AUSA Background Brief
No. 88
November 2000
An Institute of Land Warfare Publication

## Space and Missile Defense Challenges:

# National Missile Defense—Protecting Our Nation

**(Second in a series of four Background Briefs based on information obtained from U.S. Army Space and Missile Defense Command)**

*The rapid spread of technology across increasingly porous borders raises the specter that more and more states, terrorists and criminal syndicates could gain access to chemical, biological or even nuclear weapons, and to the means of delivering them whether in small units deployed by terrorists within our midst or ballistic missiles capable of hurling those weapons halfway around the world. . . . There is the possibility that a hostile state with nuclear weapons and long-range missiles may simply disintegrate with command over missiles falling into unstable hands. Or, that in a moment of desperation, such a country might miscalculate, believing it could use nuclear weapons to intimidate us from defending our vital interests or from coming to the aid of our allies or others who are defenseless and clearly in need.*

President Clinton, 1 September 2000

## Introduction

After fifty years of research and development of ballistic missiles and missile defense systems, and many aborted attempts to field systems designed to provide a limited missile defense for the homeland, today the United States still has no capability to defend itself against even one incoming ballistic missile. The President's recent decision to delay a national missile defense (NMD) deployment decision to the next administration provides more time for testing and evaluating of NMD components, but puts into question our nation's ability to meet the emerging threat. It also reopened the door for increased debate on the form a future NMD capability should take—land-, sea-, air- or space-based, or a combination of some or all. But the single option that meets the threat within the next decade remains the land-based option.

## A Historical Perspective

The process to develop a defense against missiles began in February 1946, when the Army Air Force awarded two contracts for the purpose of developing the characteristics for antimissile systems. In November 1956, following a lengthy debate between the Army and Air Force—who were both conducting antiballistic missile (ABM) research and development programs—Secretary of Defense Charles E. Wilson issued a memorandum assigning the Army responsibility for the development, procurement and manning of land-based surface-to-air missile systems for point defense.

In 1957, the development of a strategic defense system took on a new sense of urgency when the Soviet Union launched SPUTNIK I. In 1965, the People's Republic of China exploded their first nuclear device and announced they were experimenting with missile technology. Strategists then began to contemplate limited strikes by nations other than the Soviet Union.

In September 1967, the administration decided to deploy an ABM system—Sentinel. This decision called for the defense of urban and industrial targets, with the expansion capability to defend selected American intercontinental ballistic missile (ICBM) bases. Rising public opposition to American involvement in the Vietnam War and to the military in general, and the realization by the people who lived in the cities where Sentinel sites were to be built that the missiles contained nuclear warheads, caused Secretary of Defense Melvin Laird, in February 1969, to order all work on the Sentinel base construction to cease.

In March 1969, President Nixon decided to deploy only ABM defenses of ICBM sites. This deployment, called Safeguard, called for 12 sites, with construction to begin immediately at two sites—Grand Forks, North Dakota, and Malmstrom Air Force Base, Montana. Follow-on construction would take place at the other ten sites, based upon an annual threat evaluation. When completed, Safeguard would provide limited protection against a small attack by the People's Republic of China or an accidental launch by anyone else.

In 1972, the United States and the Soviet Union signed the Anti-Ballistic Missile Treaty limiting each nation to two ABM sites—one at a location selected by the signatory and one at each National Command Center (Washington, DC and Moscow, respectively). In 1974 a protocol added to the treaty limited each side to only one ABM site.

With the arms limitation agreement in effect, Congress determined that, once completed, the continued operation of Safeguard was not justified. After only 135 days in operation, on 10 February 1976, the Joint Chiefs of Staff, in response to congressional direction, ordered the termination of the Safeguard mission.

Despite reduced funding levels for ABM research through 1984, research and testing did continue and on 10 June 1984, as part of the Homing Overlay Experiment, the Army proved that an exoatmospheric intercept of an ICBM mock reentry vehicle with a nonnuclear warhead was possible.

A new era in ABM defense began on 23 March 1983 when President Reagan announced his concept for the Strategic Defense Initiative (SDI). His goal was to create a nationwide defense shield against ballistic missiles that would make nuclear weapons impotent and obsolete. On 25 March 1985, President Reagan issued National Security Directive 85, implementing his plans for the Strategic Defense Initiative. Funding for research, development and testing of missile defenses increased significantly.

Fourteen years later, on 2 October 1999, at approximately 7:32 p.m. PDT, an exoatmospheric kill vehicle located, tracked and then intercepted an ICBM target approximately 140 miles above the Pacific Ocean during In-Flight Test (IFT)-3. This was the first intercept attempt in a series of planned tests to be accomplished before fielding the land-based NMD system.

As we have learned from previous missile defense development efforts, it is reasonable to expect some tests will not be completely successful. IFT-4 accomplished most test objectives, but failed to achieve an intercept due to a "plumbing" problem—a pinched tube precluded the proper cooling of the infrared sensors used to determine the maneuvers required during the last six seconds before intercept. IFT-5 accomplished some of its test objectives, but failed to achieve an intercept because of a faulty circuit board on the upper stage of the launch vehicle that precluded the kill vehicle from separating from the booster rocket. Both of these failures are a direct result of quality control problems—not with the ability to conduct an intercept in the exoatmosphere (IFT-3 proved it could be done). The next intercept attempt is scheduled for early 2001.

## How Much NMD Capability Does the Nation Want?

Because of the President's decision not to move forward at this time with deployment of the land-based system, there has been much discussion in the media lately about alternative systems such as a sea-based NMD; the employment of space-based lasers; and even a joint boost-phase intercept program with Russia. As with theater missile defense, the greatest level of protection would come from a multilayered defense that provides the capability to engage the missiles before launch; the capability to intercept any launched missile throughout its entire flight path; and personal protection should a missile successfully penetrate our active defenses. The NMD Capstone Requirements Document (CRD) will address the requirement for a multilayered defense.

Given unconstrained resources, it would make sense to build systems that conducted intercepts in the boost, ascent, mid-course and terminal phases. Unfortunately, we live in a world of constrained resources. The current plan calls for the development of a limited land-based capability to deal with a limited attack from "states of concern." The system and technology associated with this plan is the furthest along in the development process. If the nation were to decide it wanted a more robust capability, it has only a few choices: (1) to continue the current plan to develop and field a limited land-based capability and follow it with sea-based and/or space-based capabilities; (2) to develop an entirely new plan that concurrently develops the land-based system and one or both of the other systems; or (3) to scrap all the work completed on the land-based system and give priority to one or both of the other systems. If option 2 or 3 is chosen, the nation is put at risk in the near term because money would have to be shifted from the current plan to the new plan.

## The Space-based Laser Option

Should the nation decide its wants a more robust NMD capability than the currently planned land-based system, an Air Force-operated space-based laser could very well be a part of the more robust system. However, as with ongoing development of the land-based system (and any sea-based system) there are unique challenges to be overcome for it to be a viable capability.

First, coverage of all potential launch locations will require a significant number of systems in low-earth orbit that are operational 24 hours a day, 365 days a year. The timeline between launch and completion of the boost phase is so small, there is no time available for maneuvering a space-based laser into position upon launch detection—it must already be in position and ready to fire. Second, in that the space-based laser would direct energy against the booster before it completes its burn, the effectiveness of any engagement attempt is susceptible to various booster countermeasures, such as salvo launches, or fast-burn boosters. Third, in that the timeline involved in boost-phase intercepts is so small, it would have to be decided early on in the development process whether to carry out space-based laser operations autonomously or with human control. And fourth, there is no guarantee that the warhead would be destroyed during a boost-phase intercept, so it must be considered where any remaining warhead could land after the booster is destroyed and rules of engagement developed that consider the potential for a remaining warhead landing on friendly (or neutral) territory.

To date, no one knows exactly what an operational space-based laser would look like. An architecture study is ongoing to define a design. From a technological perspective, the challenges represented by a space-based laser system are well beyond those of any existing laser system, let alone one that may operate autonomously in space. These and many other tough issues would have to be resolved before a space-based laser could become an effective element of any national missile defense system. If this alternative were selected, it probably could not begin to come into existence until the end of the next decade, and then only after significant funding increases.

## The Sea-based Option

Another alternative receiving much discussion right now is a sea-based NMD capability that would intercept missiles in their boost and ascent phases. If the nation decides it wants a more robust NMD system than is currently planned, a sea-based capability will prove itself to be a very valuable contributor. However, there are several unique challenges facing a sea-based NMD:

- To ensure coverage of all potential launch sites 24 hours a day, 365 days a year, a forward-deployed fleet of properly equipped ships would probably have to be dedicated to the mission.
- Geography, in some cases, will preclude the positioning of ships where they can be effective against certain potential launch points. Additionally, an adversary could change launch locations or configuration, causing our sea-based defense to suddenly be in the wrong position.
- For those high-value ships positioned close enough to hostile shores to be effective in an early intercept attempt, increased survivability provisions must be developed.
- The Aegis combat system's SPY-1D phased-array radar is optimized for the performance of its air defense mission. The addition of an NMD mission will require a major reworking and/or augmentation of the Aegis' target acquisition systems (a difficult task considering the complexity of the system's 12 million lines of computer code and the physical configuration of the system).
- Perhaps the most significant obstacle to be overcome is the much faster interceptors required for boost and ascent phase intercepts. These interceptors will drive significant modifications to existing ship hulls and/or new ship construction. These interceptors will, by necessity, have to be larger than the current vertical launch system (VLS) can handle, and the pressure and heat generated by the launch of these fast interceptors may be more than the ablative material lining of the existing VLS can withstand. Modifying existing ship hulls is a difficult, expensive and time-consuming process. Designing and then building new ship hulls is a very long and drawn-out process. The hull design for ships to be built starting in 2007 is locked. The next opportunity for change of this magnitude is probably around 2012.

The current Navy Theater Wide (NTW) program would most likely be the starting point for any development of a sea-based NMD capability. As it now stands, the NTW program is structured to field an integrated Block I NTW capability by 2010. Building on the NTW development effort to get a sea-based NMD capability will take time and significant amounts of additional funding. It is doable, but probably not before the middle of the next decade.

## If the Nation Wants NMD Protection This Decade

The only NMD option the United States can deploy within this decade is the land-based option. No other option, no matter how much money is thrown at it, is possible before the beginning of the next decade. If the nation wants a more robust NMD capability at some point in the future, then adding a sea-based element and later a space-based element makes sense. What doesn't make sense is having no defense—and that is the situation the United States is in right now.