The Planned U.S. National Missile Defense: Will it Work?

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The United States will soon decide whether or not to deploy a limited national missile defense (NMD) system. This system would be intended to defend all 50 states from small-scale attacks by intercontinental-range ballistic missiles (ICBMs).

Supporters of immediate deployment argue that
an NMD system is needed to defend against emerging missile states such as North Korea, Iran or Iraq, as well as to protect against accidental/ unauthorized launches from Russia or to counter an attack by China. They argue that this limited system should not be a problem for Russia, and some argue that it could be compatible with a modified Anti- Ballistic Missile (ABM) Treaty, while others would like to see the Treaty eliminated. Opponents of deployment argue that the NMD system is not needed, that it will not be effective, and that its deployment will have adverse consequences for U.S. and international security that far outweigh its benefits. For example, the planned NMD system would violate the ABM Treaty, provoke strong reactions from Russia and China, endanger future efforts to reduce nuclear weapons, and could lead to the unraveling of the entire nuclear arms control and nonproliferation regime.

A Pentagon Deployment Readiness Review (DRR) will assess whether or not the NMD technology is ready for deployment. Following the DRR, the President will decide, probably in the fall of 2000, whether or not to begin deployment.

This article describes the planned NMD system and then considers whether the planned system would be effective against real-world missile threats.

The Planned NMD System

Under current plans, the initial NMD deployment would include 20 ground-based interceptors in central Alaska, a new missile defense radar at Shemya in the western Aleutians, upgrades to five existing early warning radars, a battle management center in Colorado, and several communications questionable. Altogether there are good arguments relay stations. The system would be supported by existing and new early warning satellites. If the Administration decides to deploy this year, this system would be operational by late 2005. By 2007, the number of interceptors in Alaska would be increased to 100.

This initial system would be oriented primarily against North Korea and would be intended to defend all 50 states from “a few tens of warheads accompanied by simple penetration aids.” It is also intended to defend against a smaller number of warheads from the Middle East.

Under the Clinton Administration’s plan, this system would be expanded into a much larger system by about 2010 or 2011. This larger system would be intended to counter “a few tens of warheads with complex penetration aids” from North Korea or the Middle East. It would add a second interceptor site in North Dakota, and bring the total number of interceptor missiles up to about 200 to 250. This system would deploy up to eight more missile defense radars spanning the northern hemisphere from Britain to South Korea. It would also add a constellation of about 24 missile-tracking satellites. This sensor infrastructure would allow for rapid expansion by adding more interceptors.

The Congressional Budget Office recently estimated that this system would cost about $60 billion to build and

operate through the year 2015. However, as with almost any cutting-edge, complex military system at such early stages of development, the actual costs would certainly be considerably higher.

Moreover, many congressional Republicans (and presidential candidate George W. Bush) believe that even this system is inadequate and that a still larger NMD system is needed, which would use sea-based interceptors and ultimately include spacebased weapons.

Will the Planned NMD System Work?

Will the planned NMD system work well enough to be useful? The key issue is its operational effectiveness how well it will work in the real world, where an attacker would likely attempt to defeat it.

The issue is not whether it is possible to "hit a bullet with a bullet" or whether it is possible to hit warhead targets on a test range. There is little doubt that, with enough time and money, the U.S. could build a system that could reliably hit an ICBM warhead on the test range. However, the problem of achieving effective defense against an adversary that attempts to defeat the system is a qualitatively different and much more difficult problem. A testing program against cooperative targets may tell you very little about how the defense will work in the real world.

This situation is highlighted by the only actual use of a ballistic missile defense the Patriot in the 1991 Gulf War. Prior to the Gulf War, Patriot had 17 tests against ballistic missile targets, and every one was successful. But against the Iraqi missiles it failed completely (although it was a political success). Unlike the test range targets, which flew on smooth, predictable trajectories, the Iraqi missiles broke apart and maneuvered erratically, and Patriot had almost no chance of destroying such targets.

The operational effectiveness of the NMD system will be determined primarily by its ability to deal with steps "countermeasures" that an attacker takes to defeat the system. Countermeasures have been the fundamental problem for ballistic missile defenses from the beginning, and still are. There are many possible countermeasures and if the NMD system is to be highly reliable and effective, it must be effective against all plausible countermeasures.

However, the proposed U.S. NMD system with a well defined design comprised of specific components appears to be vulnerable to a number of straightforward countermeasures. A recent study by 11 scientists sponsored by the Union of Concerned Scientists and the MIT Security Studies Program surveyed a wide range of potential countermeasures and then focused in detail on three specific countermeasures that combined high effectiveness with ease of implementation (this report is available at http://www.ucsusa.org):

Chemical and biological submunitions. Rather than using a single large warhead, an attacker using chemical or biological weapons would likely divide the missile's payload into numerous small submunitions or bomblets in order to better disperse them over the target city. This approach would have the side effect of defeating the defense by overwhelming it with many more targets than it could even attempt to intercept.

Anti-simulation decoys. Rather than trying to make decoys look like the warhead, the attacker could disguise the appearance of the warhead, so that almost any object with a size comparable to a warhead could be a credible decoy. For example, the warhead could be put inside a balloon coated with a thin layer of metal (similar to balloons sold in florist shops but larger) and released along with many empty balloons. The defense would then be confronted with a large number of targets, none of which looked like a warhead, and the defense's sensors

would be unable to determine which balloon contained the warhead.

A cooled shroud. Covering the warhead with a thin shroud cooled with liquid nitrogen (a common laboratory material) would make it invisible to heat-seeking interceptors.

Each of these countermeasures would defeat the planned NMD system, and all are within the means of emerging missile states such as North Korea or Iran.

NMD supporters argue that effective countermeasures are not easy to build and deploy from missiles, and so third world countries may not be able to build effective countermeasures for many years if ever. However, a third world country able to attack the United States with nuclear-armed ICBMs has already solved much harder problems building ICBMs, building nuclear weapons that fit on such missiles, and solving reentry problems than those involved in building and deploying simple yet effective countermeasures. Relative to these problems, many potentially effective countermeasures are not difficult to build. This conclusion is consistent with the 1999 U.S. National Intelligence Estimate, which stated that countries such as North Korea or Iran could have a number of countermeasures ready by the time they test their missiles.

Ultimately, the only way to determine whether the planned NMD system will work is through tests against realistic targets. However, there has never been an intercept test of a NMD-type defense system when the targets used credible countermeasures. Moreover, even by the time the NMD system is deployed and operational, no such realistic test will have occurred.

There have been several NMD tests in which the warhead target was accompanied by other objects, which were sometimes referred to as decoys. However, these objects were quite different from the warhead, and the characteristics of both the “decoy” and warhead were known in advance to the defense. Such tests do not demonstrate that the system could work in the real world, only that it can function in a controlled test-range environment.

Supporters of the NMD system argue that it is appropriate to start with such simple targets that one must “walk before running.” While this is true, these simple tests do not in any way demonstrate that the system can work against a real-world attack one that actually attempts to defeat the defense. The availability of effective countermeasures indicates that while the planned NMD system may be able to “walk” on the test range it will never be able to “run” in the real world.

NMD System Architecture

If a decision is made to deploy, initial deployment would include:

- 20 ground-based interceptors in Alaska
- Upgrades to 5 existing early warning radars
- A new X-band radar at Shemya in the western Aleutians
- DSP/SBIRS-high early warning satellites
- Battle Management, Command, Control and Communications

This system would be operational by late 2005. This is sometimes called the "Capability 1 (C-1)" system.

The number of interceptors in Alaska would be increased to 100 by 2007. This is know as the "Expanded C-1" system.

This initial system is oriented against North Korea and intended to be able to defend all 50 states from a "few tens of warheads accompanied by simple penetration aids." It is also intended to defend against "a few warheads with simple penetration aids" from the Middle East.

Longer term goal is defense against "a few tens of warheads with complex penetration aids" from North Korea or Middle East. This capability might be achieved as early as 2010/2011. This system is sometimes known as the C-3 or "objective" system, and would include:

- A second interceptor site (North Dakota?)
- More interceptors (200-250 total?)
- More X-band radars (8 to 9 total?)
- SRIRS-Low space-based missile tracking system

Recent cost estimate for C-3 system is about $60 billion. Actual costs will likely be higher.

Many Republicans argue a larger NMD system is needed, including naval and space-based weapons.

Current Timetable

Oct. 1999: First intercept test: Hit target.

Jan. 2000: Second intercept test: Missed target.

July 2000: Third intercept test: Missed target. First integrated system test.

July 2000: Deployment Readiness Review (DRR). Will assess if technology is mature enough to make a deployment decision.

Fall 2000: Deployment Decision. According to Administration, will consider not only technical readiness, but also threat, cost, and arms control considerations.

Fall 2000: If deployment is to occur by 2005, deadline for giving 6 months notice of intent to withdraw from the ABM Treaty (if Russia has not agreed to change Treaty).

Spring 2001: According to Administration, if system is to be deployed by 2005, construction in Alaska must begin now.

2005: Deployment of initial system (with 20 interceptors in Alaska) completed, system now operational.

2010-2011?: Complete "objective" system deployed, including second interceptor site.

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