THE DEFENSE MONITOR

ISSN # 0195-6450 • Volume XXX, Number 5 • June 2001

SPECIAL ISSUE

NMD Development is Not Hostage to the ABM Treaty

By Philip E. Coyle, Senior Advisor

TO PROVE HE IS SERIOUS about National Missile Defense, President George W. Bush must abrogate the Anti-Ballistic Missile (ABM) Treaty now, according to the most strident critics of the treaty. The longstanding ABM accord with Russia, it is said, is thwarting the technology needed for missile defense.

To the contrary, the 1972 treaty is not holding back design and development of the technology needed for National Missile Defense (NMD), nor is the treaty slowing the testing of an NMD system. Development of NMD will take a decade or more for technical and budgetary reasons, but not due to impediments caused by the ABM treaty.

A premise of the ABM treaty - widely considered to be the foundation stone for U.S.-Russian nuclear arms control efforts - is that the United States and Russia may elect to have strategic antiballistic missile defenses. In the early 1970s, Russia chose a system to protect Moscow; the United States chose a system to protect its deterrent force of land-based missiles deployed in North Dakota. After only four months of operation, the United States shut down its ABM system, called Safeguard, as cost ineffective, and has not deployed an intercontinental ABM system since. Nevertheless, the ABM treaty permits the United States to have such a system, and to develop and test it.

On the other hand, the ABM treaty restricts missile defense against intercontinental missiles to systems that protect a defined area, such as the area around Moscow or a large missile field. The ABM treaty prohibits any system that defends either side's entire national territory, and puts limits on the number of interceptors deployed at the permitted sites.

Development of NMD will take a decade or more for technical and budgetary reasons, but not due to impediments caused by the ABM treaty.

The ABM treaty also prohibits **mobile** defenses that would constitute a nationwide shield, including those deployed at sea or in space.

What the treaty does permit is development and testing of missile defenses against long-range intercontinental missiles, so long as the defenses are fixed systems (that is, not mobile) tested at approved test sites. The negotiators of the ABM treaty recognized that in early development, one could not necessarily determine through national technical means - e.g., satellite imagery - whether a particular test was of an NMD system, let alone whether it was of a system intended to be fixed or mobile. In fact, much of the work ultimately might be used in either fixed or mobile modes.

One way to understand the current situation is to examine each of the conceptual approaches to defense against intercontinental-range ballistic missiles aimed at the territory of the United States. NMD systems can be designed to intercept enemy missiles in different phases of their flight trajectories. A system could try to shoot down enemy missiles during initial lift-off or boost phase; later during mid-course flight; or, finally, in the incoming, terminal phase, as the missiles approach and reenter the atmosphere over the United States.

Alternatively, a system could try to shoot down enemy missiles in all three phases, with a so-called layered defense, thus hoping to kill in each phase of flight those missiles that had been missed in earlier attempts.

Under any of these approaches, interceptors could be launched from land, sea, air, or space, and would require an integrating command and control system

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with a network of high-power tracking radars and/or satellites.

The new Bush administration has not yet explained exactly how its system, or system-of-systems, will be different from the land-based, mid-course NMD system planned by the administration of President Bill Clinton. Clinton's plan involved upgrading five existing early warning radars in the United States and abroad (the United Kingdom and Greenland); building a new X-band missile tracking radar in the Aleutian Islands off the Alaskan coast; and placing up to 250 mid-course, ground-based interceptors in Alaska and North Dakota.

However, it is expected that the Bush NMD architecture will involve new emphasis on boost-phase missile defense, and be more complex and layered than the Clinton system.

In addition, the Bush administration has emphasized the importance of defending U.S. friends and allies, as well as the U.S. homeland. Adding the technical difficulties of defending U.S. friends and allies to the technical difficulty inherent in homeland defense makes for a very complex situation. Defending, say, South Korea from a North Korean threat is technically quite different from defending London, Paris or Rome from, say, Libya. All of these scenarios are quite different from the technical requirements necessary for a working system to defend the U.S. homeland. The distances, speeds and defended areas are different, the types of enemy rockets being defended against are different, and the operational configurations of search radars and other missile detection sensors would be different.

Further, the spending levels required to support all these developments are not affordable given the current U.S. budgetary environment - a downturn in the economy, a large tax cut, and strong competition in the discretionary portions of the federal budget, defense and non-defense.

One question that has dogged NMD is exactly who is the enemy? Is it North Korea? Is it China? Is it Iran, Iraq or Libya? Is it Russia? Is it all those countries? A year and a half-ago, North Korea was emphasized as the threat. But thanks in good measure to the fine diplomatic efforts of former Secretary of Defense William Perry, North Korea no longer seems to be the same threat as before.

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Some have joked that the real enemy of NMD is the ABM treaty itself. Indeed, the Bush administration and some members of Congress have been clear that they view the ABM treaty as an obstacle, even though it is not actually preventing the United States from conducting research and development on NMD, boost-phase, mid-course or otherwise.

Until a few months ago, the Pentagon's Ballistic Missile Defense Office said the urgency, the "long pole in the tent," for NMD was starting construction on a missile tracking radar site in the Aleutians. This was misleading. There were then, as now, many obstacles to developing and deploying an effective NMD, and singling out the need to start construction in the Aleutians was to ignore all others – some requiring even more time to overcome.

Now, some Bush administration officials and members of Congress are arguing that the ABM treaty is the "long pole in the tent." This is misleading also.

Mid-Course NMD

NMD, that is, the mid-course NMD program underway at the Pentagon, has not had a successful flight intercept test since its first attempt in October 1999. That test was to demonstrate the basic elements of an NMD system, including the concept of "hit-to-kill" - that is, "hitting a bullet with a bullet." To help insure a successful hit-to-kill, a beacon on the target missile, linked to the Global Positioning System satellite network, aided in achieving the successful intercept. Recognizing the scripted and unrealistic nature of that test, the plan then was that three more follow-on flight intercept tests would have been conducted by now, all successfully. That didn't happen. The next two flight intercept tests failed, and a fourth attempt has been delayed for months.

Some 20 or more flight intercept tests, and hundreds of component and

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RECENT EVENTS RELATED TO NATIONAL MISSILE DEFENSE

U.S. To Resume Talks with N. Korea— President George W. Bush announced on June 7 that the United States would resume talks with North Korea on that country's production and exports of advanced missile technology and other topics. The talks were initiated by the Clinton administration but suspended by President Bush in order to conduct a wider review of U.S. policy toward the Asian country.

President Bush said the talks will include U.S. demands for "verifiable constraints on North Korea's missile programs and a ban on its missile exports."

Albright: U.S.-Russia Were Close on ABM Changes— Former U.S. Secretary of State Madeleine Albright said that the Clinton administration came close to reaching an agreement with Russia on modifying the ABM treaty to allow for the deployment of a U.S. National Missile Defense system. In a June 5 op-ed article for *The New York Times,* Albright wrote that "Russia ultimately decided to wait for a new administration before making a deal." The Bush administration is pursuing such agreement with Moscow, so far with no success. On June 5, Russian Defense Secretary Sergei Ivanov said that if the United States withdraws from the 1972 ABM treaty, Moscow will consider itself free of the obligations set in 32 other strategic arms accords, ITAR-TASS reported.

Turkey Could Support NMD—Turkey will support U.S. missile defense plans as long as they cover the territory of other NATO allies, said a Turkish diplomat quoted on June 4 in *Defense News.* "We will expect to receive a number of U.S. requests regarding the creation of missile defense systems," said the diplomat, "probably including a defense base in Turkey." Turkey borders on both Iraq and Iran, two countries cited by U.S. intelligence officials as potential sources of ballistic missile threat to the United States.

NATO Won't Endorse U.S. Threat Assessment—At a May 29-30 meeting in Budapest, Hungary, NATO foreign ministers refused to endorse U.S. language in the final communiqué declaring that NATO faces "a common [ballistic missile] threat." Instead, the document calls for "appropriate assessment of threats" to be prepared in consultation with the United States. However, unlike last year's communiqué, the document produced this year holds no references to the ABM treaty as a "cornerstone of strategic stability." It merely mentions that "international arms control and disarmament are important" in combating proliferation of missiles and weapons of mass destruction.

U.S. Considering Russian Arms Purchase—*The New York Times* reported on May 28 that to win Moscow's cooperation on NMD, U.S. officials are prepared to offer Russia a package consisting of purchases of S-300 air defense systems and investments into the country's early warning radars. The S-300 systems, serving in an anti-missile role, could be integrated in a ballistic missile defense system for Europe. The United States and Moscow would also hold joint missile defense exercises and cooperate on upgrading Russia's crumbling missile radar network, the newspaper wrote. U.S. officials refused to comment. Russia's Defense Minister Sergei Ivanov responded with skepticism, saying that if received, the proposals would "not resolve the issue of the...anti-missile program."

IAEA Inspects N. Korea—A high-level team from the International Atomic Energy Agency arrived in North Korea in late May to certify that the country ceased its nuclear weapons program, which it pledged to abandon seven years ago, the *International Herald Tribune* reports. In the 1994 Geneva agreement North Korea pledged to give up the pursuit of nuclear weapons in exchange for international help in acquiring two light-water nuclear reactors to fulfill the country's energy needs. The certification of North Korea's cessation of the nuclear weapons program is required before the reactors can be delivered. Several analysts have alleged that North Korea is continuing its nuclear weapons program, or that it has not disclosed its holdings of weapons-grade nuclear material or actual nuclear bombs.

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subsystem tests, will be needed before the Pentagon will be ready to attempt realistic operational testing of such an NMD system.

Also, Pentagon plans at the time were that a new, higher acceleration, two-stage booster - needed for flight engagements that realistically could be expected on the battlefield - would have been through three successful development tests by now. The first of those booster development tests, which was to have taken place over a year ago, is still a couple of months away, a year and a half delay. And that is simply a test of the booster rocket, not of the full interceptor. The first flight intercept test **with** the new booster is now not to take place before the summer of 2002, again about a year and a half delay in a year and a half of elapsed time.

Concepts for a fixed, land-based, mid-course intercept system have been lambasted by scientists as being vulnerable to countermeasures and decoys, and any system is years from being ready for realistic operational testing, let alone effective deployment. Nevertheless, the Bush administration will continue to support this approach. They have little choice. It is the farthest along developmentally of any of the NMD approaches, and a necessary part of any future layered defense.

And there is no reason the administration cannot continue, or even accelerate, development of such a system. Development and testing of fixed, land-based, mid-course missile defense is permitted under the ABM treaty. In fact, the United States has been developing and testing a fixed-site, mid-course, missile defense system for at least a decade in compliance with the treaty.

Most flight testing is done at the Army's Kwajalein Missile Range in the Pacific Ocean, a test site that is specifically permitted under the ABM treaty. Targets are launched from Vandenberg AFB on the California coast towards Kwajalein, where the NMD interceptors are launched. So far, the intercepts have been attempted close to Kwajalein to maximize the time for search radars there to get a fix on the incoming target, and to limit the spread of rocket debris.

[A] fixed, land-based, mid-course intercept system … is years from being ready for realistic operational testing, let alone effective deployment.

In due course, during development, intercepts will be attempted at greater and greater distances from Kwajalein to demonstrate more realistic engagements, but this also will be permissible under the ABM treaty. Such tests are permitted under the ABM treaty because they are being used to demonstrate an NMD system that is intended to operate from a fixed, land-based site, and because the tests are carried out at a permitted test range.

More importantly, a mid-course missile defense system will need to demonstrate that it can discriminate decoys, countermeasures, and rocket debris from the real target, the re-entry vehicle of an incoming enemy missile. This will take many tests paced by time, money and other resources - again, not by the ABM treaty.

After 20 or so developmental tests, and assuming they all were successful, the Pentagon would want to do more realistic operational tests. For example, these might include tests where the target missiles were launched from Kodiak Island in Alaska towards Kwajalein. This would help demonstrate that the early warning radars, interceptors, and command and control systems can do their job together in a more realistic geometry, something that the current testing arrangement misses. Even this type of test, however, would not require a modification of the ABM treaty.

Eventually, realistic operational tests should be conducted in which the system is operated by real soldiers, without prior knowledge or warning, and in realistic battlefield environments, such as bad weather. Such operational tests are many years away. Still, there is no reason such testing would require changes or abrogation of the ABM treaty, because those tests arguably could be aimed at future deployment of a site defense rather than a nationwide defense, something the ABM treaty specifically prohibits.

Another reason why operational tests late in development might **not** be a problem under the ABM treaty is that it is not unusual for complex military systems to do poorly in such tests, even after years of development. When this happens, many more years of development and testing are sometimes required before a system can become operational.

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In any case, the language of the ABM treaty recognizes the potential need for amendments and new interpretations – and such changes have been made several times before. There is plenty of time for that, anyway.

Ironically, some members of Congress have said that NMD should be deployed without the benefit of well-planned development and operational tests, and, in fact, they have introduced legislation to that effect. While such legislation has never been enacted, one of its consequences would have been to eliminate a reason for modifying the ABM treaty.

Boost-Phase NMD

What about boost-phase missile defense? Under such a system, the interceptors could be launched from Navy ships, from land, or from aircraft. In any case, the interceptors must be close enough to the enemy missile launch site that the interceptors can catch up before the target has traveled too far and deployed its payload. The idea behind boost-phase missile defense is to kill the enemy missile when it is most vulnerable, early during its launch or ascent phase, and before its payload can be dispersed and disguised among other objects, decoys, countermeasures, or rocket debris. In addition, any intercept likely would take place far from U.S. territory.

The advantages of boost-phase defense are offset by a serious disadvantage: the reaction times are very short. The process of detection and classification of enemy missiles must begin within seconds, and intercept must occur within only a few minutes. In some scenarios, the reaction time to intercept can be less than 120 seconds. Since the response times are quite short, a boost-phase system would need to be essentially autonomous, commanded by computers. In other words, in any type of boost-phase NMD, there would be no time for the president, the national security adviser, the secretary of defense or foreign heads of state to be consulted.

The question is how soon would development of mobile, boost-phase NMD systems come to be in violation of the ABM treaty?

Naturally, the United States would want to test such a system - including the reliability of a fully computerized command and control network - before deploying it. But, again, it is not the ABM treaty that is holding up such work. That work can be done at various U.S. testing centers, including Kwajalein, or the White Sands Missile Range in New Mexico.

Some have suggested that the Army or Navy theater missile defense programs could be adapted and expanded for boost-phase NMD intercepts. Currently, these systems are intended to protect ships at sea or troops in the field, and such systems are not governed by the ABM treaty. However, if expanded to defend against long-range intercontinental missiles, these systems would fall under ABM treaty restrictions because they would then be defined as mobile NMD systems. The ABM treaty specifically prohibits mobile NMD systems, whether land, sea, air, or space based. Boost-phase NMD systems have to be mobile simply so that they could be positioned close to enemy territory without becoming too vulnerable to attack themselves.

The question is how soon would development of mobile, boost-phase NMD systems come to be in violation of the ABM treaty? For example, development of the components of such systems in the laboratory is not prohibited by the ABM treaty, nor is testing of those components at defense contractor or government test centers.

In reality, development of boost-phase systems will take many years. For example, the Navy Theater-Wide system is planning for theater-level deployment at sea in 2007. However, its booster rocket is too slow to adequately undertake NMD intercepts, and its radar is not capable of detecting NMD-class engagements. And, as with land-based boost-phase systems, the reaction times are very short, requiring development of fast and highly accurate command and control processes. The latter development alone could take many, many years, as integrated command and control systems remain a major technical challenge to current theater missile defense efforts.

The Army theater system, the Theater High Altitude Area Defense (THAAD) system, is scheduled for deployment in 2008. Since the fielding of Army and Navy **theater** systems is seven or eight years away, fielding of **boost-phase NMD** based upon these

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theater systems will take even longer, unless development and spending are dramatically accelerated. At current rates of expenditure, development and testing of boost-phase systems probably will take at least a decade.

Boost-phase NMD systems, whether on land or aboard ship, also would require very fast rockets and high acceleration maneuvering. Such rockets would take years to develop and test. As noted earlier, the interceptor rocket for mid-course NMD has been under development and testing for many years, and within agreed interpretations of the ABM treaty. Similarly, still faster rockets for boost-phase NMD could be tested in the United States in the same way.

With respect to the Airborne Laser and the Space Based Laser, each has its own special challenges. In the case of the Airborne Laser, there are important operational considerations. A Boeing 747 loaded with heavy laser apparatus, and flying close to an enemy makes an inviting target. To permit the 747 to stand back from the forward edge of battle, the airborne laser needs very high power to propagate through the atmosphere. In concept, the Airborne Laser could be used for either theater or National Missile Defense. Development of such a high-power laser is ongoing at contractor and government test facilities in full compliance with the ABM treaty. However, it will be many years before the system will have anti-ballistic missile capability and be ready to be tested in an ABM mode.

As for the Space Based Laser, no one has ever built and fielded a high-power laser in space, let alone maintained it in space. It takes teams of Ph.D. laser physicists, engineers and master technicians to maintain and operate high-power laser systems here on terra firma. In addition, the current prototype of the Space Based Laser is too heavy to be launched into space by existing U.S. booster rockets. Perhaps it can be made lighter and more powerful, but this will take time - at least a dozen years - and, again, the development and testing is not being held back by the ABM treaty. Years of development and testing will be needed in a fixed, land-based mode on the ground. Doing it in space won't be practical.

[T]he United States can force the ABM treaty to become an issue sooner by attempting, before current systems are ready, advanced tests with mobile elements prohibited by the ABM treaty …

With any mobile NMD approach, whether sea- or land-based, air- or space-based, at some point in time it will be essential to perform realistic operational tests with the system operated in its intended operational environment in an ABM mode. This would require modification of the ABM treaty, as would deployment of mobile NMD systems. However, such tests will not be possible without first constructing new Navy ships - in the case of a sea-based defense - or other large equipment - in the case of land-, air- or space-based systems - which will take time to design, develop and build.

Of course, the United States can force the ABM treaty to become an issue sooner by attempting, before current systems are ready, advanced tests with mobile elements prohibited by the ABM treaty, and by boasting that the Pentagon knows how to build an NMD system now. This would confuse U.S. citizens and allies alike, and unnecessarily complicate long-term and difficult technical work with equally difficult domestic policy and international relations questions.

Perhaps the greatest challenge for NMD, whether boost-phase, mid-course, or terminal, is building realistic simulators - computer models, hardware-in-the-loop, and man-in-the-loop test and exercise facilities that capture how all the elements of an NMD system might work. Such facilities are needed because it will never be practical to test and exercise all of the possible scenarios an NMD system might encounter. While the Pentagon would certainly want to conduct tests that are as realistic as possible, and which define the edges of an NMD operational envelope, it would not be practical to test and exercise every single possible point within that envelope.

So far, developing such simulators has been a daunting task, equal in difficulty to developing NMD itself. The NMD program is years behind in this area, and has much work to do.

Nevertheless, there is nothing in the ABM treaty that prohibits the development of such simulators. The problem has been building simulations with realistic views or scenes for search radars, satellites, and interceptor seekers, with accurate motion of the missiles in

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NATIONAL MISSLE DEFENSE

From the Annual Report by the Defense Department's Office of Operational Test and Evaluation

The following findings and recommendations are excerpted from the Director, Operational Test & Evaluation (DOT&E) Annual Report FY2000, authored by Philip E. Coyle and published February 2001 by the U.S. Department of Defense. The recommendations cover the development plan designed by the Pentagon under President Bill Clinton for a mid-course, land-based system of up to 250 interceptors, and associated radar and command and control systems.

DOT&E has voiced significant concern about the limitations of testing to date and the robustness of future testing to support a deployment decision for an effective NMD system. The Department [of Defense] is developing revised plans for the NMD program, which is attempting to address those limitations.

RECOMMENDATIONS

The NMD testing program of record was intended to accommodate an aggressive pace of development. However, the program is not aggressive enough to match the pace of acquisition to support deployment, and the test content does not yet address important operational questions. Because ground test facilities and models and simulation for assessment are considerably behind schedule, a more aggressive testing program, with parallel paths and activities, will be necessary … This means a test program that is structured to anticipate and absorb setbacks that inevitably occur.

- Target suites used in integrated flight tests need to incorporate challenging unsophisticated countermeasures…
- Discrimination by the radar and EKV [exoatmospheric kill vehicle] should be given more weight in performance criteria. Discrimination by the EKV…will be the biggest challenge to achieving a hit-to-kill intercept.
- An innovative new approach needs to be taken towards [hardware-in-the-loop] testing of the EKV, so that potential design problems or discrimination challenges can be wrung out on the ground in lieu of expensive flight tests…
- Finally, DOT&E recommends that the growth path from Capability 1 [20 interceptors] to Capability 2 or 3 [100 to 250 interceptors] be rigorously defined and evaluated. A program to reach [Capability 2 or 3] will involve more demanding scenarios in a complex operational architecture than that required of [Capability 1]. The program office needs to ensure that such growth is realizable.

multi-axis test chambers, and with realistic command and control elements. If the United States is serious about NMD, a great deal of work is needed in this area of computer modeling and simulation, and none of it is restricted by the ABM treaty.

Such simulations also will be used to explore systems-of-systems interoperability; i.e., the ability of all the elements of an NMD system to work together. NMD program officials themselves have admitted that this is one of the greatest challenges because of the complexity involved.

Some have joked that the real enemy of NMD is the ABM treaty itself.

So, the United States faces a very complex and difficult set of NMD development problems involving combinations of different intercept approaches - boost-phase, mid-course, and terminal - with different types of platforms – land-based, sea-based, aircraft- or satellite-based - and different friendly countries to be defended from other unfriendly countries.

Executing these many options is not affordable without substantial increases in spending. The spending required to pursue these options is the real current issue, not the ABM treaty. Until the U.S. government learns whether the technical, budgetary, and operational problems that National Missile Defense presents can be solved, the ABM treaty is the least of President Bush's problems. ■

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