Statement of
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Mr. Chairman and Members of the Committee, it is my privilege to appear before you today to present the Department's Ballistic Missile Defense (BMD) program and budget for Fiscal Year 1998. I am particularly pleased to be able to report to the Committee significant progress in all three areas of the BMD program: Theater Missile Defense, National Missile Defense and BMD Technology. I look forward to outlining those significant accomplishments in just a few moments.

At the same time, I think it is equally important that we recognize the challenges we still face in developing and fielding ballistic missile defenses -- in many cases this really is "rocket science." We are building highly sophisticated BMD systems, consisting of sophisticated sensors and interceptor missiles that incorporate state-of-the-art electronics, seekers, communications, avionics and propulsion. We are applying the very best talents that government and industry have to offer across all BMD programs. We will continue to reduce these risks by diligently applying our financial and personnel resources to ensure program success.

My twenty-eight years of experience in the United States Air Force, all of which has been involved in research, development and acquisition, tell me that we have structured the right program to address the existing and projected missile threat and that we are proceeding as rapidly as possible to field these systems. Where we have deployed upgrades to air and missile defense systems, it is clear that they are significant improvements over the capabilities our forces had in the Gulf War. But we cannot stop with these upgrades because the potential missile threat warrants continued development and deployment to ensure highly effective defenses.

The Ballistic Missile Threat. While the end of the Cold War signaled a reduction in the likelihood of global conflict, the threat from foreign theater missiles has grown steadily as sophisticated missile technology becomes available on a wider scale. The proliferation of weapons of mass destruction and the ballistic and cruise missiles that could deliver them pose a direct and immediate threat to the security of U.S. military forces and assets overseas, as well as our allies and friends.

We have already witnessed the willingness of countries to use theater-class ballistic missiles for military purposes. Since 1980, ballistic missiles have been used in six regional conflicts. Recently, United Nations reports indicate that, in addition to the high explosive warheads used during the Gulf War, Iraq was prepared to use theater ballistic missiles with chemical and biological warheads. Fortunately, it did not do so.

Strategic ballistic missiles, including intercontinental and submarine launched ballistic missiles (ICBMs and SLBMs) exist in abundance in the world today. Fortunately, the intelligence community rates the threat to the U.S. homeland from these existing missiles as low, with only accidental or unauthorized launches raising any concern. The greater concern, however, stems from the emergence of a Third World long range missile threat to the United States.

Theater Missile Assessment. I must note that my organization is a consumer, not producer, of intelligence analyses on missile threats. Therefore, my testimony reflects the unclassified assessments provided by the intelligence community. The missile threat to our forward deployed forces, allies and friends involves a wide range of systems, including theater ballistic missiles and cruise missiles launched from sea, air and land platforms. Representative theater threats are illustrated in the chart below. These missiles represent a continually evolving threat, as increasing numbers of countries are acquiring these weapons due to their relatively low cost and the comparative ease with which they can be constructed. While the threat posed by these missiles is regional in nature, the trend is clearly in the direction of systems with increasing range, lethality, accuracy and sophistication. At the beginning of 1996, there were thousands of theater-class ballistic missiles in service in 30 non-NATO countries. In addition, nine of these same countries are reported to be developing nearly 20 new theater-class ballistic missiles. Even a relatively small number of ballistic missiles armed with weapons of mass destruction -- chemical, biological or nuclear weapons -- would dramatically raise the potential costs and risks of U.S. or coalition military operations.

The cruise missile threat is also a growing concern. Currently 77 nations possess cruise missiles, with 17 countries producing approximately 130 different types of cruise missiles. The majority of these systems are anti-ship cruise missiles. Land attack cruise missiles are being developed by 13 nations, and proliferation of advanced land attack cruise missiles is expected in about 10 to 15 years. Like theater-class ballistic missiles, cruise missiles are inexpensive and the technology to build them is relatively easy to acquire. Combining these facts with their high degree of accuracy, mobility, survivability and multiple roles make cruise missiles an attractive weapon for "rest of world" nations. The threat posed by both ballistic and cruise missiles is likely to continue to evolve.

The theater missile threat is here and now. It is widely dispersed and has to be taken very seriously. Our Theater Missile Defense program plays a critical role in the Department's overall Counterproliferation strategy to reduce, deter and defend against these and potential future threats. Our TMD program is structured to provide a highly effective, active defense against missile attacks.

Strategic Missile Assessment. In the case of nuclear strategic weapons, Russia has a significant capability for delivering these weapons with strategic weapon delivery systems - land-based and submarine-launched missiles and long range aircraft. China can also deliver these weapons with land-based and emerging sea-based ballistic missile capabilities. We do not see these systems as posing a threat to the United States in the foreseeable future. That is, we do not see an intent that goes with the capability. Even if that situation changes, we will continue to field a significant U.S. deterrent force.

We do not see a near-term ballistic missile threat to U.S. territory from the so-called rogue nations, but we cannot be complacent about this assessment. The threat of a long-range missile from rogue nations could emerge in the future. The intelligence community estimates that this threat would take 15 years to develop, but could be accelerated if those nations acquired this capability from beyond their borders.

Regardless of how remote the territory potentially threatened, we cannot take lightly the emerging ballistic missile capability of a rogue nation to threaten any part of the United States. This is why the Department's three plus three NMD program is designed for a possible deployment as early as 2003 -- well ahead of the intelligence community's estimates for a potential Third World ICBM deployment. My staff and I are working closely with General Estes and his staff at U.S. Space Command to ensure that we develop an NMD system that meets the warfighter's requirements. General Estes and I want to ensure that the NMD system can be deployed in a timely manner, while effective against the identified threat.

Fiscal Year 1998 Program and Budget. In order to address the missile threat, the Department has structured a sound and affordable program for Fiscal Year 1998. The total Fiscal Year 1998 budget request for the Ballistic Missile Defense Organization is $2.589 billion. This includes $1.835 billion for Theater Missile Defense, $504 million for National Missile Defense, $250 million for Support Technologies. In addition, the Department is requesting $384 million in procurement funds for TMD systems, which was realigned to Army and Navy budgets. The chart on the following page provides a detailed overview of funding for Fiscal Years 1996 through 1998. Of the total BMD budget request (BMDO and Service Procurement funds) for Fiscal Year 1998, TMD accounts for roughly 75 percent, NMD 17 percent and Technology 8 percent.

TMD Procurement Funds. The Fiscal Year 1998 budget request marks a significant change from previous budgets in that the procurement funds for BMD programs reside in the Military Service budgets. For Fiscal Year 1998, the Department is requesting $349 million for PAC-3 and $20 million for TMD BMC3 in the Army budget, and $15.4 million for the Navy Area Defense in the Navy procurement budget.

The Department shifted BMD procurement funds to the Services over the Future Year Defense Plan (FYDP) in recognition that our TMD programs will soon be transitioning to the procurement phase. For example, the THAAD system will transition to the EMD phase of the acquisition process in less than a year and the PAC-3 program is scheduled for a milestone III decision in 1999. Recently, the Under Secretary of Defense for Acquisition and Technology gave BMDO and the Navy permission to proceed into the EMD phase for Navy Area Defense. As these programs mature, it is important that increasing attention be placed on operational and logistical matters. These are the appropriate responsibilities of the Military Departments. By moving the procurement funding to the Services that will actually field and operate these systems, Service planning for deployment and operation can be more easily combined with manpower and force structure considerations.

BMDO will continue to serve as the central DoD manager and integrator of the BMD mission, and will develop and maintain BMD architectures and ensure interoperability among systems. The Director of BMDO remains the Department's BMD Acquisition Executive. As such, I will continue to serve on the Defense Resources Board (DRB) when BMD programs and issues are discussed and, thereby, will be able to influence the allocation of funds to programs and DoD components. Finally, procedures are being developed which will ensure that BMDO will review any proposed Service reprogramming, realignment or transfer of BMD program funds within the Services. As the BMD Acquisition Executive, I will have the opportunity to concur or non-concur with Service funding proposals that impact BMD programs. If I disagree with a Service proposal, I will work with that Service and the Department's senior leadership to ensure BMD programs are appropriately funded.

Theater Missile Defense Programs. Since the theater ballistic missile threat is diverse with respect to range and capability, and the assets we must protect are similarly diverse -- *from military forces, their assets and points of debarkation to population centers and regions* -- no single system can perform the entire TMD mission. This leads us to a "family of systems" approach to successfully defeat the theater missile threat. The family of systems approach will ensure a defense in depth, utilizing both lower-tier -- *those systems that intercept at relatively low altitudes within the atmosphere* -- and upper-tier systems -- *those that intercept missile targets outside the atmosphere and at longer ranges* -- to fully engage the theater threat and ensure highly effective defenses. Lower-tier programs include the PATRIOT Advanced Capability-3 (PAC-3), Navy Area Defense, and Medium Extended Air Defense System (MEADS). Theater High Altitude Area Defense (THAAD) and Navy Theater Wide systems comprise our upper-tier development efforts. In addition, the Air Force, in coordination with BMDO, is developing a boost-phase intercept system called the Airborne Laser (ABL). Finally, BMDO is developing the command and control mechanisms that will ensure these systems are interoperable.

Lower Tier TMD Systems

PAC-3. The PATRIOT Advanced Capability-3 system builds on the existing PATRIOT air and missile defense infrastructure. Since the Gulf War, BMDO and the Army have significantly increased the effectiveness of the PATRIOT system. In the last few years we have fielded the PAC-2 Guidance Enhanced Missile (GEM) to improve PATRIOT's accuracy against short-range ballistic missiles. In addition, the PAC-3 Configuration 1 Air and Missile Defense System will be completely fielded and we have begun to field the PAC-3 Configuration 2, which uses both PAC-2 and GEM interceptors. It also incorporates modifications to the radar, communications system, remote launch capability, and other system improvements.

On February 8, 1997, the PAC-3 Configuration 2 system, utilizing both PAC-2 and GEM interceptors, successfully engaged a theater-class ballistic missile to demonstrate system performance. The target missile was launched from Bigen Island toward the U.S. Army Kwajalein Atoll (USAKA) in the Central Pacific. The PATRIOT missile was launched from Meck Island within USAKA and intercepted the target over the broad ocean area. The objective of this mission was to obtain sensor data on the target and to demonstrate the effectiveness of the improved PATRIOT system against ballistic missiles.

PAC-3 is a smaller interceptor which results in increased firepower (16 PAC-3 missiles per fire unit vice four PAC-2) and improved lethality (hit-to-kill intercepts). The new interceptors, when combined with other improvements to the system, will allow the PATRIOT air and missile defense system to increase its battlespace and range. Later this year, BMDO and the Army will begin flight tests of the PAC-3 missile, leading up to a low rate initial production decision by the end of the calendar year. We are planning a First Unit Equipped (FUE) date for the fourth quarter of Fiscal Year 1999.

Navy Area Defense. This program represents a critical TMD capability that can take advantage of the strength and presence of our naval forces, and build upon the existing AEGIS/Standard Missile infrastructure. Naval vessels that are routinely deployed worldwide are currently in potential threat areas or can be rapidly redirected or repositioned. A Naval TMD capability can therefore be in place within a region of conflict to provide TMD protection for nearby land-based assets before hostilities erupt or before land-based defenses can be transported into the theater.

Equally significant, Navy Area Defense can provide protection to critical points of debarkation, such as seaports and coastal airfields. Our Naval Area Defense program focuses on modifications to enable tactical ballistic missile detection, tracking and engagement with the AEGIS Weapon System and a modified Standard Missile II, Block IV.

On January 24, 1997, the Navy Area Defense program successfully intercepted a Lance missile at White Sands Missile Range, New Mexico. The Standard Missile Block IVA intercepted the target using its infrared terminal guidance, and its blast fragmentation warhead completely destroyed the Lance missile. This test, which is required by the exit criteria for a milestone II decision, completed the demonstration of all the criteria needed for Navy Area Defense to proceed to the Engineering and Manufacturing Development phase of the acquisition process. As I noted a moment ago, the Under Secretary of Defense for Acquisition and Technology permitted BMDO and the Navy to proceed into the EMD phase based on this important accomplishment.

User Operational Evaluation System (UOES) software will be available for testing and crew training in Fiscal Year 1998. UOES flight hardware will be available in 1999. UOES at sea testing will commence in 2000 after we complete EMD development flight testing at the White Sands Missile Range. BMDO and the Navy plan to field a UOES system for continued testing and training, as well as an emergency warfighting capability, upon the successful completion of the UOES testing in Fiscal Year 2000. The Navy Area Defense program will equip its first unit (FUE) in Fiscal Year 2002. The Navy has designated the USS Lake Erie (CG-70) and the USS Port Royal (CG-73) as the AEGIS cruisers to support the Navy Area Defense UOES system.

Medium Extended Air Defense System. Operationally and tactically, our forces will likely fight on less dense battlefields, over greater expanses of land and with large gaps between friendly forces. Ground force commanders will incur risks as they constitute forces in major unit assembly areas upon arrival to a theater of operations. MEADS will play a key role in reducing these risks in future Army and Marine Corps operations because it is the only TMD system under consideration that can provide maneuver forces with 360 degree defense protection against short-range tactical ballistic missiles, cruise missiles and unmanned aerial vehicles.

Both the Army and Marine Corps have requirements for such a system that can provide defense of vital corps and division assets associated with their maneuver forces. As such, this system must provide 360 degree defense against multiple and simultaneous attacks. In addition, it must be available for immediate deployment for early entry operations within a theater, using C-141 transport aircraft. MEADS must also be transportable aboard C-130 aircraft and standard amphibious landing craft. Finally, it must be able to move rapidly and protect the maneuver force during offensive operations. MEADS is designed to perform these critical air and missile defense functions.

In 1993 an Army/BMDO RDT&E cost estimate for a U.S. only Corps SAM new start program was $3.1 billion. The use of technology leveraging from DoD investments in the TMD mission area and multi-national burden sharing by the U.S., Germany, and Italy have reduced cost estimates. Burden sharing with Germany and Italy have reduced the current RDT&E cost estimate to $1.9 billion. Current schedule will achieve a Fiscal Year 2005.

Upper Tier TMD Systems.

Theater High Altitude Area Defense. Last year the Department restructured the THAAD program by concentrating on militarizing the User Operational Evaluation System design with low risk enhancements to a "UOES plus" configuration. This program, termed the new THAAD objective system, retains significant capabilities to meet the most critical THAAD requirements while reducing overall program risk. It concentrates on militarizing the UOES design and upgrading certain components, such as the infrared seeker, radar and battle-management, command, control, communications, computers and intelligence (BM/C4I) system. Currently, a UOES capability that will include two THAAD radars, four launchers, two BM/C4I systems, 40 missiles, and 295 soldiers will be available for developmental testing and contingencies by Fiscal Year 1999. All of the UOES equipment is currently available, except the missiles. An option to purchase the UOES missiles will be exercised following the successful intercept of its target. In response to Congressional direction, the Department has increased THAAD funding by $722 million over the FYDP to accelerate fielding the system. This move will shift the FUE date for THAAD from Fiscal Year 2006 to 2004.

In Fiscal Year 1998, the THAAD program will conclude its program definition and risk reduction flight tests. These tests are designed to resolve technical issues and demonstrate the system's capabilities. So far, BMDO and the Army have conducted six flight tests. The next flight test, scheduled for February 28, 1997, will attempt an intercept of a theater-class ballistic missile. The test will take place at the White Sands Missile Range and may be delayed due to ground weather or high winds that are typical for this time of year. High winds at altitude would delay the test because even tiny intercept debris could fly off the range, potentially raising a safety issue. However, it is important to note that high winds would not inhibit the operational system.

The first three THAAD flight tests -- *which by plan did not include intercept opportunities* -- successfully demonstrated several basic missile functions, including missile launch, booster separation, and kill vehicle closed loop navigation. On the next three missions, the THAAD system was unsuccessful in its attempts to intercept the target. On flight test four, for instance, the seeker obtained a solid lock-on the target, but the missile did not achieve an intercept because an errant midcourse maneuver caused the kill vehicle to deplete its fuel supply prior to achieving intercept. On flight test five, a malfunction occurred during booster separation causing a loss of command functions on-board the kill vehicle. Therefore, the kill vehicle did not respond to navigation commands and did not acquire the target. On the most recent flight test, number six, a seeker malfunction occurred following target acquisition which prevented the interceptor from locking-on the target. The post-flight investigation indicated that the failure was most likely due to small particle contamination causing an electrical short in the seeker.

The corrective measures for the failures that occurred during flight tests four and five were verified during flight test six. In preparation for flight test seven, we have included several additional screening processes, risk mitigation measures, and detailed reviews to maximize the probability of success of the mission. Although the previous three missions were not successful in achieving intercepts, several key test objectives were met. Ultimately, the program gained valuable data needed for model and simulation validation. The program also successfully integrated the command and control element and the launch platform into the test configuration. The THAAD radar, which successfully operated in the "shadow" mode during the previous missions, will be the primary sensor for flight test seven. These accomplishments are noteworthy in that they have demonstrated critical overall THAAD system capabilities. However, BMDO and the Army fully recognize that the system's ultimate performance is linked to the successful intercept of the target missile.

Navy Theater Wide. The Navy Theater Wide program continues to build upon the modifications we are making for the Navy Area Defense system to AEGIS ships and to the modified Standard missile. The Navy Theater Wide system will further modify the missile for ascent, midcourse, and descent phase exo-atmospheric intercepts. In addition, we will work with the Navy to modify the AEGIS Weapon System to support the increased battle space required for the improved, longer-range interceptor.

Last year the Under Secretary of Defense for Acquisition and Technology, Dr. Kaminski, designated the Navy Theater Wide program as part of the "core" TMD program. Navy Theater Wide has also been designated a pre-Major Defense Acquisition Program (pre-MDAP), a program that may eventually become an MDAP. Therefore, BMDO and the Navy have begun the steps necessary to establish NTW as an acquisition program under the Department's 5000 series regulations.

These important steps, along with increased resources, allow the Navy Theater Wide program to accelerate its development. Congressional funding increases, and the Department's increase of $254 million over the FYDP, have allowed the Navy to modestly accelerate the initial intercept date. Most notable, however, is that increased resources have allowed program managers to reduce program risk and increase the number of flight demonstration program flight tests from five to eight. Finally, we have been able to procure additional backup hardware specifically to reduce the risk of a single hardware failure slowing down the program.

Later this year, Navy Theater Wide will conduct its first flight under the flight demonstration program. This flight test will use a Standard Missile II, Block IV and help us understand the performance of the Standard missile autopilot at high altitudes up to the third stage injection (or stage separation) point. In addition, the BMDO-Navy team will continue engineering and ground-test activities to support the first controlled test vehicle flight test in Fiscal Year 1999, as well as continuing risk reduction activities.

Remaining TMD Efforts.

Joint TMD Program Element. The activities we collect within this program element represent programs and tasks that are vital to the execution of joint TMD programs. These activities have been grouped together because most of them provide direct support across BMD acquisition programs which could not be executed without this important support. (Activities such as the Arrow Deployability Program are an exception, but are funded within this program element.) Therefore, we introduce greater efficiency into the programs because they accomplish an effort that otherwise would have to be separately accomplished for each Service element.

I would like to outline just a few critical activities that are funded in the Joint TMD account. Interoperability in BMC3I is essential for joint TMD operations. Accordingly, BMDO takes an aggressive lead to establish an architecture that all the Services can build upon and is actively pursuing three thrusts to ensure an effective and joint BMC3I for TMD. These three thrusts are:

- improving early warning and dissemination,
- ensuring communications interoperability, and
- upgrading command and control centers for TMD functions

The primary goal is to provide the warfighter with an integrated TMD capability by building-in the interoperability and flexibility to satisfy a wide range of threats and scenarios. From its joint perspective, BMDO oversees the various independent weapon systems developments and provides guidance, standards, equipment and system integration and analysis to integrate the multitude of sensors, interceptors, and tactical command centers into a joint theater-wide TMD architecture. While these activities may not seem to be as exciting as building new and improved TMD interceptors, it is absolutely critical to the success of the overall U.S. TMD system. It is the glue that holds the architecture together and will ensure that the whole is greater than the sum of its parts. To ensure these important activities are built-in to the TMD systems, I have recently realigned my organization to emphasize Architecture/Engineering to ensure interoperability.

In addition to BMC3I, the other activities in this program element strongly support the TMD system and key acquisition programs. BMDO test and evaluation responsibilities include: oversight of major defense acquisition program (MDAP) testing; sponsoring and conducting TMD family of systems integration and interoperability tests; development of common targets; and providing for range upgrades. These activities are key to the success of all our core programs. System integration tests will enable us to assess end-to-end system interoperability and performance of the TMD architectures in the presence of live targets. Furthermore, BMDO's consolidated targets program has facilitated improved management of target requirements; verification, validation, and accreditation processes; and acquisition of expendable and support systems.

This program element also funds modeling and simulation support. Because of the large number of variables, safety concerns, and the high costs associated with "live" testing, integrating models and simulations into all BMDO programs is a must. As a result, the BMD community has developed an extensive array of computer models, simulations, wargames, and system exercisers. The network of modeling and simulation facilities includes the Joint National Test Facility (JNTF) at Falcon AFB, Colorado and the Advanced Research/Simulation Center (ARC) at Huntsville, Alabama. The JNTF provides the BMD community access to a world class facility where real-time simulations, threat models and wargaming are performed to evaluate BMD weapon systems across Service boundaries. The JNTF is the BMDO's *joint* missile defense modeling, simulation, and test center of excellence whose focus is the joint inter-service, interoperability, and integration aspects of missile defense system acquisition. It is staffed by all the Services. As such, the JNTF allows BMDO to present a *level playing field* for the resolution of missile defense issues which cut across Service interfaces.

The JNTF conducts man-in-the-loop missile defense wargaming for concept of operations (CONOPS) exploration and development. All of the NMD program's BMC3 work will be conducted at the JNTF. Test planning and analysis for both NMD and TMD are conducted at the facility as well. BMD system level analysis of missile defense issues are also conducted there. Finally, the JNTF also provides inter-Service computational capabilities and wide area network communication networks with Service facilities.

In Fiscal Year 1997, BMDO began a modernization program to improve the computation suite, including hardware upgrades and developing improved models and simulations to support the program.

Our interaction and responsiveness to the needs of the warfighter is a key element in the BMDO mission. The Joint TMD program element funds a critical series of interactions with the warfighting CINCs. Our CINCs TMD Assessment program consists of operational exercises, wargames, and Warfare Analysis Laboratory Exercises (WALEX). This provides an opportunity for the material developer to have direct contact with the user. This is the CINC's vehicle for refining and articulating TMD concepts of operation, doctrine and TMD requirements. Our assessments provide the BMD community with operational data - something that is absolutely invaluable to the material developer.

Of special interest in this program element is the U.S.-Israeli Arrow Deployability Project. The U.S. derives considerable benefits from its participation in this project -- primarily gains in technology and technical information that will reduce risks in U.S. TMD development programs. Of course the U.S. also benefits from the eventual presence of a missile defense system in Israel, which will help deter future TBM conflicts in that region and will be interoperable with U.S. TMD systems.

In response to Congressional direction, BMDO has increased funding for Cooperative Engagement Capability (CEC) analysis. CEC is a program run by the Navy to distribute sensor and weapons data, using existing systems, but in a new manner. The data is filtered and combined to create a common "air picture" or composite track. BMDO's Joint Composite Tracking Network (JCTN) is a real-time network, based on the CEC program, that directly links sensors and shooters within a theater to maximize synergy of multiple systems.

Congress also directed that we provide funds for upgrade of the Kauai Test Facility at the Pacific Missile Range Facility (PMRF). I am happy to say that the capital improvements to instrumentation, resources, and sites will soon begin. Improvements include precision optics, radars, telemetry, global positioning system (GPS), communication, range safety, and range command and control. With these important improvements, PMRF will be able to meet the Navy's requirement to support the AEGIS Weapon System's multi-mission warfare capability, and provide hit-to-kill efficiency and miss distance information.

The Joint TMD program element has sustained significant reductions, which limits our ability to support the core TMD acquisition programs. This program element should be recognized as a collection of critical engineering and support for all our core TMD programs, as well as important projects like Arrow. JTMD provides a cost-effective approach to acquisition support using centralized management and decentralized execution. The JTMD product is a true example of synergy - where the total benefit really is greater than the sum of the individual elements. As I stated before, it really **is** the glue that holds the architecture together.

National Missile Defense. During the last year, the NMD program has witnessed perhaps the most significant change of all BMD efforts. Last year, Secretary Perry transitioned the NMD program from a *Technology* Readiness Program to a *Deployment* Readiness Program and defined the Department's "3 plus 3" program that could achieve an operational system by the year 2003. Dr. Kaminski designated the NMD program as a major defense acquisition program to ensure it receives the appropriate level of management attention and oversight. The Congress authorized and appropriated a substantial funding increase for the NMD program. Within the past few weeks, the Department released to industry a request for proposals for the lead system integrator, who will act as "prime" contractor for the NMD system. Finally, the Department selected Brigadier General Joseph Cosumano, United States Army, to be the Program Manager for NMD. He will report directly to me. Each of these significant steps moves us closer to developing for deployment an effective National Missile Defense system that can protect the United States against the emerging ballistic missile capabilities of rogue nations.

The "3 plus 3" program was designed to conduct three years of development and test activities, leading up to an integrated system test of the NMD elements for an initial capability in Fiscal Year 1999. If the threat at the time warrants, a decision to deploy could be 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, because the threat has not emerged, we do not need to deploy an NMD system in the near-term, then we could continue to enhance the technology of each element and the concomitant capability of the NMD system that could be fielded on a later deployment schedule. The overarching goal of the "3 plus 3" program was to remain within a three year window of deployment so that we can effectively respond to an emerging threat.

As Secretary Perry outlined last year, the development program that we execute will be compliant with the ABM Treaty as it exists today. Again, as the Secretary asserted, the system that is ultimately fielded might comply with the current Treaty, or it might require modifications to the Treaty depending upon what the threat situation requires.

NMD Architecture. Based on the BMD Program Review concluded a year ago, the Department is pursuing a fixed, land-based architecture for the National Missile Defense program. The NMD system we plan to demonstrate in an integrated system test includes six fundamental building blocks: the interceptor; ground-based radar; upgraded early warning radars; forward-based X-band radars; Space-based Infrared System (SBIRS); and battle management, command, control and communications (BMC3). Depending on the threat to which we are responding when a deployment is required, an NMD system consisting of these elements could be deployed in a Treaty compliant configuration or in a configuration that may require some amendment to the ABM Treaty. Nonetheless, the system elements have remained fairly consistent over time and throughout several architecture analyses.

The **Ground-based Interceptor** (GBI) is the weapon element of the NMD system. It consists of an exoatmospheric kill vehicle (EKV) launched by a fixed, land-based booster. We have made significant progress over the past few years to develop an EKV which can perform hit-to-kill intercepts of strategic reentry vehicles in the midcourse phase of their trajectory. As a result of the changed focus of NMD toward deployment readiness, and the increased funds authorized and appropriated by Congress, we have made some changes in the EKV program. The program has been structured to accommodate the more stressing nature of a deployment program. Moreover, the program is a competitive effort and we had planned to down-select to a single contractor about 18 months ago. Instead, we have continued this competition. This significantly reduces the technical risk, but does require additional test resources. Rockwell/Boeing and Hughes are under contract to develop and test competing EKV designs which will be evaluated in a series of flight tests. I will address our first flight test attempt in just a few moments. Following intercept flights in 1998, a single contractor will be selected for the initial system. The EKV flights will be conducted using a payload launch vehicle as a surrogate for a dedicated GBI booster.

Several booster options are being examined for the GBI, including the Minuteman missile, and other modified, off-the-shelf boosters. My intention is to foster a "level playing field" and ensure that all booster options are fairly evaluated. The bottom-line must be the use of the most effective and affordable booster option available.

The NMD **Ground-based Radar** is an X-band, phased array radar that strongly leverages off developments achieved by the THAAD radar program. By taking advantage of the work already completed in the TMD arena, BMDO and the Army have been able to reduce the expected development cost of the GBR. Before the "3 plus 3" program shifted program focus, the GBR program was a technology effort. We have subsequently changed the design to make it directly traceable to the deployment configuration and accelerated the development. We are in the process of building a prototype at the U.S. Army Kwajalein Atoll test range to support the integrated system test for NMD.

The **Upgraded Early Warning Radar** (UEWR) program is designed to answer fundamental questions concerning how UEWRs can contribute to NMD while completing the initial development work. Working with the U.S. Air Force, we have already completed two years of successful demonstrations, showing how software modifications can increase the radars' detection range, sensitivity, and accuracy. We will continue this work and prepare specifications for the early warning radars' upgrades necessary if there is a decision to deploy an NMD system before the Space & Missile Tracking System is available.

Forward-based X-band Radars would place the radar where it can obtain accurate high-resolution data from the early phases of an ICBM's trajectory. These radar attributes provide for early and accurate target tracking and signature data, permitting earlier launch of defense interceptors and a greater battle space within which they can operate. These overall system's defense performance would consequently be enhanced. Several X-band radars are under consideration and will continue to be explored under the program.

The **NMD BMC3** program provides the capability for the designated operational commander to plan, coordinate, direct, and control NMD weapons and sensors. BMC3 has always been identified as one of the most difficult issues associated with an NMD system. Unlike the other elements, this is not primarily a hardware issue, but rather a software development challenge. With the additional funds authorized and appropriated, we have established an active development program that is working with the user to address this complex issue. Using a "build-a-little, test-a-little" philosophy, we have already been able to deliver a core BMC3 capability to the user for assessment. We are also conducting numerous exercises and wargames to validate BMC3 concepts and exercising the evolving BMC3 system during every test.

Deployment Readiness Activities. While no decision to deploy has been made, BMDO has begun several activities to support the deployment readiness program. These activities are absolutely critical to begin in order to field the NMD system within three years of a decision to deploy. Many of these efforts, incidentally, are a result of the Congressional funding increase during the past year.

In particular, the shift in program emphasis to deployment readiness led us to increase our NMD Systems Engineering efforts. This has allowed us to increase our activity in developing: operational requirements documents; NMD System and NMD Element Cost Analysis Requirements Documents (CARDS); Deployment Planning and Documentation Requirements; Test and Evaluation Requirements; and other critical acquisition documentation. Finally, the emphasis on deployment readiness allowed us to establish formal review processes for the NMD program, such as the Systems Requirements Review, which greatly increases our understanding of the system's requirements as well as its performance and costs. In addition, these efforts include developing an Integrated Deployment Plan for the deployment of the NMD system that includes all the system elements; and beginning or expanding Site Activation Plans and Site Surveys for the North Dakota Region; Site Development and Environmental Planning; NMD Industrial Base Assessments; and Logistics and Deployment Planning. While these efforts represent modest funds, their importance far outweighs their financial costs. For example, site surveys and environmental planning **today** can preclude lengthy delays down the road.

NMD Program Execution. Several fact of life issues have potentially impacted our ability to execute the "3 plus 3" program along the timelines the Department has previously outlined. While the "3 plus 3" program approach remains an absolutely valid strategy, recent events have highlighted the *fragility* of the program schedule. Our inability to establish the management team, embark on our acquisition strategy by establishing an LSI contractor, and most significantly the recent failure of the EKV seeker flight test together have left us well "behind the power curve" in executing the program.

Earlier this year BMDO and the Army attempted the first test of the GBI EKV sensor. We planned to launch an EKV seeker from the U.S. Army facility at Kwajalein Atoll in the Pacific Ocean to observe a set of targets launched aboard a Minuteman missile from Vandenberg AFB, California. While the targets were successfully launched and deployed, the payload launch vehicle which carries the EKV for testing failed to launch. The problem has been traced to human error and corrective procedures have been implemented. Working with the Army, we are in the process of recovering from this failure. We are assessing schedule and cost options to reattempt the test. Our next opportunity is in May 1997, with the remaining EKV seeker flight test now likely delayed until January 1998. This delay is due to the time required to program, fabricate, assemble and test a new target set and target launch vehicle. This simple human error clearly highlights the very high level of schedule risk associated with the NMD program. Since we do not have backup test hardware we are essentially delayed eight months because a technician failed to turn a switch to the correct power current level. It is also important to note that since we have not yet demonstrated EKV seeker performance, we still have high technical risk associated with the EKV seekers.

We have not made any final assessments on the overall "3 plus 3" schedule, but will continue to assess our ability to execute the program over the next few months. But I assure you, we will continue to work to develop an NMD system that could be deployed as early as 2003, should the threat warrant. As we select our LSI contractors, we will benefit directly from industry involvement. They will assist us in identifying program and schedule risks, technical long-poles, and can help develop efforts that can help mitigate these risks and challenges.

Space and Missile Tracking System. In addition to the elements being developed by BMDO, future NMD systems will be significantly enhanced by the sensing and tracking capability of the Space & Missile Tracking System, also known as SBIRS-Low. The U.S. Air Force's SBIRS-Low (SMTS) program 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 SBIRS-Low (SMTS) will also provide valuable technical intelligence and battlespace characterization data.

The SBIRS-Low (SMTS) constellation of sensors and satellites will acquire and track ballistic missiles throughout their trajectories. Unlike DSP or SBIRS High satellites, SBIRS-Low (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 site. This maximization of their battlespace:

- 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 defended area.

Each SBIRS-Low (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 missile targets in their boost, post-boost, and midcourse phases. SBIRS-Low (SMTS) can detect and track objects at very long distances by observing them against the cold background of space.

The SBIRS-Low (SMTS) program consists of two competing contractor teams. Hughes/TRW is developing a two-satellite Flight Demonstration System (FDS); Rockwell/Lockheed-Martin is developing a single satellite Flight Experiment, with both programs launching in late Fiscal Year 1999. These risk-reduction satellites will serve as a "bridge" to a fully operational SBIRS-Low (SMTS) early in the next decade. The Department has accelerated the schedule for an EMD phase of SBIRS-Low (SMTS), which results in a first launch in Fiscal Year 2004.

BMD Support Technology Programs. As the BMD program has adapted to the demands of the strategic environment, we have dramatically shifted our program and its allocation of resources from technology development in the mid- to late-1980's to acquiring and fielding missile defense programs. The fact that we allocate about 70 percent to TMD systems and 20 percent to the NMD program necessarily limits our investments in technology. I do not advocate that we not field highly effective defenses. Instead, I want to remind everyone interested in missile defense of the importance of technology investment. Our past investments in technology allow us to build into today's interceptors, sensors, and radars the capability to counter existing and emerging missile threats. For example, our LEAP technology program, which began in 1986 under the SDI program, now forms the basis for Navy Theater Wide. PAC-3's hit-to-kill technology is derived from the ERINT program, which was preceded by the Flexible Lightweight Agile Guidance Experiments (FLAGE) under SDI in the mid-1980's. More recently, we demonstrated twenty-three different component technologies on our Clementine satellite that orbited the Moon. Some of those technologies are now being inserted into the THAAD system and the Space and Missile Tracking System. Currently, the Midcourse Space Experiment (MSX) is demonstrating the function of midcourse missile target tracking that will feed into the Space and Missile Tracking System.

The importance of technology investments is clear. In order to ensure that we efficiently use those limited resources, BMDO's technology program has five main thrusts:

- Advanced sensor technology (focal plane arrays, laser radar, image processing algorithms) to help us detect and track missiles better.
- Advanced interceptor technology (improved sensor windows, projectile structures, guidance and control, and seekers) to vastly improve our hit-to-kill capabilities.
- Directed energy (chemical laser) to provide us an option of space-based, global coverage with a powerful boost-phase intercept defense capability.
- Phenomenology and missile plume signature measurements to assist in readily identifying and tracking missile threats.
- Innovative science and technology (IST) programs to explore novel, albeit high-risk, options in technology to enable quantum leaps in missile defense capability.

Our technology investment strategy is straightforward. We anticipate the future missile threat and push our own technologies in relevant areas in response. We leverage other Federal and industry research and development investments where appropriate to aid missile defense. We integrate and demonstrate emerging technologies in modest systems demonstrations that seek to identify their merits. Finally, the BMDO technology staff works closely with acquisition staff to expedite the insertion of the newest technology into BMD systems. With this approach, we ensure that our five technology thrusts help develop near-term improvements or technology insertions to our current acquisition programs, or provide an advanced BMD capability to address evolving missile threats.

Our accomplishments in Fiscal Years 1996 and 1997 continue to directly support our theater and national missile defense programs. In particular, I would like to highlight one important technology program. The MSX experiment I just noted, launched in 1996, is the first technology demonstration in space to characterize ballistic missile signatures during the "midcourse" phase of flight between booster burnout and missile reentry. During its lifetime, MSX will detect, track, and discriminate realistic targets against earth, earth-limb, and celestial backgrounds. To date, MSX has collected literally billions of bits of data on numerous missile targets and backgrounds. MSX is capable of observations over a wide-range of wavelengths, from the very-long infrared to the far-ultraviolet. It represents a pioneering use of hyperspectral imaging technology in space. The spacecraft incorporates five primary instruments consisting of eleven optical sensors. All sensors are precisely aligned so that simultaneous observations with multiple sensors can be made. This is essential for scenes or targets that change rapidly. MSX will allow us to collect a complete book of knowledge on what we can expect our sensors to see during a future missile engagements leading to intercept. The performance of the MSX long-wave infrared (LWIR) sensor is feeding directly into the development of the Air Force's Space and Missile Tracking System's LWIR sensors by the contractor teams.

Similarly, we recently successfully tested the key components of the space-based chemical laser program in a ground-test at the Capistrano Test Site, California. On February 20th, BMDO conducted a high-power test integrating the Alpha high energy laser and LAMP telescope. This was the first time that the high energy laser beam has been propagated through a representative SBL beam control system using the four meter LAMP telescope. This experiment demonstrates precise pointing, jitter control, and wavefront measurement. Initial review of the results indicate all test objectives were met. Detailed analysis of the test data will continue for several more weeks. The test will lead to two additional high power tests of the beam control system later this year. The objective is to demonstrate proof-of-principle end-to-end operation of the SBL system in our ground test facility.

Conclusion. Mr. Chairman, I appreciate the opportunity to appear before this Committee and share my views about the BMD program. While I have only been on board as the Director of BMDO for roughly a half year, I can assure you the program is sound. It is strongly supported by Secretary Cohen, Deputy Secretary White and my immediate boss, Dr. Kaminski. My interactions with the user community and the Joint Staff similarly indicates strong support for both the mission of missile defense and the program we have structured to ensure we field those systems as soon as possible.

My twenty-eight years of research, development and acquisition experience tells me that we have our challenges and some aspects of the program are relatively high-risk, but I am reminded that nothing worthwhile is ever easy. And, when the issue is the threat of missile attack, potentially carrying weapons of mass destruction, those program risks may be acceptable if they allow us to field our defenses more rapidly.

I am particularly impressed with the combined Government-industry team that is working to develop and field highly effective missile defenses for the warfighter. The talent, experience and dedication across the spectrum is tremendous. When combined with strong support inside the Department and here in Congress, this talented team can deliver on the promise to make missile defenses a reality.

Thank you, Mr. Chairman. I look forward to working with all the Members of the Committee on this important program. Mr. Chairman, that completes my statement. I look forward to addressing the Committee's questions.