left over from the Cold War are too high for addressing the deterrence requirements of a multipolar, widely proliferated world. Without rectifying that situation, we would end up being self-deterred.
>
> Will the U.S. then consider the need for a new nuclear weapon to equate with our Supreme National Interest, as President Clinton has said he would do for a problem in reliability or safety of a critical weapon in the current stockpile?[32]

In the spring of 2000, nuclear weapons advocates in the Senate added a provision to the Defense Authorization Bill aimed at loosening the restrictions on low-yield nuclear weapons research. According to an unnamed "former senior Pentagon official who is still involved in government military and intelligence research" quoted in the *Washington Post* report on the provision's introduction in the Senate, the aim of the study would be to develop "'a deep penetrator that could hold at risk a rogue state's deeply buried weapons or Saddam Hussein's bunker without torching Baghdad.'"[33]

The version eventually passed requires the Energy and Defense departments to "conduct a study relating to the defeat of hardened and deeply buried targets." As part of this study, DOE and DoD are authorized to "conduct any limited research and development that may be necessary" to "assess both current and future options to defeat hardened and deeply buried targets as well as concepts to defeat stockpiles of chemical and biological agents and related capabilities."[34]

How much additional low-yield nuclear weapons research this provision will make possible remains unclear. The study is limited to one year, and there were no additional funds specifically allocated for it (although the nuclear weapons laboratories most likely have sufficient funding in their budgets for the early stages of development, and in the recent past have initiated a weapons development project, a B61 "glider bomb" variant, without either a request from the military or earmarked funding).[35] But the Conference Report also indicated that the study should help the Defense Department make an "informed decision" whether to "seek any necessary modifications to existing law," presumably inviting a request to rescind what remains of the restrictions on low-yield nuclear weapons research if the Department of Defense deems it desirable.[36]

It is important to remember in this context, however, that new military characteristics can be acquired by modifying existing designs, although certain types of nuclear weapons effects may be difficult to achieve without nuclear explosive testing.[37]

Nuclear Weapons Effects Testing: More Uses for More Useable Nuclear Weapons

Although the status of current low-yield nuclear design efforts remains obscure, what is evident is that the United States is pursuing a broad program of research, including both physical experiments and simulation, exploring ways to use nuclear weapons, including low-yield warheads. The 1999 *Defense Technology Area Plan* identified

as a priority the ability "to provide national leaders with improved options by increasing the responsiveness of strategic forces and developing more discriminate options, as done most recently with the introduction of the B61–11 earth-penetrating weapons."[38] To this end, Pentagon planners are looking to increase their understanding of how nuclear weapons work so that the United States can use them more easily against more types of targets:

> Technical challenges are presented by the rapidly developing need to hold evolving enemy targets at risk using the reduced stockpile, and recognizing greatly increasing political and environmental constraints. As a result, we must improve our understanding of weapons outputs and target interactions without underground testing, using only calculations and the ASCI [Accelerated Strategic Computing Initiative] capabilities of DOE laboratories, and apply this understanding to update effects calculational capabilities and develop innovative targeting techniques to defeat increasingly clever enemies—both national and terrorist.[39]

To accomplish this, weapons lab researchers are to develop "improvements in the warfighters ability to hold at risk very hard targets with greatly reduced collateral damage. *Significant new techniques for nuclear weapons effects analysis for exploitation will lead to increased confidence in the lethality of new and existing military systems.*"[40]

Ongoing and planned weapons effects experiments and simulations reflect the same priorities which impelled the early 1990's precision low–yield nuclear weapons programs: ways to attack hard and buried targets, destruction of chemical and biological warfare facilities and materials, and disruption of electronic equipment via nuclear weapons electromagnetic pulse effects.

Although there has been no public indication that nuclear weapons have been chosen as one of the alternatives for further weapons development under the Agent Defeat Weapon program, nuclear weapons are being studied closely as a means of destroying chemical and biological weapons.[41] A Lawrence Livermore National Laboratory study clearly set forth the rationale for this approach:

> Large underground storage bunkers containing many barrels filled with chemical or biological agent are difficult to destroy with conventional high explosive warheads. For this reason the use of earth-penetrating low-yield nuclear weapons is sometimes considered. Such a weapon produces thermal and prompt radiation effects within the bunker, all of which can be expected to have significant degradation effects on the stored agent.[42]

Work continues on the modeling of nuclear weapons effects and attack techniques against weapons of mass destruction facilities, including use of nuclear electromagnetic pulse.[43] The DOE nuclear weapons laboratories also did some research on the effectiveness of low-yield nuclear warheads for ballistic missile interceptors in the early and mid-1990's.[44] It is unclear whether this research was discontinued, or merely has disappeared from public view. A 1995 document detailing potential weapons effects testing experiments using the National Ignition Facility (NIF), an enormous, multi-billion dollar laser driven inertial confinement fusion device under construction at the Lawrence Livermore National Laboratory, included nuclear interceptor research as one possible application when it is completed:

> The U.S. and its allies face a growing threat of ballistic missiles capable of carrying biological/chemical agents or contact/salvage-fuzed nuclear warheads. The limited effectiveness of the interceptors being developed by the U.S. against this threat, using fragments or hit-to-kill vehicles, can be expected to generate increased interest in evaluating the lethality of a low-yield nuclear interceptor option against this threat. NIF provides large fluences of both fusion and fission neutrons with the very short pulse widths characteristic of low-yield nuclear

STOCKPILE STEWARDSHIP: Nuclear Weapons Research and Production for the 21st Century

Despite the end of the Cold War and its obligation under the Nuclear Non-Proliferation Treaty (NPT) to negotiate in good faith to end the arms race and eliminate nuclear weapons, the U.S. has stated that "[n]ational security policies in the post-Cold War era require that all historical capabilities of the weapons laboratories, industrial plants, and NTS [the Nevada Test Site] be maintained," and that "denuclearisation... is not feasible based on current national security policy." Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management, United States Department of Energy, September 1996, p. S-3, S-48. To sustain this vast complex of nuclear weapons facilities, the U.S. is spending over $5 billion dollars a year on the "Stockpile Stewardship" program, including billions on new and more advanced nuclear weapons research and production facilities.

These include:

- The National Ignition Facility (NIF), now being built at the Livermore National Laboratory in California. The NIF is a laser driven fusion machine the size of a football stadium, designed to create very brief, contained thermonuclear explosions. It is slated to be used for a wide range of applications from training weapons designers in nuclear weapons science to nuclear weapons effects testing.

- The Dual Axis Radiographic Hydrotest Facility (DARHT). This facility, near completion at the Los Alamos National Laboratory in New Mexico, will join several already existing facilities where mockups of primaries, the first stage of a thermonuclear weapon, are imploded while very fast photographic or x-ray images are generated, thus allowing scientists to "see" inside. DOE already is developing technology for an even more sophisticated "hydrodynamic testing" facility, the Advanced Hydrotest Facility.

- Pulsed power technologies: Further experiments exploring the extreme conditions created in a nuclear weapon explosion are studied using various types of "pulsed power," in which a large amount of energy is stored up and then released very quickly in a small space. The energy source can be chemical high explosives or stored electrical energy. Pulsed power facilities at both Department of Energy and Department of Defense laboratories are used to explore nuclear weapons function and effects and directed energy weapons concepts, and could lead over the long run to a wide range of high technology weapons, including new types of nuclear weapons.

The data streams from these and other experimental facilities, along with that from "subcritical" tests which implode nuclear materials but have no measurable nuclear yield and the archived data from over 1000 past U.S. nuclear tests, will be integrated via the Accelerated Strategic Computing Initiative (ASCI). This multi-billion dollar supercomputing program reaches beyond the weapons laboratories, seeking to incorporate the nation's leading universities into an effort to attract and train yet another generation of nuclear weapons designers. Finally, smaller, modernized nuclear weapons production processes are being developed to allow flexible, small lot manufacturing, with contingency plans for resumption of large-scale production.

Some of the efforts to refine techniques for nuclear warfare will use Stockpile Stewardship facilities. The B61-11 nuclear earth penetrator bomb was a warhead modification deployed without underground testing, using stockpile stewardship capabilities. And a goal listed in the Defense Technology Area Plan is to "conduct laser/fireball test in National Ignition Facility (NIF) to improve understanding in-tunnel airblast." U.S. Department of Defense, Deputy Under Secretary of Defense (Science and Technology), 2000, *Defense Technology Area Plan*, Table XI-5, at p.XI-14.

For a more detailed overview of the Stockpile Stewardship Program, see *Faustian Bargain 2000: Why Stockpile Stewardship is Fundamentally Incompatible with the Process of Nuclear Disarmament*, Western States Legal Foundation 2000, available at http://www.wslfweb.org/doclib.htm

> intercepts, that can be used to establish lethal criteria for chemical/biological agents and nuclear warhead targets.[45]

Studies on nuclear weapons use against tunnels and other hard and buried targets also continue. One Department of Defense research goal for 2001 is to "Demonstrate the effectiveness of nuclear weapons capabilities in defeating deep structures using precise, low-yield attacks by HE [high explosive] simulation."[46] Work also is proceeding to incorporate what is being learned about nuclear weapons effects on hard targets and on weapons of mass destruction materials and facilities into the computerized "Munitions Effects Assessment" system used by the military for weapons targeting and damage assessment. The Defense Threat Reduction Agency (DTRA) listed among its FY1998 research accomplishments

> Developed prototype Integrated Munitions Effects Assessment-(Nuclear) (IMEA-N) model to allow collateral consequence assessment of targeting weapons of mass destruction (WMD) materials.[47]

FY 1999 plans called for extending the "IMEA nuclear weapons module to include ground shock kill of ultra-hard targets."[48] And a FY2000 DTRA notice requested proposals to develop methods for assessing the "weapons penetrability" of various geological materials by remote means, specifying that the "[p]roposer should include compatibility of exploitation system with the DTRA IMEA-N (Integrated Munitions Effectiveness Assessment — Nuclear) targeting and damage assessment system in the design."[49]

More Useable Nuclear Weapons: a Small Part of a Bigger Arms Race to Come?

In his report to President Clinton on the Comprehensive Test Ban and the path to its ratification, retired chairman of the Joint Chiefs of Staff General John Shalikashvili implicitly warned against the push to expand the role of nuclear weapons and to make them more useable:

> It would not be in our security interest to assign a high profile role to nuclear weapons in the U.S. military posture. Better that they remain in the background, for if the world's strongest conventional power needed new types of nuclear weapons, other nations would have even more incentive to acquire them. Any activities that erode the firebreak between nuclear and conventional weapons or that encourage the use of nuclear weapons for purposes that are not strategic and deterrent in nature would undermine the advantage that we derive from overwhelming conventional superiority.[50]

Despite its apparent caution towards further refinement of nuclear arsenals and the expansion of their role in warfare, this passage is a troubling manifestation of just how narrow the spectrum of discussion on matters of war and peace has become in the United States. The general is not disputing the fundamental premise, that the United States should seek to dominate the planet through force of arms. He is merely debating the least risky way to accomplish it.

Pentagon planning documents today endlessly reiterate the need to seek "full spectrum dominance," the ability to place overwhelming military force anywhere on the planet in short order.[51] The concepts for use of low-yield nuclear weapons now being researched are not intended to work in isolation. They are part of a broad set of initiatives intended to assure that the U.S. can continue to deploy expeditionary forces anywhere in the world and defend them once they are there. The new technologies sought for destroying hard targets and WMD facilities are expected to work together with a multi-tier theater missile defense system, with long-range, stealthy, accurate and powerful stand-off weapons destroying most missiles on the ground, boost phase missile defense targeting missiles soon after launch, with the difficult problem of "hitting a bullet with a bullet" reduced to the destruction of those incoming missiles which survive.[52] An indication of the prevailing attitude within the U.S. military establishment can be found in the words of one high-ranking Air Force official, promoting the

Airborne Laser (ABL), a component of the theater missile defense scheme:

> It would not be smart to ever let our airmen enter a fair fight -- the ABL is another step toward ensuring we have an unfair advantage over our enemies."[53]

Consider what the consequences would be if a great many countries took the position guiding U.S. military technology development: that the United States has both the need and the right to deploy military forces capable not only of having an "unfair advantage" in protecting its own national territory, but in taking military action virtually anywhere in the world.[54] This kind of thinking is the recipe for a renewed arms race in the 21st century.

We are seeing signs of this already. Objections to U.S. ballistic missile defense plans by Russia and China are well known, but the debate over missile defense also must be placed in the broader context of U.S. hi-tech weapons development. The growing range, power, stealth, and accuracy of conventional weapons makes them an increasing factor in the strategic calculations of the nuclear weapons states, particularly as these types of weapons become more capable of destroying or disabling targets such as components of air defense and command and control networks. Missile defense development provides the technology base for a variety of military space systems, ranging from improved satellite surveillance which can help precision weapons hit targets on the ground to weapons operating through or from space.[55] Combined with missile defense and ongoing refinement of the U.S. nuclear arsenal, continued intense high-tech weapons development will pose formidable obstacles for nuclear disarmament.[56] There might continue to be reductions from rubble-bouncing Cold War nuclear stockpile numbers, impelled as they were by ideologies which left the interest-driven calculations and justifications of the various weapons establishments beyond scrutiny, but the essential fact, the existence of civilization-destroying arsenals, would be unlikely to change.

The end result may be a multipolar arms race of unprecedented complexity, with the U.S. deploying an array of exotic new "conventional" weapons, along with a smaller, modernized nuclear arsenal on long-range, more accurate, and stealthier delivery systems, with a number of other nations resuming or intensifying weapons development in an effort to keep up. These high-tech weapons programs, whether for ballistic missile defense or new techniques of long-range precision attack, don't have to work to spark a destabilizing arms race. The development cycles of complex weapons systems are long, and the path of weapons development not entirely predictable. Hence other militaries will demand expanded weapons programs to offset the possibility of an insurmountable U.S. advantage, and the conditions for a renewed arms race are in place.

The continued pursuit of high-tech military dominance by the United States also provides the militaries of a number of other states with arguments for either keeping or obtaining weapons of mass destruction and the means for their delivery. The modernization of enormous post-Cold War nuclear forces by a state whose wealth and power dwarfs all others legitimates nuclear weapons as instruments of state power and prestige, and provides a model for others to emulate. The military of India, locked in a dangerous new nuclear arms race with Pakistan, is arguing not only for a "strategic triad" of nuclear forces like that of the Cold War superpowers, but for an "aerospace force," proving that not only military technologies but their ideological wrappings diffuse across borders.[57] This has led in turn to talk of missile submarines by Pakistani military elites.[58] And the militaries of states which the U.S. views as adversaries, facing the continued refinement of long-range, stand-off weapons which appear to be lowering the political costs of violence to the United States and increasing U.S. willingness to use force, may perhaps see weapons of mass destruction as a cheap "equalizer." This would in turn fulfill the prophecies of Pentagon contingency planners who then can argue for yet more "counterproliferation" weapons, whether conventional or nuclear.[59]

Within this broader context, it is clear that U.S. programs aimed at developing low-yield nuclear weapons concepts make the world less safe, not more. Researching ways to use nuclear weapons against chemical and biological weapons systems, command and control facilities, and other targets, manifests a dangerous drift towards a lower threshold of nuclear weapons use, including possible use against states without nuclear weapons. These efforts also make disarmament efforts far more difficult by calling into question the sincerity of the U.S. commitment to its Nuclear Non-proliferation Treaty obligation to *'pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament'*." At this year's Nuclear Nonproliferation Treaty Review Conference, the United States and the other nuclear weapons states affirmed their "unequivocal undertaking... to accomplish the total elimination of their nuclear arsenals." The U.S. also committed to "a diminishing role for nuclear weapons in security policies to minimize the risk that these weapons will ever be used and to facilitate the process of their total elimination," and agreed that a no-backtracking "principle of irreversibility" applies to "nuclear disarmament, nuclear and other related arms control and reduction measures."[60]

In the public debate that will accompany the new U.S. administration's review of military priorities in general and of nuclear weapons in particular, we must delve deeper than debates over stockpile sizes or the carefully circumscribed abstractions of how many major regional wars can be fought at once. These numbers games will give the pundits and politicians ample opportunity to appear more informed than their audience, while avoiding what really matters to most of us: *what are these enormous military forces really for? Will they really bring us a more peaceful world? Who will be killed by them in our name, and why? And finally, whose interests will really be served?*

There are those in the national security establishment who don't believe that ordinary human beings have any right to a voice in these decisions. C. Paul Robinson, Director of the Sandia National Laboratories, a major beneficiary of both nuclear weapons and missile defense spending, said recently that

> I have believed all my career that nuclear weapon issues are even more important than foreign policy issues in the sense that you must not have partisan divides over them. You know, in foreign policy we say that 'debate stops at the water's edge.' With nuclear weapons, the debate should never extend beyond the classified community that is considering what to do, and you need to have those initial debates and come out of them without partisan shapings.[61]

The opportunity which came with the end of the Cold War for humanity to escape the constant threat of nuclear destruction is slipping away. These are issues which affect us all, and they are too important to be left to the "classified community," operating unaccountably in secret, or to any other set of experts. We must demand a real national debate on these crucial decisions, and do the work to make our voices heard.

Notes

1. Committee on International Security and Arms Control, National Academy of Sciences, *The Future of U.S. Nuclear Weapons Policy*, National Academy Press, Washington, D.C. 1997, p.75.

2. Hans Kristensen, *Nuclear Futures: Proliferation of Weapons of Mass Destruction and U.S. Nuclear Strategy*, British American Security Information Council (BASIC) Report 98.2 p. 10. This report provides a detailed account of the shift in U.S. nuclear weapons targeting policy towards greater emphasis on broadly defined "weapons of mass destruction" threats during the 1990's.

3. United States Joint Chiefs of Staff, *Doctrine for Joint Theater Nuclear Operations*, Joint Pub 3-12.1 (February 1996), p.I-3.

4. Id., p. viii.

5. *Nuclear Operations*, Air Force Doctrine Document 2-1.5, 15 (July 1998), pp. 8-9 (Emphasis added)

6. These "negative security assurances" were affirmed in the runup to the 1995 NPT Review and Extension Conference, with the U.S. declaring that

> The United States reaffirms that it will not use nuclear weapons against non-nuclear-weapon States Parties to the Treaty on the Non-Proliferation of Nuclear Weapons except in the case of an invasion or any other attack on the United States, its territories, its armed forces or other troops, its allies, or on a State towards which it has a security commitment, carried out or sustained by such a non-nuclear-weapon State in association or alliance with a nuclear-weapon State.

It should be noted, however, that the U.S. has attempted to limit the scope of these assurances, stating for example in a press briefing concerning the U.S. signing of the protocol covering non-use in the African Nuclear Weapon Free Zone Treaty (Palindaba Treaty) that the protocol "'will not limit options available to the United States in response to an attack by an ANFZ [African Nuclear-weapon Free Zone] party using weapons of mass destruction.'" Quoted in John Burroughs, "Two Legal Issues Confronting NATO and the Non-proliferation Regime: US Presidential Decision Directive 60 versus Pledges of Non-Use of Nuclear Weapon Made to Non-Nuclear Weapon States, NATO Nuclear Sharing versus the Nuclear Non-Proliferation Treaty," Lawyers Committee on Nuclear Policy (1999) http://www.lcnp.org/disarmament/nato.htm

7. Robert Bell, "Strategic Agreements and the CTB Treaty: Striking the Right Balance," 28 Arms Control Today (No. 1, January/February 1998) 3, at 9, quoted in John Burroughs, "Two Legal Issues Confronting NATO and the Non-Proliferation Regime: U.S. Presidential Decision Directive 60 versus Pledges of Non-Use of Nuclear Weapons Made to Non-Nuclear Weapons States and NATO Nuclear Sharing versus the Nuclear Non-Proliferation Treaty," Lawyer's Committee for Nuclear Policy, May 1999, at 4.

8. See, for example, "New Nuke Policy by Clinton directive allows atomic retaliation against Hussein," *Newsday*, February 1, 1998, pp A07. This article also goes into considerable detail concerning nuclear posturing by the U.S. in the January-February 1998 Iraq crisis, stating that

> Most senior military planners now prefer conventional weapons for the massive strike being considered if Iraq refuses to allow UN weapons inspections. But in the latest showdown, the administration wants Hussein to include in his current calculations the possibility of one or more B61 nuclear warheads finding their way to Iraqi targets.

And providing considerable detail about the B61 and why the U.S. might choose to use it against Iraq:

> The B61 series of tactical warheads involved in the contingency planning are so-called "mini-

nukes" with an explosive force less than 1 kiloton. The bomb dropped on Hiroshima had an estimated 13 kilotons of explosive power. Even so, the mini-nukes are 300 to 500 times more powerful than the largest conventional, non-nuclear warhead in the U.S. arsenal. Some U.S. intelligence officials suspect that the remnants of Hussein's chemical and biological weapons are hidden in European-built bunkers made of reinforced concrete.

9. See Department of Defense News Briefing Transcript, January 27, 1998, Kenneth Bacon, presenter:

> Q: I just wanted to check, has the President ruled out a response to weapons of mass destruction with our own weapons of mass destruction?
>
> A: The Administration's policy on this is very clear. We will respond decisively with devastating force.
>
> Q: The reason I ask is because if some of these targets are buried targets, the best weapons to get after them are the nuclear penetrating bombs. Has that been ruled out?
>
> A: I don't think we've ruled anything in or out in this regard. Our position is that we would respond very aggressively.

10. See Patrick J. Sloyan, "New Nuke Policy by Clinton directive allows atomic retaliation against Hussein," *Newsday*, February 1, 1998, p. A7.

11. Concerning the 1996 Libya incident, see Department of Defense News briefing, April 23, 1996, Kenneth Bacon, Presenter; and Associated Press, "US Options on Libya Plant Called Few: Conventional Arms Won't Destroy It," *Boston Globe*, April 26, 1996, p.9. For more detail on the B61-11 and its development, See Greg Mello, "New bomb, no Mission," *The Bulletin of Atomic Scientists*, May/June 1997.

12. "We think that the ambiguity involved in the issue of the use of nuclear weapons contributes to our own security, keeping any potential adversary who might use either chemical or biologicals unsure of what our response would be." Department of Defense News Briefing, Monday, November 23, 1998 - 10 a.m. (EST) Presenter: Secretary of Defense William S. Cohen .

13. William S. Cohen, U.S. Secretary of Defense, Annual Report to the President and Congress 2000, Chapter 2, "The Military Requirements of the Defense Strategy." http://www.dtic.mil/execsec/adr2000/chap2.html

14. Article VI of the Treaty on the Non-Proliferation of Nuclear Weapons reads: "Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control."

These commitments were in 1996 strongly reinforced and expanded by the historic advisory opinion of the International Court of Justice (ICJ), the judicial branch of the United Nations, on the legality of the threat or use of nuclear weapons. In what is now the authoritative interpretation of Article VI, the Court held unanimously that "[t]here exists an obligation to pursue in good faith and bring to a conclusion negotiations leading to nuclear disarmament in all its aspects under strict and effective international control." International Court of Justice, Legality of the Threat or Use of Nuclear Weapons, General List No.95 (Advisory Opinion of 8 July 1996), sec. 105F.

15. The 1995 *Annual Defense Report* summarized the results of the 1994 Nuclear Posture review, stating that "[t]he United States has no new nuclear weapons programs, and has committed to achieving a Comprehensive Test Ban Treaty, extending its testing moratorium in the interim...." The *Annual Defense Report* also stated that "No new-design nuclear warhead production is required." U.S. Department of Defense, *Annual Report to the President and Congress*, February 1995, http://www.dtic.mil/execsec/adr95/index.html (see section on Nuclear Posture Review).

16. National Defense Authorization Act For Fiscal Year 1994, Sec. 3136, Prohibition on Research and Development of Low-yield Nuclear Weapons.

17. "The Role of Nuclear Weapons in the New World Order," Briefing by Thomas C. Reed, Chairman of the Joint Strategic Target Planning Staff Strategic Advisory Group Deterrence Study Group, October 10, 1991, p.8.

18. Department of the Navy, Office of the Deputy Chief of Naval Operations for Plans, Policy and Operations, *Stratplan 2010 Phase II, Final Report* (June 1992), V.I, pp.92-93. Obtained through the Freedom of Information Act by the Greenpeace Nuclear Free Seas program, 1994 (emphasis added).

19. The Department of Energy FY 94 budget request showed several ongoing efforts, asking funding to "continue to support Phase 1 and 2 studies for High Power Radio Frequency warhead; Precision Low-Yield warhead; Cruise Missile-type warhead; and B-61 diameter bomb." Quoted in William Arkin, "Nuclear Junkies: Those Loveable Little Bombs," *Bulletin of the Atomic Scientists*, July August 1993

20. National Defense Authorization Act For Fiscal Year 1994, Sec. 3136, Prohibition on Research and Development of Low-yield Nuclear Weapons.

21. See Greg Mello, "The Birth of a New Bomb," *The Washington Post*, June 1, 1997, p. C1 (.3 kilotons).

22. "This modified B61 will provide surety features enhanced in comparison to the B53 warhead." U.S. Department of Energy, *Stockpile Stewardship and Management Plan* ("Green Book"), February 1996, p. IV-11 (obtained under the Freedom of Information Act by the Natural Resources Defense Council). See also "Hagengruber: B61-11 a modification, not a new weapon," *Sandia Lab News*, August 1, 1997.

23. Assistant Secretary of Defense Dr. Harold Smith, testimony before the Senate Energy and Water Development Appropriations Subcommittee, March 20, 1997. (Emphasis added.)

24. National Research Council, Commission on Physical Sciences, Mathematics, and Applications, Naval Studies Board, Committee on Technology for Future Naval Forces, Panel on Weapons, *Technology for the United States Navy and Marine Corps, 2000-2035: Becoming a 21st Century Force*, Vol. 5, "Weapons,"National Academy Press, Washington, D.C. (1997), p.255.

25. *Ibid.* p.256.

26. *Ibid* p.253. It is clear that a considerable amount can be done to provide new nuclear weapons capabilities, by modifying existing designs without nuclear explosive testing: As Sandia National Laboratories director C. Paul Robinson noted in his testimony to the Senate Armed Services Committee on the CTBT, while the national laboratories "cannot create completely new concepts without testing, many previously tested designs could be weaponized to provide new military capabilities." Robinson observed that

> For example, if nuclear weapons emerge as the right answer to deter the use of other weapons of mass destruction in a regional conflict, the nuclear weapons we currently deploy may carry too high a yield and be far too disproportionate a response to be a credible deterrent. Proven designs of lower yield exist that might be adaptable for new military requirements in the future. I believe that such weapons could be deployed this way without the need for nuclear tests.

27. "The panel proposes the following recommendations for the Navy:

> --Pursue penetrating weapons technology that consist of either
>
> > –a high-velocity precision penetrator containing high energy or other conventional lethal mechanisms, or
> > –high-velocity RV-delivered kinetic energy impact/penetrator or low-yield nuclear warhead penetrators.

> –Conduct a study to determine nuclear munitions characteristics for optimum target effectiveness to include yield, accuracy versus depth and target hardness in various geological formations, target location error, and weapon impact velocity needed to destroy targets with no release of radioactivity.
>
> –Consider the use of SSN or SSBN platforms to launch 1000-km or greater-range, highly accurate ballistic missiles with low-yield (10 tons to 1 kiloton) nuclear warheads that can penetrate and destroy or incapacitate hard and deeply buried enemy targets, functions that are beyond the capability of conventional weapons systems. This may be particularly important against weapons of mass destruction facilities.
>
> –Conduct a comparative study of earth penetrators, kinetic energy penetrators, and low-yield, penetrating munitions."

Recommendations of the Panel on Weapons, National Research Council, Commission on Physical Sciences, Mathematics, and Applications, Naval Studies Board, Committee on Technology for Future Naval Forces, in *Technology for the United States Navy and Marine Corps, 2000-2035: Becoming a 21st Century Force*, Vol. 5, "Weapons," National Academy Press, Washington, D.C. (1997), pp.257-258

28. U.S. Department of Energy, *Fiscal Year 1996 Congressional Budget Request*, V.I, "Atomic Energy Defense Activities," p.52. There is some question whether the high-power radio frequency warhead effort was terminated upon completion of phase 2. In late 1997 William Arkin, likely the best-informed outside observer of U.S. nuclear weapons design programs throughout this period, opined that the program had merely "dropped out of sight," noting newspaper reports that the weapon still was under development and continuing visible research on nuclear weapons electromagnetic pulse (EMP) effects which would be relevant to such an effort. William M. Arkin, "What's New?" *The Bulletin of the Atomic Scientists*, November/December 1997, p.23, 27. See also further discussion of nuclear weapons EMP effects testing below.

29. 1998 Air Force budget documents summarized early Agent Defeat Weapon efforts:

> Counterproliferation Assessments. Provided technical guidance and support for the Agent Defeat Weapon (ADW) Assessment of Alternatives (AoA) Study (DoD Phase 0); provided program guidance and technical expertise in the evaluation of nuclear, thermal, chemical, emitter and conventional systems identified as possible Agent Defeat concepts; performed weapon effectiveness assessments for nuclear and non-nuclear baseline and conceptual weapon alternatives; and provided collateral damage assessments of ADW baseline weapon systems. FY 1999 Air Force Program Element Descriptive Summaries 0604222F Engineering and Manufacturing Development, Nuclear Weapons Support, February 1998.

And Defense Special Weapons Agency budget documents for research on "weapons system lethality" showed activities to increase the capability to destroy hard and deeply buried targets using both conventional and nuclear weapons:

> Building upon core DSWA nuclear competencies in nuclear effects and target response, this project addresses the lethality of the full spectrum of weapons, including nuclear and advanced conventional weapons, against the target base of today and tomorrow -- ranging from ultra-hard underground facilities to above ground, unhardened surface facilities and other special facilities that may be associated with the production, storage or deployment of weapons of mass destruction....

FY 1996 "accomplishments" for this program included "Supported DoD (STRATCOM) evaluations of nuclear and conventional weapons capabilities to counter ultra hard targets. Assessed nuclear effects against ultra hard targets." And FY 1997 plans included "Develop concepts and requirements for demonstrating nuclear weapons capabilities to achieve damaging mechanical effects to very hard or very deep targets." Defense Special Weapons Agency; FY 1998 Program Element Descriptive Summaries, 0602715H RDT&E, Defense-Wide/Applied Research , Project AC, Weapons System Lethality.

This program continues to date, doing the same kind of research. See Defense Threat Reduction Agency, FY 2001 Program Element Descriptive Summaries, Nuclear Sustainment & Counterproliferation Technologies,

0602715BR, Project AC, Weapons Systems Lethality.

30. U.S. Department of Energy, Office of Defense Programs, *FY 2000 Stockpile Stewardship and Management Plan*, March 15, 1999, pp. 5-26–5-27 (Obtained under the Freedom of Information Act by the Los Alamos Study Group, Santa Fe, New Mexico).

31. Senator Jesse Helms, Chair of the Senate Foreign Relations Committee, warned that

> Our clear, future need facing the United States is the requirement to develop new or modified warheads to respond to developments in missile defense--particularly in the area of directed energy. It would be impossible to adapt to such developments under a complete test ban. Further, without the ability to design new weapons, such as a warhead optimized to kill biological plagues or to destroy deeply-buried targets, the U.S. will be unable to respond to serious emerging threats to our security. Senator Jesse Helms, Congressional Record: October 6, 1999 (Senate), p. S12312.

32. "Maintaining a Viable Nuclear Weapons Program in a Test Ban Environment: A Strong Technical Foundation in the Laboratories," C. Paul Robinson, President and Laboratories Director, Sandia National Laboratories (Presented at the Nuclear Security Decisionmakers Forum, March 28, 2000, Albuquerque, NM).

33. Walter Pincus, "Senate Bill Requires Study of New Nuclear Weapon," *The Washington Post*, June 12, 2000, p.A2.

34. Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001, P.L. 106-398, Oct. 30, 2000, sec.1044, Report on The Defeat of Hardened And Deeply Buried Targets.

35. The nuclear weapons laboratories, for example, did substantial development work on yet another B61 nuclear bomb variant (eventually canceled) without any request from the military or earmarked funding from Congress. As reported by Jonathan Landay in the *Christian Science Monitor:*

> "No one in the government asked for it and the Air Force says it does not need it.
>
> Yet the Sandia National Laboratory in New Mexico, one of America's nuclear-weapons research facilities, is working on an atomic bomb that would have capabilities beyond those in the current United States arsenal.
>
> The bomb, carrying an 'old' nuclear explosive device and a new guidance system, would soar on wings like a glider after its release from a radar-dodging B-2 bomber. It would drill deep into earth or concrete, its explosion crushing 'hardened' bunkers hundreds of feet below ground while causing little surface damage....
>
> 'Standoff capability is something that people have wanted in weapons for years,' says Heinz Schmitt, Sandia's vice president for weapons systems, in defending BIOS. 'This is very much exploratory in nature.'
>
> But Pentagon and DOE officials say they have not asked for a modified version of the B61-11. Adds Capt. Leo Devine, an Air Force spokesman: 'The Air Force has no requirement for it.'
>
> Still, DOE and Pentagon officials support the objectives of BIOS program. They say such work is not barred by any arms-control accords and is justified under a new nuclear-weapons program designed to allow the US to adhere to the 1996 Comprehensive Test Ban Treaty (CTBT)." Jonathan Landay, "Why US Lab Is Designing A Bomb No One Asked For," *Christian Science Monitor*, July 24, 1997, p.1.

36. House Report 106-945, Conference Report to Accompany H.R. 4205, Enactment of the Provisions of H.R. 5408, the Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001, page number unavailable (unpaginated internet version)

37. "The certification of substantially new nuclear weapons designs is difficult or impossible to do with high confidence without underground nuclear testing. However, the United States has a large archive of previously tested designs that might be fielded with reasonable confidence to meet evolving military needs. In addition, the current stockpile has significant flexibility for modification for new requirements. Such flexibility was most recently

evidenced by the modification of the B61 bomb to provide earth-penetrating capability.... " Stephen M. Younger, *Nuclear Weapons in the 21st Century*, Los Alamos National Laboratory, June 2000, LAUR-00-2850, pp.11-12. Younger is Associate Laboratory Director for Nuclear Weapons, Los Alamos National Laboratory.

"The United States could have a mixed force of weapons based upon current types suitably modified to meet evolving military needs. Special consideration might be given to maneuvering reentry vehicles that can deal effectively with enemy defenses. One could consider tailored output weapons for special applications such as those that produce an enhanced electromagnetic pulse for the disabling of electronics or those that produce enhanced radiation for the destruction of chemical or biological weapons with minimum collateral damage. (There is serious doubt in the nuclear weapons community as to whether such systems could be introduced into the stockpile without additional nuclear testing.)" Younger, *Nuclear Weapons in the 21st Century*, at 13-14.

38. U.S. Department of Defense, Deputy Under Secretary of Defense (Science and Technology), *Defense Technology Area Plan,* (2000), p.XI-7, obtained by Western States Legal Foundation under the Freedom of Information Act

39. U.S. Department of Defense, Deputy Under Secretary of Defense (Science and Technology), *Defense Technology Objectives for Defense Technology Area Plan*, (2000), "Nuclear Phenomenology," p. II-372, obtained by Western States Legal Foundation under the Freedom of Information Act .

40. *Id*. (emphasis added)

41. There are, however, some indications that a nuclear weapon option continues to be considered for the Agent Defeat role. Consider, for example, the following solicitation from the Air Force Institute for National Security Studies (note in particular the reference to "first use:"):

2.1 What are the policy implications of developing and using an Agent Defeat Weapon (ADW)?

How would an ADW capability affect current theater strategies? How would the use of an ADW affect deterrence or warfighting strategies?

- What are the trade-offs between conventional counterforce weapons and the use of an ADW?
- What alternative counterforce options, other than ADW, might the US use (e.g., Information Operations)?
- How should the US handle accusations of "first use" or other related charges which might arise from use of ADW in a preemptive attack? U.S. Air Force Institute for National Security Studies, "Research Program Guide," 15 June 2000, http://www.usafa.af.mil/inss/fy01guide.doc

42. Hans Kruger, "Delayed Fission Debris Radiation Effects on Chemical and Biological Agents Stored in a Bunker," Lawrence Livermore National Laboratory (1998), UCRL-ID- 130475, p.2.

43. Defense Threat Reduction Agency FY2001 budget documents claimed FY 1999 Accomplishments which included

> Developed simulation and modeling of EMP Targeting of WMD, using coherent pulsed power and nuclear EMP Simulator Source based on air, land, and sea mobile platforms. Defense Threat Reduction Agency, FY 2001 Program Element Descriptive Summaries, Nuclear Sustainment & Counterproliferation Technologies, 0602715BR, Project AF, Weapons System Operability.

FY 2000 plans included

> Upgrade EMP-VN Model for specific WMD Targets.
> Upgrade and transfer SREMPTAPS smart system for WMD Target Planning.
> Develop end-to-end targeting models of WMD for the simulated nuclear EMP stress on targets via the new initiative. *Id.*

and

> Complete the development of a lethality and collateral effects assessment tool for nuclear strikes on a full

spectrum of WMD targets for NATO and STRATCOM. Defense Threat Reduction Agency, FY 2001 Program Element Descriptive Summaries, Nuclear Sustainment & Counterproliferation Technologies, 0602715BR, Project AC Weapons Systems Lethality

44. Studies based on simulation and calculations generated during this period included:

Hans Kruger, "Defense Against Biological or Chemical Bomblet Warheads with Nuclear Interceptors, Lawrence Livermore National Laboratory, UCRL-ID-123815 (1996).

Edgar Mendelsohn, "Energy Deposition in a Biological Submunition Warhead by Low-Yield Nuclear Interceptors," Lawrence Livermore National Laboratory, UCRL-ID-119330 (1994).

Edgar Mendelsohn, "Effects of Kinetic Energy Shielding on Energy Deposition in a Biological Submunition Warhead by Low-Yield Nuclear Interceptors, Lawrence Livermore National Laboratory, UCRL-ID-120854 (1994).

Ed Mendelsohn, "Dependence of Nuclear Interceptor Effectiveness on Hydrogen Content of Chemical Warhead Agent," Lawrence Livermore National Laboratory, UCRL-ID-115728 (1993).

Edgar Mendelsohn, "Neutron Shielding of Chemical/Biological Warheads to Minimize the Effects from Low-Yield Nuclear Interceptors, Lawrence Livermore National Laboratory, UCRL-ID-112014 (1992).

Edgar Mendelsohn, "Effectiveness of Nuclear Interceptors against Large Single Volume Chemical/Biological Warheads, Lawrence Livermore National Laboratory, UCRL-ID-113660 (1993).

45. Lawrence Livermore National Laboratory, *Nuclear Weapon Effects Test Facilitization of the National Ignition Facility*, August 8, 1995, de-classified version, CD-95-0055, p.15.

46. U.S. Department of Defense, Deputy Under Secretary of Defense (Science and Technology), 2000, *Defense Technology Area Plan*, Table XI-3, p. XI-9. (Obtained through the Freedom of Information Act by Western States Legal Foundation). This and other DoD science and technology planning documents obtained under the Freedom of Information Act are available on the WSLF web site, at http://www.wslfweb.org/nukes/foia.htm

47. Defense Threat Reduction Agency, FY 2000 Program Element Descriptive Summaries, Nuclear Sustainment & Counterproliferation Technologies, 0602715BR, Project AC - Weapons Systems Lethality.

48. *Id.*

49. Defense Threat Reduction Agency FY2000 SBIR Topic Descriptions, DTRA 00-002 TITLE: Multiple Sensor Characterization of Inaccessible geologic Formations for Hard Target Defeat.

50. *Findings and Recommendations Concerning the Comprehensive Nuclear Test Ban Treaty*, General John M. Shalikashvili (USA, Ret.), Special Advisor to the President and Secretary of State, January 2001.

51. "The label full spectrum dominance implies that US forces are able to conduct prompt, sustained, and synchronized operations with combinations of forces tailored to specific situations and with access to and freedom to operate in all domains – space, sea, land, air, and information. Additionally, given the global nature of our interests and obligations, the United States must maintain its overseas presence forces and the ability to rapidly project power worldwide in order to achieve full spectrum dominance." U.S. Joint Chiefs of Staff, *Joint Vision 2020* (2000), p.6.

52. For a summary of the Theater Missile Defense architecture in the broader context of U.S. counterproliferation technology development see U.S. Department of Defense, Office of the Secretary of Defense, *Proliferation: Threat and Response* (January 2001) p.99 *et seq*. See also U.S. Department of Defense, Deputy Under Secretary of Defense (Science and Technology), *Joint Warfighting Science and Technology Plan* (February 2000), Chapter VII, "Joint Theater Missile Defense." Obtained under the Freedom of Information Act by the Western States Legal Foundation,

available on the WSLF web site at http://www.wslfweb.org/nukes/foia.htm

53. Lt. Gen. Robert H. Foglesong, commander of the 12th Air Force and U.S. Southern Command Air Forces, quoted in Company Press Release, Boeing, Inc., "First Airborne Laser Aircraft Arrives at Boeing Wichita for Start of Major Modification Work" Saturday January 22, 2000.

54. See, for example, *The Air Force Science and Technology Plan, FY2000*:

> The precision strike ITT [integrated technology thrust] is addressing technology to enable an affordable capability to swiftly and flexibly deliver highly effective weapons against targets at any required global location. This ability to affordably destroy or neutralize any target on the earth will enable the execution of more missions from CONUS [continental United States] or forward base. Department of the Air Force, 2000, at. p.22. Obtained by the Western States Legal Foundation through the Freedom of Information Act.

55. Regarding the technology base provided by missile defense development for other purposes, including terrestrial attack, the U.S. Space Command *Long Range Plan* noted that

> Many of the technologies, systems and CONOPS [concept of operations] developed for a robust Missile Defense provide a significant springboard for Force Application capabilities. In the event that the NCA {National Command Authority] chooses to accomplish Force Application, the ongoing Missile Defense efforts and the research and development initiatives outlined in the plan would meet all mission requirements by 2020;.... U.S. Space Command, *Long Range Plan: Implementing USSPACECOM Vision for 2020* (1998), p.69.

For a recent overview of the long-range technology development goals of U.S. space forces, see *Air Force Space Command, Strategic Master Plan FY02 and Beyond*, February 9, 2000, http://www.spacecom.af.mil/hqafspc/library/AFSPCPAOffice/2000smp.html

56. As John Steinbruner notes, Russia and China are not only facing a technically "more capable" U.S. nuclear arsenal,

> They have substantial conventional force disadvantages as well. The sensing systems and information capacity associated with the projected NMD system would meaningfully enhance the pre-emptive potential of U.S. offensive forces, both nuclear and conventional. Even the limited initial deployment of 100 interceptors designed for 4-to-1 engagements would threaten the residual deterrent forces that Russia and China could expect to survive an initial U.S. attack.. John Steinbruner, "National Missile Defense: Collision in Progress," *Arms Control Today*, Vol. 29 No. 7, November 1999, p. 4, 5.

On the vulnerability of Russian strategic forces to U.S. and NATO conventional forces, see A. Arbatov, "Deep Cuts and De-alerting: a Russian Perspective," in Harold A. Feiveson et al., *The Nuclear Turning Point: A Blue print for Deep Cuts and De-Alerting of Nuclear Weapons* (1999), Brookings Institution Press, Washington, D.C. pp. 305, 321-322.

Los Alamos National Laboratory Associate Director Steven Younger sets out a possible future role for reduced yield nuclear weapons as part of a mixed nuclear and conventional strategic force, taking advantage of continuing improvements in missile guidance, assisted by the growing sophistication of space-based sensing. See Younger, *Nuclear Weapons in the 21st Century*, pp.14-15. Such a force, which might be considered more useable by U.S. decision-makers, could be perceived as very threatening by Russian decision makers, who already face a U.S. nuclear force whose accuracy is being upgraded. On U.S. strategic force upgrades see William M. Arkin and Hans Kristensen, "Dangerous Directions," *Bulletin of the Atomic Scientists*, March/April 1998.

57. "The Indian Air Force (IAF) today celebrated its 68th anniversary with Air Chief Marshal A.Y. Tipnis calling for an early transition to aero-space power.

'Under the new security dimension, we have to prepare for a smooth transition from air-power to aero-space power,' the Air Chief Marshal said, addressing an impressive parade at the Air Force station here.

He said in addition to both strategic and tactical tasks during conflicts, the IAF also had to maintain a 'deterrent posture,' adding 'our security concerns need unremitting vigilance.'

Asked whether aero-space programming was necessary in view of any threat perception, he told reporters the this was not being done 'keeping any front in mind.' "Tipnis calls for transition from air-power to aero-space power," Online edition of *The Hindu,* Monday, October 09, 2000.

58. "Nuclear Rivals Bolster Naval Defences," *The South China Morning Post* Friday, February 23, 2001.

59. On the possibility of some states keeping or acquiring WMD as a counter to U.S. high technology military dominance, see Andrew F. Krepinevich and Steven M. Kosiak, "Smarter Bombs, Fewer Nukes," *Bulletin of the Atomic Scientists*, November/December 1998, pp. 26-32.

60. 2000 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, Final Document, NPT/CONF.2000/28, 22 May 2000.

61. C. Paul Robinson, Director, Sandia National Laboratories, *Sandia Lab News*, "State of the Lab" Interview, February 23, 2001, p.5.

Western States Legal Foundation Information Bulletin by Andrew M. Lichterman.