Sources of Confusion in the RNEP Debate

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Jonathan Medalia
Specialist in National Defense
Congressional Research Service

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This symposium addresses the search for technical and policy common ground. To reach this common ground, it helps to start from a common set of facts. Yet misconceptions often arise in dealing with nuclear matters. I want to discuss five sources of confusion in the debate on the Robust Nuclear Earth Penetrator, or RNEP: complex issues; facts that morph into myths; irrefutable claims; unclear terminology; and competing story lines. I'm not saying this as either an advocate or a critic of RNEP. By way of background, RNEP is at present a study to determine if one of two existing nuclear bombs could be modified – mainly by using a heavy, pointed, hardened case – so as to penetrate several meters underground to increase by a factor of 20 to 50 its ability to destroy buried targets.

For a $27.6 million request for the next fiscal year, RNEP has sure received a lot of attention! This includes TV segments, reports, press articles, public concern, congressional debates, and legislation. I believe it has received this attention for several reasons. Critics assert that RNEP is the first new weapon to implement the Administration's nuclear policies, and that a related program, the Advanced Concepts Initiative (ACI), is developing a mini-nuke, the second such weapon. There is concern that RNEP's budget will grow sharply. Politically, the debate is win-win. Each side gets to stress themes that resonate with its base, portraying itself as the defender of American security and common sense and the other side in less glowing terms. Issues at stake include how to maintain national security and the role of nuclear weapons in that effort. Do we still need nuclear weapons, and if so, what types, how many, and for what missions? As such, the debate on RNEP is a clash of world views on a tiny stage – Macbeth performed in a closet, with each side playing MacDuff.

Complicated Issues

But confusion on technical and military topics clouds debate on these larger issues. One source of confusion is simply that issues linked to RNEP are complicated. Let me give you some examples.

1. Should the United States improve its ability to destroy buried targets? Countries of concern have many such targets. RNEP's proponents claim that we must be able to hold these targets at risk in order to deter or, if necessary, defeat an enemy. We may be self-deterred from using Cold War weapons, the argument goes: because their yield is so high, they would kill an unacceptable number of civilians. An earth penetrator would have the same effect on a buried target as a weapon with a much higher yield detonated on the Earth's surface. As a result, earth penetration greatly reduces the yield needed to destroy a buried target or, with higher yield, could destroy buried facilities that we could not reach even with our highest-yield weapons. Critics respond that we could use conventional weapons and forces to destroy or disable buried targets. Target nations could thwart earth penetrators by digging deeper, dispersing WMD stockpiles, or moving

leaders to undisclosed locations. Some critics doubt that we would use nuclear weapons at all, while others fear that reduced-collateral-damage weapons would make it more likely that we would use nuclear weapons; critics use both arguments against RNEP. Regarding self-deterrence, candidate RNEP weapons are the B61 and B83 bombs, Cold War weapons of substantial yield, so self-deterrence may still apply. Critics fear that even development of RNEP would signal to other nations that the United States is more willing to use nuclear weapons, thereby undermining our case that other nations should not go nuclear.

2. What are the targets of an EPW (earth penetrator weapon)? Some call these weapons "bunker-busters," but that shorthand term might convey the notion of a World War II-style bunker. Are we talking about a single chamber buried just below the Earth's surface, or an extensive tunnel complex inside a mountain, or what? Are many of these facilities likely to be vulnerable to an EPW that are in countries of concern, and are many under construction?

3. How would an EPW affect buried targets? The effects of a nuclear weapon detonated in the air are easy to visualize – we've all seen the pictures. Ground shock is harder to visualize, and I think that contributes subliminally to confusion over EPWs. What is the shape of the underground volume within which an EPW of specified yield can destroy a buried target of specified characteristics? How does ground shock attenuate with distance, and in different media? How does an increase in yield translate into an increase in ability to destroy HDBTs (hardened and deeply buried targets)? How deeply can a weapon penetrate using current technology, are there foreseeable technical advances that would enable substantially deeper penetration, and what would be the consequences of deeper penetration for military effectiveness and collateral damage?

4. What is military effectiveness for an EPW? In an attack on an HDBT, must the target be destroyed, or is it sufficient to disable it, and if the latter for how long? In an attack on a facility housing chemical or biological agents, is it enough to collapse the facility, or must the weapon physically destroy the chem or bio agents? Is it sufficient to destroy 75 percent of the bioagent in a facility? 95 percent?

5. What conditions must be met to achieve military effectiveness? For the weapon, these include yield, accuracy, depth of penetration, and speed and angle of impact. For the target facility, the conditions are more complicated. How might likely variations in the geology above the facility affect how the shock wave would propagate? How deeply is the facility buried? How extensive is it? How is it laid out? Where in the facility are the key assets that must be destroyed? Might they be dispersed throughout the facility? Does it have features to increase its hardness, such as heavy springs or blast doors? Are there countermeasures, such as granite boulders above the facility or decoy facilities? The decision to use a nuclear weapon would have to be made on the basis of intelligence. Do the intelligence misses at the macro level in Iran, Iraq, North Korea, and Libya, and the failure to detect Indian preparations for nuclear tests in 1998, reduce our confidence in intelligence at the micro level? RNEP, a modified bomb, would be delivered by aircraft. If the target nation got wind of the impending attack, it might have time to clear key facilities of their most important assets, such as leaders or WMD, or to launch missiles. Could we be confident of our ability to deny warning to the enemy?

6. How would EPWs affect the ability of U.S. military personnel to carry out battle damage assessment, or BDA? BDA is important to military operations in order to determine whether a target was destroyed, or if it still poses a threat and must be attacked again. Clearly, we would not send soldiers into a tunnel complex that had been struck by a nuclear weapon, and at any rate BDA in which troops enter a tunnel complex is probably not needed for a nuclear target. We would probably be reluctant to send troops into a complex used for production or storage of chemical or biological weapons — whether struck by nuclear or conventional EPW — because of the high risk. However, other methods may be available for BDA. Robots might enter a complex, or sensors carried by airplanes or implanted in the ground might detect signs of activity coming from a complex, such as air currents, electronic communications, or vibrations indicating that generators were functioning. As a related matter, if we proceed with RNEP and decide that we must do BDA of facilities thus attacked, should we develop new BDA sensor technologies to accompany RNEP development?

7. Beware how perspective affects judgments on weapon effectiveness! In studies calculating the effectiveness of nuclear weapons to destroy bioagents, physicist Hans Kruger of Livermore and physicist Michael May and mathematician Zachary Haldeman of Stanford used physicist-friendly scenarios. By that I mean that they assumed a target – a large area on or near the surface holding many barrels containing anthrax in aqueous solution – that was vulnerable to nuclear attack and that permitted ready calculation of the effects of gamma rays, neutrons, and neutron-induced gammas on the target material. The calculation was that these effects were reliably lethal to aqueous anthrax to perhaps 10 to 50 meters for a 10-kiloton weapon. But when I spoke to Jonathan Tucker, an expert on biological weapons with the Center for Nonproliferation Studies, he pointed out problems with the scenario. Aqueous anthrax, he said, would not be stored for a long time because after several months the spores clump together and become much less useful militarily. A nation that could manufacture aqueous anthrax would therefore probably not have huge quantities sitting in a warehouse waiting to be attacked, but might manufacture it close to the time of use. On the other hand, a nation that had the more advanced technology to produce dry powdered anthrax, which could be stored for longer periods, would need far less of the material and could easily disperse it. The image of a future Saddam giving 5-pound zip-lock bags of the stuff to his most trusted lieutenants comes to mind. It is thus important to have experts from several disciplines cross-examine such scenarios.

8. How reliable are estimates of collateral damage? A B61 or B83 bomb — the two weapons being considered for RNEP — detonated a few meters underground, as would be the case for RNEP, would cause a very large amount of fallout. A calculation cited in the debate is that this fallout could kill many thousands of civilians. Yet there is the risk of a numbers game, a sort of battle of the dead. Key uncertainties affect collateral damage estimates, everything from wind and rain to depth of detonation, type of rock or soil, population distribution, ability of the population to move rapidly away from the contaminated area, and how many people live near the target. The number of fatalities for an attack might vary by a large factor, depending on something as simple as which way the wind blows.

9. Would collateral-damage estimates affect a decision to use RNEP? RNEP, if used, could cause massive collateral damage. Yet a President who felt that RNEP was the only way to stop an imminent threat to the United States might decide to use that weapon

regardless of collateral damage. A related question is whether a nuclear earth penetrator could be designed that would reduce the radioactivity of the fallout, perhaps by reducing the amount of fissile material used or adding neutron-absorbing material to the heavy case around the nuclear explosive.

Facts, Myths, and Morphs

A few minutes ago, I mentioned MacDuff. Let me switch dramatis personae and quote Uncle Remus, who said that it's not what you don't know that gets you in trouble – it's what you knows for sure that ain't so. Many "urban myths" have grown up around the EPW issue, leading to uncertainties, contradictions, and misunderstandings.

Some of these myths, I believe, flow from the mixing together of four true statements. (1) The Administration sought, successfully, to have Congress lift the ban on R&D on low-yield nuclear weapons. (2) Nuclear earth penetrators could be used to destroy some hardened and deeply buried targets. (3) Some in DOD and DOE have suggested using nuclear weapons to destroy chemical and biological agents. (4) It is desirable to minimize collateral damage, and for attacking HDBTs a low-yield earth penetrator will produce less fallout than a surface-burst weapon of yield high enough to have equivalent effectiveness.

Now combining 1 and 4, one concludes that RNEP is a low-yield weapon, and that fallout from it will be totally contained underground. This is not the case. NNSA Administrator John Gordon said in 2002 that the emphasis is on "a more standard yield system called an enhanced penetrator ...There's no design work going on low-yield nuclear weapons." In June 2004, NNSA Administrator Linton Brooks said, "it became part of the conventional wisdom that there were Administration plans to develop new, low yield weapons. There are no such plans." Further, there is no way that fallout from even a low-yield nuclear earth penetrator could be contained. Combining 2 and 3, one arrives at the idea that nuclear earth penetrators could destroy biological weapons housed in HDBT. However, the intervening earth and rock would shield HDBTs from neutrons and gamma rays produced by the detonation that would be lethal to bioagent. Combining 1 and 2, one may conclude that sub-5-kt EPWs could destroy HDBTs — but much more yield would be needed. Combining 1 through 4, one arrives at the idea that RNEP is a low-yield weapon that can destroy bioagent in HDBTs with no collateral damage.

I've seen a number of erroneous statements in the debate and wondered where they came from. I think that a kernel of truth becomes transmuted through a misunderstanding of science or policy, or through a logical but unwarranted inference or extrapolation, something I call a morph chain. Let me give you five examples. In each case, I take an assertion made in the debate, then look back for the kernel of truth, then try to find the logic train leading from the fact to the assertion.

- Penetration matters –> penetration matters, not yield –> the key is to make nonnuclear penetrators burrow deeper into the earth –> nonnuclear bunker busters can be as effective as nuclear weapons in destroying HDBTs (Flaws: yield matters; there are severe limits on depth of penetration; increasing depth of penetration of a nuclear weapon buys little in terms of target destruction)

- The Administration sought to lift the ban on sub-5-kiloton R&D –> The Administration sought to lift this ban in order to develop sub-5-kt weapons –> ACI does some early-stage weapons-related research –> ACI would be the program to develop new weapons –> ACI is developing sub-5-kt mini-nukes (Flaw: NNSA

states that the United States is not developing mini-nukes through ACI or any other program)

- Nuclear weapons could destroy chemical and biological agents –> These agents might be hidden in HDBTs –> Earth penetrators could destroy chemical or bio agents in HDBTs –> Chem and bio agents in HDBTs are intended targets of RNEP. (Flaws: chem and bio agents are not targets of RNEP; RNEP could not destroy such agents buried deep underground)

- In the past, new nuclear weapons were tested –> Putting an existing physics package in a different case and using it for a new mission creates a new weapon –> RNEP and mini-nukes will require testing –> The Administration wants to enhance test readiness in order to test RNEP and mini-nukes (Flaws: RNEP is intended not to require testing; modifying the B61-7 into the B61-11, the current U.S. nuclear EPW, did not require testing; no mini-nuke is under development)

- ACI and RNEP spur technical innovation –> These programs are essential for technical innovation (Flaw: stockpile stewardship is a $6.6-billion program; technical innovation would continue even in the absence of two programs totaling $36.6 million)

Irrefutable claims

A couple of irrefutable claims are made in the debate on RNEP. They are irrefutable because they can't be proven one way or another.

Simply study vs. slippery slope. Last year, Secretary Rumsfeld said that RNEP "is a study. It is nothing more and nothing less." Congress included a provision in the FY2004 defense authorization act [sec. 3117] barring DOE from starting engineering development, or subsequent development phases, of RNEP "unless specifically authorized by Congress." This year, Secretary Abraham said about RNEP, "We are doing the research on that, nothing more, and would require congressional endorsement to move to an engineering level." Critics see the RNEP study as leading down a more dangerous path, expressing concern that RNEP will lead to development and deployment of a new generation of nuclear weapons, and perhaps to nuclear testing and nuclear use.

The truth probably lies somewhere in between. Why spend $71 million or so on a four-year study if a favorable outcome does not lead to development of the weapon? And why spend perhaps hundreds of millions of dollars developing the weapon without planning to deploy it? On the other hand, the study could find that RNEP would be less effective or more costly than anticipated. Potential adversaries might counter RNEP in various ways. Nor is there any assurance that Congress would approve its development. While the House and Senate defeated amendments to the FY2005 defense authorization bill to eliminate RNEP and ACI funds, the vote was close in the House, 214-204, and the same House voted 370-16 to approve the FY2005 energy and water development bill largely as reported by the House Appropriations Committee, with no funds for ACI or RNEP.

Security through deterrence or nonproliferation? Supporters focus on RNEP's role in deterrence, asserting that deterrence must adjust to changing threats. They view HDBTs as an increasing threat; adversaries may use them to shelter leaders, key communications nodes, or WMD

facilities. RNEP would enable us to hold at risk these targets, which we cannot now do. Supporters believe that weapons like RNEP must be usable; as Representative Thornberry said, "we do not deter anybody if they know we are not going to use a weapon." Failure to update the deterrent would have serious consequences. As Senator Allard said, "if the United States does not show that it is serious about ensuring the viability of our entire military capability, including our weapons of last resort, we might not be able to dissuade potential adversaries from developing weapons of mass destruction and deter those adversaries from using those weapons they already have."

Critics question the deterrent value of RNEP. They argue that it cannot deter terrorists because they have no fixed address, and rogue states could counter an EPW by deeper burial, camouflage, or dispersal. They see RNEP as an ineffective deterrent because, as Representative Allen stated, "no President or operational commander is going to be launching a nuclear device to strike a deep bunker." Even continuing to develop RNEP, critics believe, will undercut worldwide cooperation on nonproliferation, weakening our security. As Senator Lautenberg asked, "How can we credibly ask North Korea and Iran to stop their own nuclear programs while at the same time we develop mini nukes and bunker busters?"

An open question is the strength of the link between deterrence and proliferation on the one hand, and RNEP and ACI on the other. Regarding proliferation, most may find it hard to imagine countries going nuclear on grounds that the United States is continuing RNEP, which is at present a cost and feasibility study on modifying an existing warhead to create a second type of earth penetrator. At the same time, most will find it hard to imagine North Korea, Iran, Pakistan, or India giving up its nuclear program because we stop RNEP. Developing a nuclear program takes decades and vast sums of money. India conducted a nuclear test in 1974, and North Korea has been working on its nuclear programs since at least the 1960s. Nations make this investment for reasons of their own security. It's also possible that the U.S. debate may be imputing to other nations the intense detail of analysis typical of the United States even though — perish the thought! — other nations may simply not make such calculations.

Confusing terminology and competing story lines

I want to touch on a couple of other areas of confusion, the first involving terminology and the second involving competing story lines.

Threshold vs. use: Critics claim that RNEP will lower the nuclear threshold and make it more likely that nuclear weapons will be used. I think it's important to differentiate between threshold and use. The nuclear threshold, as I see it, is a set of criteria any one or more of which must be met in order for the President to order the use of nuclear weapons. Examples include a nuclear attack on the United States, and perhaps an attack on U.S. allies with nuclear weapons, a bio attack on the United States, or positive intelligence that an attack by terrorists or a rogue state was imminent. The existence of RNEP would not lower the nuclear threshold because the weapon arguably would not change the **criteria** that would merit a nuclear response. But RNEP could affect the **likelihood** that nuclear weapons would be used. If RNEP turned out to be a deterrent, as its supporters suggest, then it would reduce the likelihood of nuclear use. The same nuclear threshold criteria would exist, but fewer events would meet these criteria because those events would have been deterred. On the other hand, if RNEP turns out not to have a deterrent effect, then nuclear use would be more likely. RNEP could arguably be used in more circumstances than existing nuclear weapons. If RNEP did not add capabilities beyond those of the current U.S. nuclear arsenal, thus expanding the envelope of circumstances in which nuclear weapons could be used, what would be the point of building it?

Pointillism vs. connect-the-dots: Pointillism, you may recall from History of Art 101, was a style of painting in which the artist used dots or points of differing colors to form an image. The Administration and RNEP supporters have presented decisions on low-yield R&D, ACI, RNEP, and nuclear test readiness as four separate dots, using the following arguments. (1) The low-yield ban barred R&D that could lead to production of a sub-5-kiloton nuclear weapon. This fuzzy ban interfered with much weapons R&D, even on weapons well above 5 kilotons. (2) ACI excluding RNEP does early-stage R&D related to weapons. It also helps train weapons designers and fosters links to the broader defense community. (3) RNEP would be a second U.S. nuclear EPW, and it could hold at risk targets that the current such weapon, the B61-11, cannot. (4) It is important to enhance nuclear test readiness because 36-plus months is too long to wait to conduct a nuclear test if necessary. The likelihood that any future underground test would vent radiation is remote.

In contrast, these elements seem to have fused, in the public mind, into the following proposition:

> The Administration sought to lift the low-yield ban in order to develop low-yield battlefield weapons – "mini-nukes" – through ACI. The Administration is developing RNEP to destroy chemical and biological weapons in hard and deeply buried targets. Because RNEP and the mini-nukes are new weapons, they will require underground nuclear tests. These tests will release radioactive fallout that will threaten citizens much as the atmospheric tests of the 1950s and early 1960s did. These weapons will make nuclear use more likely by lowering the nuclear threshold.

Each piece of that proposition is questionable at best. Nonetheless, one problem the Administration has had in making its case is that saying the dots are connected is a more compelling story line than saying that they are not, and, in the critics' view, the Administration has not connected the dots to form its own story. Unlike pointillism, separate dots do not form an image; connected dots do. As a result, one could argue that the critics' story line appears more credible. And credibility matters because credibility is "truth's shadow," as someone once called it: where there's credibility, there must be truth. The story line also links to the deepest public fears in the nuclear arena – nuclear-weapon use and radioactive fallout. It gains added traction because public trust on things nuclear was shattered by the government, decades ago, downplaying concerns over fallout. The bitter residue from that breach of trust persists to this day. In part because of constituent concerns, Representative Matheson of Utah introduced a bill, H.R. 3921, to protect public health and safety should U.S. nuclear testing resume, and Senator Bennett of Utah had planned to introduce an amendment to the FY2005 defense authorization bill to require specific congressional authorization for a full-scale underground nuclear test of RNEP. The issue is personal: Representative Matheson has said, in discussing this issue, that his father died of a form of cancer linked to radiation.

Some argue that not only has the Administration not connected the dots, but also that it seems to have some uncertainty as to what the dots are. Congressional staff have given me examples of disconnects between DOD and DOE, and within DOD, about earth penetrators in general, and RNEP in particular. I've heard that some in DOD think of RNEP as low yield, while others think of it as high yield, and that on at least one occasion a DOD official told staffers that RNEP would be low yield so as to contain fallout, while DOE has never, to my knowledge, claimed that any feasible EPW would be able to contain fallout, and some in DOD and DOE list the ability to destroy biological agents as a rationale for RNEP while another DOD source states that the goal is to destroy HDBTs.

Conclusion

To wrap up, decisions on nuclear weapons made by Congress and the Administration have always been consequential because they affect international perceptions of the United States, deterrence, the ability to respond to threats, and thus the security of the nation. While it is the case that the Administration requested FY2005 RNEP funds only for a study, RNEP is closely watched, and serious issues are at stake. The many misperceptions embedded in the debate, however, may impair our ability to make informed policy on this issue. Strengthening the factual and analytic foundation on which policy rests can only result in a stronger structure.