Statement of Rear Admiral Richard D. West, USN
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before the Committee on National Security, House of Representatives
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Mr. Chairman, and Members of the Committee, it is my privilege to appear before you today to testify on the Department's National Missile Defense (NMD) program and the Military Services' emergency response options.

It is important to put the NMD program in the proper perspective, including various NMD architectures, deployment timelines, program schedules and estimated costs. Congress and the American people deserve to have the NMD program presented to them in a clear and understandable fashion.

Because of concerns about the emergence of a ballistic missile threat to the United States sooner than the Intelligence Community projections at that time, in late 1994, the Ballistic Missile Defense Organization (BMDO) commissioned a Tiger Team Study to identify feasible and effective architectural alternatives that could be deployed on a very short timeline. Both the Army and Air Force proposed architecture options were developed as a part of that study. The Team estimated time scales of approximately four years to deployment and described several opportunities and associated challenges to deploy an interim NMD capability to deal with rudimentary Third World threats to the United States.

The Army and Air Force emergency response architectures that could be deployed with in the next few years, **should the Nation face a ballistic missile threat sooner than anticipated**, do **not** represent NMD programs. Instead, they are contingencies which would be considered for execution in the event of a clear and present danger to the Nation's security.

Early in calendar year 1995, the Department developed a set of NMD program options. These included an enhanced NMD baseline development effort, an emergency response system, and an enhanced NMD technology program. The enhanced NMD baseline program became the Department's 3 plus 3 program. The emergency response system program included the Air Force and Army options. The enhanced NMD technology program would have focused more emphasis on longer-term NMD technologies, such as directed energy weapons.

U.S. Air Force Emergency Response Architecture. The Air Force recommendation consists of an early deployment option, should a national emergency require fielding an NMD system before the 2003 timeframe. Building upon the existing Minuteman intercontinental ballistic missile infrastructure, this architecture would deploy 20 Minuteman missiles equipped with kinetic energy kill vehicles in existing silos at Grand Forks AFB, North Dakota. A network of upgraded early warning radars would support the interceptors. The Air Force projects that such an architecture would cost about $2.5 billion and could be deployed in about four years. However, my predecessor, LTG O'Neill assessed the Air Force cost estimate to be preliminary. In particular, LTG O'Neill assessed the Air Force cost of the kinetic kill vehicle was underestimated by approximately a factor of five.

U.S. Army Emergency Response Architecture. The Army responded to the emergency deployment challenge by proposing a booster which combines existing commercial booster stages to launch the kill vehicle. This kill vehicle is already under development. In order to enhance radar coverage, the Army proposes to augment early warning radars and utilize a ground-based radar (GBR) that uses technology adapted from the theater missile defense Theater High Altitude Area Defense (THAAD) GBR. The Army estimates that this emergency deployment option could be executed for approximately $3.5 to $5 billion. This Army estimate includes development, testing, production, and fielding of a system which could be operational in slightly more than four years. The Army proposal basically accelerates an architecture similar to the Department's 3 plus 3 NMD system. I would have to caveat the Army schedule estimate as riskier than other approaches, since the architecture does not take full advantage of existing hardware.

The Army and Air Force have described NMD options which could provide a limited capability against simple, rapidly-emergent threats somewhat earlier than the 3 plus 3 system. Although the two Services affirm that their respective systems could be deployed at a somewhat lower cost than the 3 plus 3 system, I would remind the Committee that Deputy Secretary White, in his June 5 letter to Representative Spratt, expressed concern about the fidelity of those cost estimates. He stated, "These cost estimates have important omissions and may be substantially understated." More importantly, although these options should be considered in the context of a national emergency, they do not include many of the features normally required when developing and acquiring military weapons systems. In developing the 3 plus 3 program, the Department has sought to capture the strongest features of each proposal. Therefore, the 3 plus 3 program represents a reasonable approach which balances speed of deployment (and its attendant schedule and cost risk) with a more optimum defensive capability against a broader spectrum of potential threats.

The Department of Defense 3 plus 3 NMD Program. In response to the evolving ballistic missile threat, the NMD program has been elevated from a technology development effort to a Deployment Readiness Program. A Joint Program Office is being established under BMDO with a charter to develop an NMD system for possible future deployment. The Department of Defense has also designated NMD as a Major Defense Acquisition Program (MDAP) to ensure that it receives an appropriate level of management attention and oversight.

The mission of the NMD system under development is to defend against an ICBM attack consisting of several missiles launched at the United States from a rogue nation or a very small, accidental launch from more nuclear capable states. The system development is scheduled for completion within three years with an integrated system test conducted by the end of 1999. The integrated system test will demonstrate the NMD system's capabilities. The decision to deploy this system will be deferred until after a successful demonstration and the validation of a threat. If a decision to deploy were made in 2000, with additional funding the system could then achieve operational capability in another three years, i.e., by the end of 2003. If a decision to deploy is not made in 2000, the program will continue to improve the NMD deployment readiness posture by advancing the technology of each element and adding new elements, while maintaining the capability to deploy the system within three years of a decision.

NMD Architecture. A National Missile Defense architecture requires systems called "elements" to perform a number of key functions during a ballistic missile defense engagement.

There are several functions performed by the elements in a typical ballistic missile defense engagement: First, an **Early Warning Sensor** element detects the launch of one or more ballistic missiles and forms initial estimates of the missiles' tracks and targets. These estimates are then passed to the **Battle Management, Command, Control, and Communications System (BM/C3)** element. This system notifies the Command Center of the launch and provides data supporting the time-critical decision on whether the launch is hostile. The **BM/C3** element directs other **Sensor** elements to continue the tracking and threat identification function throughout the missileÍs trajectory. These elements provide data of two primary types: accurate tracking data to provide weapon engagement information; and detailed threat signature data to distinguish among warheads and other objects in the threat. The **BM/C3** element processes these data and continually relays current information to the human-in-control. Under human control, the **BM/C3** element provides specific threat and trajectory information to one or more ballistic missile defense **Weapon** elements and tasks the appropriate element to engage and destroy the threatening warheads. The **Sensor** elements continue to provide improved observational data in support of ongoing engagements. Following each engagement, the **Sensor** elements observe the results of the engagement, providing "kill assessment" data with which to assess its success or failure.

The initial NMD deployment is being designed to defend all 50 states from a single, central United States site. The Ground Based Interceptors and a Ground Based Radar will be located at Grand Forks, North Dakota, which serves as the single United States site permitted under the ABM Treaty. Since space-based sensors are not likely to be available if this architecture is deployed by 2003, the architecture includes the option to utilize forward-based radars, whose location would be contingent upon the specific Third-World threat against which the system is deployed.

These elements are depicted as they might be deployed for a notional single-site architecture in Figure 1. Quantities and other deployment data for such a single-site deployment are presented in Table 1. The Early Warning satellites would detect the launch of one or more threat missiles and track their bright infrared plumes until booster burnout. They would then pass an estimate of the threat trajectories via the BM/C3 system to the command center, so that the decision maker can authorize the defense to engage the incoming threatening warheads. The Early Warning Radars and any other forward based radars, if present, would gather tracking and threat assessment data to support commit of the interceptor and to provide guidance updates for the interceptor via the BM/C3 upon launch. Following weapon release authority, and upon command, one or more interceptors would be launched to engage the threat. Depending on the trajectory of the threat and the specifics of the defense deployment, the BM/C3 system would process the GBR and the other radar systems data to provide further threat data to the interceptor during flight. This activity would support discrimination of warheads from penetration aids and provide better interceptor guidance against the targets. As the interceptor approaches the target, it would acquire the target objects via their infrared signatures with its on-board sensor, select a target from external and internal data, and be guided to a direct high-speed collision by its own computers and propulsion systems. The radars would continue to take data throughout the defense engagement in order to perform kill assessment. For some deployments and threats, there may be sufficient battle space to allow time for multiple waves of interceptors.

The NMD Systems Engineer, in conjunction with the Element engineering effort, will play a crucial role in providing the necessary integration and orderly development of an NMD System which meets the user's requirements. The NMD Systems Engineer must ensure the development of the optimum system which meets all requirements and provides the proper balance of system performance, life cycle cost, development schedule, and risk. Much of the technology which constitutes the individual elements of the NMD program is mature. The largest challenge is the integration of all the elements as a system. This challenge is being worked aggressively and is the centerpiece of the 3 plus 3 strategy. The Systems Engineering and Integration contractor is on track to complete the Systems Requirements Review (SRR) in August 1996. Results from this review could result in modifications to the NMD architecture and a rebalancing of the element requirements to meet the system performance thresholds. Such modifications, if required, could result in a cost increase and a possible schedule delay.

The development program, to be executed over the next three years, will comply with the ABM Treaty. Should a deployment decision be made after three years, the system components that are ultimately fielded might comply with the current treaty, or might require modification of the Treaty. Such treaty decisions will depend upon the requirements of the threat situation.

NMD System Performance. This system would provide excellent protection of the U.S. for small numbers of simple threats (e.g., a few warheads from a rogue nation). It would also have some capability against a small accidental launch from more nuclear capable states. However, if the number of threats increases or the complexity of the threats increases, then this basic system is likely to provide poor protection of the U.S. Such poor protection is partly a result of a lack of sufficient discrimination capability against complex threats, which in turn will cause the interceptor inventory to be depleted by shooting at warhead decoys, and thus allow some real warheads to penetrate the defense. This deficiency could be significantly mitigated with the introduction of the U.S. Air Force Space and Missile Tracking System (SMTS). It is important to note that the system is **not** designed to protect against an unauthorized launch which might contain a large number of warheads (e.g., a full load of warheads from an SSBN).

NMD System Costs. The estimated costs to develop, produce and deploy a notional single-site system, as described above, are presented in Table 2. Costs for development are estimated at about $2.5 billion, for a total program cost of about $10 billion to deploy. Since the NMD program has recently been designated a MDAP and is still in the process of developing the actual architecture for an NMD system, there is uncertainty associated with the costs listed in Table 2. For example, the actual booster selected for the NMD interceptor as well as the type and quantity of forward-based early warning radars, both of which will have significant impact on the total system costs, have yet to be determined. A more precise estimate of the actual costs will be available by the end of the year.

NMD System Elements

To perform the functions described above, BMDO is developing, testing, and integrating the five major components listed on Table 1. The following paragraphs describe their individual functions and status.

Ground-based Interceptor. The Ground Based Interceptor (GBI) and its associated components provide the "muscle" of the NMD system. The GBI mission is to engage high speed ballistic missile warheads in the midcourse (exoatmospheric) phase of their trajectories and destroy them by force of impact. The GBI consists of:

- an intercept component called an exoatmospheric kill vehicle (EKV), which conducts the engagement,
- a booster, which propels the interceptor toward the approximate location to engage a warhead, and
- the ground command and launch equipment needed to fire the interceptor.

The GBI launches on a commit message from the Battle Management, Command, Control and Communications element and flies towards the target's predicted location. Aided by one or more in-flight target updates, the interceptor kill vehicle acquires the target cluster using on-board sensors. It then employs on-board target selection algorithms or a target object map obtained from the sensor systems in the architecture in order to determine which object is the proper target. The GBI adjusts its ballistic trajectory to collide with the target. Both the interceptor and the target are demolished as a result of the high kinetic energy impact of the collision.

Exoatmospheric Kinetic Kill Vehicle (EKV). The EKV is the intercept component of the Ground Based Interceptor. The EKV has its own sensors, propulsion, communications, guidance, and computing, which perform the following functions:

- Its sensors acquire and track the objects in the threat and provide measurements that, when used with externally provided data, permit the selection of which object is to be engaged and support homing maneuvers including the selection of a lethal aim point.
- Its propulsion system changes the orientation of the interceptor, performs large-scale maneuvers to bring the vehicle to a position to engage the warhead, and conducts final, fine-scale maneuvers to destroy the target warhead upon impact.
- Its two-way communications system receives guidance information updates and transmits health and status data; and
- Its computers support the engagement targeting decisions and maneuvers.

The major EKV component is a multiple-waveband infrared seeker which allows the EKV to acquire and track targets. The seeker consists of a focal plane array(s) and a cryogenic cooling assembly at the end of an optical telescope. Supporting the seeker is supported by processing hardware and software which also support target acquisition, tracking, and discrimination.

Currently, two EKV contractor teams utilizing two different sensor approaches are integrating sensor hardware in preparation for two sensor flight experiments. These experiments will demonstrate for the first time that our EKV sensors can operate in the flight environment. The data collected by the sensors will be transmitted to the ground and used after the flight to validate discrimination software and define any changes required. The first EKV sensor flight test is currently scheduled for this Fall, with the second flight in early 1997.

The EKV contractors have also begun to procure kill-vehicle hardware for intercept flights scheduled for FY98. As the components arrive from the manufacturers, they will be integrated into systems and tested. Current plans include hardware-in-the-loop (HWIL) testing of the seekers and electronics, cold chamber testing and calibration of the seekers, and strap-down testing of the Divert and Attitude Control System. The assembled EKVs will be integrated with the Payload Launch Vehicle (PLV), a test surrogate for a dedicated booster. Additional HWIL tests will be conducted prior to flight testing to ensure that the air vehicle (EKV integrated with booster) will perform as intended. A down selection between the contractors is scheduled for FY1998 although it is also possible that both EKV concepts will be retained past that time.

GBI Booster: The Ground Based Interceptor program will either develop a new booster or modify an existing booster which can satisfy both National Missile Defense coverage and time line requirements. To achieve 50-state coverage from a single central-United States interceptor site, interceptor velocities of at least 7.2 km/sec must be achieved. Until such a booster has been selected, GBI tests are being supported by a Payload Launch Vehicle with significantly less boost velocity. When the full-capability booster has been tested to ensure proper operation and payload deployment, it will replace the Payload Launch Vehicle.

The GBI booster will launch the EKV toward an intercept point in space estimated from available sensor data at the time of launch. While on the ground, the interceptor will be housed in a launcher along with its associated built-in test equipment and environmental support equipment. In order to increase reliability and reduce life cycle costs, the GBI is designed to remain dormant until a ballistic missile attack occurs.

There are three candidate booster approaches being considered:

- Combinations of existing missile stages. A number of combinations of existing missile stages could provide the required performance. These candidates could be configured to provide booster burn times compatible with National Missile Defense engagement requirements, and burnout velocities compatible with 50-state coverage. All such configurations would feature demonstrated producibility in the quantities needed.
- Development of a new booster. This candidate could be based on either single stage or multiple stage technology. The advantage of new booster development is that the booster performance can be optimized for GBI size (length and/or volume) and burn time requirements.
- Reconfigure Minuteman boosters. Major advantages include the use of existing hardware and an infrastructure which could be adapted to defensive use, as well as the ability to cover all 50 states from a single site.

Initiation of the decision and development of dedicated GBI booster and launch equipment will begin in Fiscal Year 1998. It is currently planned that the NMD Joint Program Office will issue one or more requests for information for GBI element integration and/or booster development in the near future.

Until the dedicated booster is available, flight tests will be conducted using the Payload Launch Vehicle. The PLV consists of the second and third stages of retired Minuteman II boosters, modified as necessary to function as first and second stages. PLV performance is adequate for testing, but is insufficient for single-site coverage of all 50 states.

Command and Launch Equipment: The Command and Launch Equipment consists of the hardware and software for BM/C3 interface, human-in-control oversight, interceptor storage (silos), launch and readiness functions. For a deployed system, Peculiar Support Equipment such as test equipment, specialized software support, and transportation equipment will also be acquired to fully support the integrated logistics support functions.

NMD Site Radar: As a primary fire control sensor for the National Missile Defense, the Ground Based Radar (GBR) would perform surveillance, acquisition, track, discrimination, fire control support, and kill assessment. Before the launch of an interceptor, the radar would search for threat objects, either autonomously or in response to information from other sensors on where to look. After acquiring one or more threat objects, the radar would track them, estimate their trajectory parameters, and, based on threat-object signatures, attempt to classify them into categories such as "warheads" or "decoys." When the available information becomes sufficient, then interceptors would be launched. During interceptor flight, the radar would continue to track the target to obtain improved target-trajectory and target-signature data. These data would be used to redirect the interceptor prior to its intercept attempt. Following the engagement, the radar would continue to collect data for assessing the intercept and the destruction of the target.

The NMD Ground Based Radar will be a phased array X-band radar with a radiating surface about 12 m in diameter. In its full-power configuration, it will have an acquisition range of 4,000 km or more against typical warheads. The radar will be built with a degree of hardening against nuclear effects, particularly against high-altitude electromagnetic pulse. Environmental conditions, including snow and ice and other natural or manmade environments unique to the deployment locale, will also affect the design of the radar. The prototype version designed for use in the testing program will have reduced range (2000 km or more) and reduced levels of nuclear effects hardening. The prototype radar can be modified, if needed, to give it objective-level performance.

The NMD Ground Based Radar prototype is being procured through a "Family of Radars" acquisition approach which emphasizes the commonality of hardware and software components that satisfy both theater-defense and national-defense radar requirements. Significant cost savings will result from this approach. The contract for the prototype ground based radar was executed in the first quarter of Fiscal Year 1996. The program builds on the ongoing development of the theater version of the ground based radar. It includes some aspects specific to the national missile defense radar, such as: development of computer software for operating the radar and evaluating its signals; simulations that test the hardware and software together; and support of integration testing with the other NMD elements. The prototype radar will be installed at the NMD system test range at Kwajalein atoll in the Pacific in time for use in radar tests and the Integrated System Test in 1999.

Upgraded Early Warning Radars (UEWR): Upgrades to America's Early Warning Radar network will provide existing forward-based attack warning system the capability to augment the operation of an NMD system. The specific advantage of utilizing upgraded early warning radars in the NMD architecture is the ability to be modified on a very short schedule. The cost of modifying existing radars is significantly less than the cost of building and deploying new radars.

The Upgraded Early Warning Radars (UEWRs) will detect, track, and count the individual objects in a ballistic missile attack early in its trajectory. Their data will extend the detection capability of the ground based radars, by telling them accurately where to look. This data will also improve the performance of the ground based interceptors by permitting them to be launched early and to operate in a larger region of space. The increased battle space will support earlier intercept opportunities and, potentially, more intercept attempts per attacking warhead.

America's early warning radars are large, fixed, phased array surveillance radars used to detect and track ballistic missiles directed toward the United States. The Upgraded Early Warning Radars operate by continually scanning the horizon in the direction from which potential attacks would come. However, an alert from the Early Warning Satellite systems would improve their performance.

In their current configurations, these radars can detect and develop approximate impact-location data for objects associated with a missile launch, such as the last missile stage. This information is insufficient for use by a ballistic missile defense system for two reasons. First, it does not track each missile long enough before returning to the "search" mode. Second, it does not permit the derivation of sufficiently accurate trajectory parameters to support intercepts. Upgrades in the system's software and modest changes to the hardware are needed to address these shortfalls and to make the data obtained available to the NMD BM/C3 system.

A program is about to begin which would prepare and demonstrate the needed upgrades to the existing early warning radars. Depending on the anticipated threat (east coast or west coast) at the time of a defense deployment decision, the appropriate BMEWS and/or PAVE PAWS radars will be upgraded for inclusion in the NMD architecture. If needed, other existing forward-based radars (such as Cobra Dane or HAVE STARE) could also be used to support the NMD system.

However, there are significant risks involved in the UEWR program. For example, the radars are old, and spare parts are difficult to obtain. Their long term availability is by no means assured. Moreover, these radars are costly to operate and maintain. A viable operations and maintenance program will have to be agreed upon if these systems are to remain part of the architecture. Their removal would increase risk and reduce system performance at least until the SMTS system becomes operational.

Forward Deployed Radars: Forward basing of a ground based radar places the radar in a position to obtain accurate data from early parts of an ICBM's trajectory. The advanced technology associated with X-band radars provides high angular resolution, thereby permitting effective performance against closely spaced threat objects. Together these radar attributes provide for early and accurate target-tracking and signature data, thus permitting earlier launch of defense interceptors and a greater battle space within which they can operate. The overall defense performance is therefore maximized.

Battle Management, Command, Control and Communications (BM/C3):
Through the BM/C3 element, the Commander in Chief of the North America Air Defense Command would control and operate the system, and the elements would function together as an integrated system.

The BM/C3 element is the "brains" of the NMD system. It has five main functions:

- It conveys information to the operational command and control system, and provides decision aids to support essential human-in-control decisions;
- It fuses data from different sensors;
- It develops plans for engagement and battle execution;

- It relays command and control decisions and directives to the defense system, including weapon release, to implement a successful defense of the United States against ballistic missiles; and
- It is the vehicle for information transfer and processing among the elements of the defense system.

If it is determined by the Command Authorities that a ballistic missile attack upon the United States is in progress, available space-based and ground-based surveillance and warning system assets would be queried for early track correlation data and impact point prediction. Under human direction, readiness postures would be upgraded to ensure the smooth transition of National Missile Defense assets from peacetime to wartime operating modes; and automated BM/C3 decision aid software would develop, as a result of a range of pre-determined response options, a battle plan that fully embodies the Commander's operational strategy.

The developed operational battle plan would include sets of operating thresholds and strategies which control the selected NMD weapons, sensors and communications. The BM/C3 element's engagement planning software would apply these rules to the threat data from the sensors and would generate plans for aiming and using the sensors, weapons, and communications links. During the battle these plans would be adjusted as new information becomes available and as the early engagements take place.

The nature of the BM/C3 operational plan requires that the human commander monitor and evaluate the threat and the NMD system's performance. The BM/C3 system will provide the human in control with the capability to change the operational plan in real time to improve performance by adjusting his/her use of NMD resources.

The BM/C3 element supports the user with extensive decision support systems, displays, and situation awareness information. It correlates the best available intelligence information, current NMD system status, and data from all sensors and sensor systems. In this way, it supplies the means to plan, select, and adjust missions and courses of action; and it provides the vehicle to disseminate Weapons Release and other Command decisions to the NMD system elements.

The communications component of the BM/C3 element has two sub-components:

- The Battle Management, Command, Control and Communications Network to convey information among the system's elements and sites, via the appropriate interfaces, and to external systems; and
- The In-Flight Interceptor Communications System (IFICS) that arranges for information flow to and from the in-flight interceptors.

An evolutionary development approach based on the "build-a-little, test-a-little" philosophy has been adopted for the BM/C3 element. This approach is appropriate for systems with heavy warfighter interfaces because such systems require significant user involvement and feedback during requirements definition and also in the implementation phase. This evolutionary approach capitalizes on current technology, and therefore reduces cost, schedule, and performance risks to the BM/C3 element. Furthermore, this approach will leverage off existing BMDO and

Service resources and utilize proven Commercial-Off-The-Shelf (COTS) and Government-Off-The-Shelf (GOTS) software wherever possible.

In Fiscal Year 1995, BMDO awarded a Battle Management, Command, Control and Communications/System Engineering and Integration Contract for the implementation of BM/C3. The contractor has defined the BM/C3 element in terms of its critical performance requirements and key test parameters.

Space And Missile Tracking System (SMTS): In addition to the elements being developed by BMDO, future NMD systems will significantly be enhanced by the sensing capability of the Space and Missile Tracking System (SMTS). This system, developed by the Air Force as part of the Space-based Infrared System (SBIRS), has been allocated those mission requirements that are best met by a low-altitude system with long-wavelength infrared sensors, primarily the ballistic missile defense mission. The unique orbit and sensors on SMTS will also provide valuable technical intelligence and battle-space characterization data.

In support of defense of the United States against a ballistic missile attack, SMTS would support the maximum possible defended area from whatever configuration of ground-based interceptor sites is available at the time of the attack. The SMTS constellation of sensors and satellites will acquire and track ballistic missiles throughout their trajectories. Unlike the DSP and SBIRS High satellites, SMTS will be able to continue tracking the warheads after the missile booster stages all burn out and the warheads are deployed. This information provides the earliest possible trajectory estimate of sufficient quality to launch interceptors for a midcourse intercept. By providing this over-the-horizon precision tracking data to the NMD system, the interceptors can be fired before the missiles come within range of the ground based radars at the defense sites. This maximization of their battle space:

- increases the probability of defeating the threat by providing the maximum number of opportunities to shoot at each incoming warhead;
- maximizes the area that can be defended for any given interceptor deployment by permitting the interceptors to travel the farthest from the deployment sites; and
- allows the warheads to be destroyed as far as possible from the area defended.

Not only is it beneficial to get the interceptors in flight as early as possible, but once in flight, the interceptors must be supported with tracking updates and identification information on the correct target. The lethal ballistic missile warheads must be discriminated from associated debris, deployment hardware, and penetration aids, based on their emission and/or radar-reflection properties. The sensors on SMTS provide discrimination data that complement the radar data; together they can determine optimally which objects are threatening and which can be ignored. Because SMTS employs the same type of sensing that interceptors use, the information it which provides to the NMD system is less ambiguous than that provided by radars alone and therefore offers improved performance against threat decoys.

Each SMTS satellite will carry a suite of passive sensors that will provide surveillance, tracking, and discrimination data, including short-, medium-, and long-wavelength infrared sensors, which detect objects by their heat emissions, and visible light sensors that use scattered sunlight. These sensors, which can be instructed to look in different directions independently of each other, will provide global (below-the-horizon and above-the-horizon) coverage of ballistic missiles in their boost, post-boost, and midcourse phases. SMTS can detect and track objects at very long distances by observing them against the cold background of space.

Conclusion. It is imperative for Congress to review these potential NMD architectures. Furthermore, it is important for Congress to be aware of the operational concepts, treaty implications, and schedule and cost issues related to all NMD architectures in order to judge how best to proceed.

Given the projected threat and the maturity of NMD technology, I strongly endorse th Department's NMD strategy as embodied in the 3 plus 3 program. It is a prudent course of action. Following three more years of system development, we will reach a point where a decision can be made to deploy an NMD system, **if the threat warrants.** If the threat does not warrant deployment, we will be prepared to continue development of a system that could still be deployed quickly in response to a threat, but would also ensure a more effective, lower risk defensive system. The 3 plus 3 program is designed with flexibility to permit -- with some increase in risk -- its acceleration, if the threat warrants and additional resources are applied. As it is currently structured, the 3 plus 3 program provides the capability to deploy with an IOC in 2003, the date which Congress has desired.

It is important to reaffirm that the Department's 3 plus 3 program had the same genesis in the BMDO Tiger Team study as the Service's emergency response architectures. As the 3 plus 3 program developed, we incorporated the strongest features of all proposals. The 3 plus 3 program represents a reasonable approach that balances speed of deployment with a more optimum defensive capability against a broader spectrum of potential threats. We have determined thus far that the 3 plus 3 program is the most prudent response available to meet an emerging threat.

In closing, I want to stress that the Air Force and Army remain critical members of our Ballistic Missile Defense team and are vigorously and efficiently developing those portions of our 3 plus 3 architecture to which they are assigned. While it may appear that there are differing views on NMD, it is important to note that the fundamental architecture is the same to all the proposals. The differences lie in the specific designs of that architecture and the timelines under which a system could be deployed. Even here the difference is a matter of about two years.

At this time the specific deployment architecture is not an issue which must be decided. What is needed is program stability. Developing the building blocks for a system of this complexity within three years presents a significant challenge -- we cannot afford to keep starting over to develop something new. I urge you to support the Department's NMD program and to provide sufficient resources to complete the deployment readiness phase of the 3 plus 3 program. Then, if the emerging missile threat requires deployment, we will be prepared to defend all 50 states against limited missile attacks by 2003.

Table 1
NMD SYSTEM "3+3" DESCRIPTION

SYSTEM ELEMENT	
Interceptor	

Initial Operational Capability	20
Full Operational Capability	100
Deployment Location	Grand Forks, ND
Deployment Configuration	Silo
V_{BO}	7.2 km/sec
Site Radar	
Initial Operational Capability	1
Full Operational Capability	1
Deployment Location	Grand Forks, ND
Type	X-band Phased Array
Upgraded Early Warning Radars	
Initial Operational Capability	5
Full Operational Capability	5
Deployment Location(s)	Clear, Thule, Fylingdales, Beale, Otis
Forward Deployed Radar(s)	
Initial Operational Capability	1
Full Operational Capability	1
Deployment Location	Shemya, AK or Bangor, ME
Type	X-band (dish or phased array TBD)
BM/C3	
In Flight Interceptor Communications Quantity	6-12
IFICS Locations	TBD
BM/C3 Approach	Centralized

Return to Single-site Architecture

Table 2
NMD SYSTEM "3+3" COST ESTIMATES

	Then-Year Dollars (billions)
Development	$2.5-2.6
Production/Procurement	$4.5-5.0
Deployment	$1.0-1.2
Testing	$1.0-1.2
TOTAL	$9.0-10.0