Chapter 6
The Army's Newest Major Command, 1995-present

The U.S. Army Space and Missile Defense Command

In the mid-1990s, the roles and responsibilities of the U.S. Army Space and Strategic Defense Command (USASSDC) continued to evolve. In January 1995, for example, the Army named the Commanding General of the USASSDC the operational advocate and focal point for Theater Missile Defense. One year later, Vice Chief of Staff of the Army General Ronald Griffith designated the USASSDC a stand-alone Army Component Command.

General Griffith reached this decision based on the fact that the "USASSDC carries out responsibilities in scope and magnitude unlike other Army organizations." Specifically, as the Army component of U.S. Space Command, the USASSDC had an operational mission. In addition, as the Executing Agent for BMDO, USASSDC retained a "complex array of funding and tasking responsibilities." Finally, on acquisition issues the USASSDC reported directly to the Army Acquisition Executive. Nevertheless, General Griffith recognized a need for a "proponent like" Army facilitator to integrate space and missile defense solutions with the Army and Joint Warfighting forums. He tasked TRADOC and USASSDC to establish a Memorandum of Agreement (MOA) that would address these issues.[1]

Fig. 6-1. This shoulder sleeve insignia symbolizing freedom and constant vigilance in the U.S. Army Space and Missile Defense Command missions was adopted in February 1998.

On 18 February 1997, following General Griffith's directive, the USASSDC signed an MOA with TRADOC which made the command the Army Specified Proponent for Space and National Missile Defense and the overall Army integrating command for Theater Missile Defense.[2] The command would now determine space requirements for TRADOC approval and lead the integration of doctrine, training, leader development, organization, materiel and soldiers (DTLOMS) solutions across the Army and within appropriate joint agencies. The MOA also chartered the command to establish a battle lab to plan and conduct space and missile defense warfighting experiments.

In response to these new responsibilities and missions, the Army created its newest Major Army Command on 1 October 1997.[3] Effective that date, the U.S. Army Space and Strategic Defense Command, a field operating agency of the Army Chief of Staff became the U.S. Army Space and Missile Defense Command. The General Order reaffirms the new duties, responsibilities, and relationships outlined in the February 1997 MOA with TRADOC and reiterates the missions previously assigned to this organization. Essentially, the command ensures that Army warfighters have (1) access to space assets and the products they provide to win decisively with minimum casualties; and (2) effective missile defense to protect the nation

as well as deployed U.S. forces and those of its allies. The command has developed a number of innovative entities and products to achieve these goals. Space considerations dictate that only some of these are discussed below.
7

Missile Defense Battle Integration Center/ Space and Missile Defense Battle Lab

With the additional responsibility as TMD Advocate, the Army Strategic Defense Command's Commanding General, Lieutenant General Jay Garner, decided to develop a Battle Lab for TMD and space issues. General Garner saw the laboratory system as a means to move missile defense concepts into reality. Army officials granted permission for this proposal in October 1994 and the result was the Missile Defense Battle Integration Center (BIC) created on 16 January 1995.[4] The initial goal of the BIC was to connect the four elements of TMD – active defense, passive defense, attack operations, and BM/C3, enabling researchers to test concepts and allowing commanders to train soldiers. To achieve this goal, TRADOC and the USASSDC developed an MOA which established a working relationship between the two organizations with particular reference to "materiel development, analytical and/or simulation capabilities."[5] As a result of the 1997 TRADOC MOA, which expanded the command's missions, the BIC was reorganized with the Colorado Springs based Army Space Exploitation Demonstration Program to form a full-fledged Space and Missile Defense Battle Lab. Its missions were "to perform experimentation in the domains of space and missile defense and "to develop warfighting concepts, focus military science and technology research, and conduct warfighting experiments."[6] The mission expanded in October 2000 when the Army designated ARSPACE as the single Army component command to support U.S. Space Command's Computer Network Attack (CNA)/Computer Network Defense (CND) missions.

Fig. 6-2. The Uncooled Imaging Technology or UCIT device will enable soldiers to see objects through camouflage, smoke, fog and other

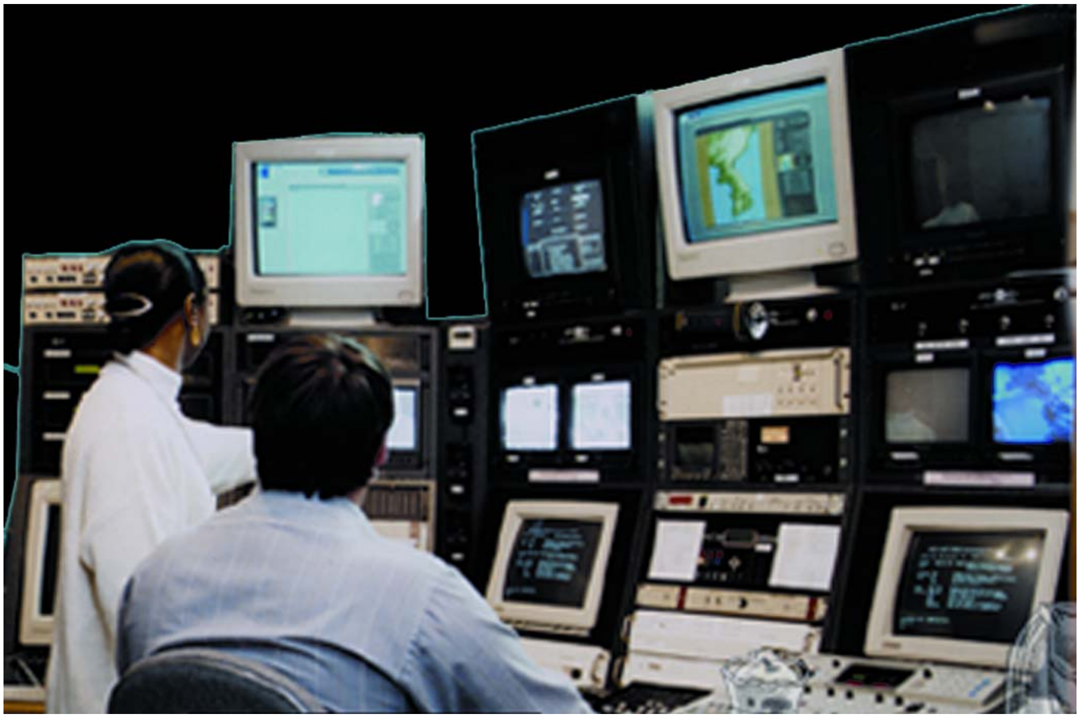

Fig. 6-3. The Extended Air Defense Testbed provides detailed simulations from the fire unit to the theater level and thorough analysis of system interoperability.

One goal for the Battle Lab was to develop a Synthetic Battlefield Environment (SBE) to link technology to the warfighter. The SBE would provide weapons developers, battle planners and commanders interactive realistic scenarios. The Battle Lab's SBE rested with the Extended Air Defense Testbed (EADTB).[7] Initiated in 1989, the EADTB models air, land, sea, and space-based forces and their contribution to theater-level extended air defense. With the innovative EADTB, the user can develop tailored simulations from the fire-unit up to the theater level for TMD and the global level for NMD. The first EADTB nodes opened in June 1994 at the Advanced Research Center in Huntsville, followed by the SHAPE Technical Center in The Hague, The Netherlands and Fort Bliss, Texas. Within three years, the EADTB had grown to include 30 nodes around the world.[8]

The synthetic environment established by the Battle Lab allowed simulated elements to be replaced with actual hardware, permitting a hardware-in-the-loop as well as a human-in-the-loop capability. They introduced the mobile STOW TMD system during Roving Sands exercises in May 1995, synchronizing the TMD battle for the land operations commander. Since then the SBE has continued to grow with the evaluation of new software and technologies to address many facets of the space and missile defense environment. Among the new technologies is Project Stalker which assists in locating, tracking and destroying mobile transporter erector launchers. Similarly, the Battlefield Ordnance Awareness system, introduced in 1999, collects and processes data on missile launches, artillery and tank fire. At another level, No Horizons is designed to support the integration of the Space-Based Infrared System into the Army's TMD force. These and other technology advances are brought to the soldier through traditional exercises, such as Roving Sands, Millennium Challenge, Optic Windmill, Ulchi Focus Lens, and Total Defender, as well as long-distance training and the Space and Missile Defense War Game.

Fig. 6-4. In March 1998, USASMDC achieved a new milestone in distance learning. Soldiers from the 32nd Air and Missile Defense Command, stationed in Kuwait, trained in a computer-simulated missile battle with the Battle Lab representatives in Huntsville, Alabama.

In addition to providing training opportunities and experiments, the Battle Lab brings the product to the soldier through the Army Space Exploitation Demonstration Program (ASEDP).[9] The goal is to "enhance Air-Land execution by demonstrating that space-based assets can support tactical commanders."[10] Many products could be used to illustrate the Battle Lab's successes in this arena. The Global Broadcast System - Joint In-Theater Injection, Joint Tactical Ground Station and the Force Protection Tactical Operations Center (FPTOC), for example, all trace their history to the ASEDP.

As envisioned by then Army Chief of Staff General Gordon Sullivan, t the FPTOC would provide overarching command and control capability for the theater missile defense fight. The mobile center collects and fuses data from a variety of sources including sensors, satellite communications and imagery, as well as air and missile defense units. Introduced in February 1995, the FPTOC was the first digitized command and control center.[11] It was designed to support the four elements of TMD - destroying missiles in flight (active defense); attacking their launchers and infrastructure (attack operations); missile defense warning and vulnerability reduction (passive defense); and, BMC^4I. The next generation system, the Future Operational Capability (FOC) TOC, improved the support provided and reduced the footprint for Joint Theater Air and Missile Defense.[12] With the new Windows-based Advanced Warfare

Environment or AWarE software, the FOC exercise demonstrated many improvements, including a 70 percent reduction in the in-theater footprint, while participating in Roving Sands '00. The new TOC is small enough to be deployed aboard a single C-141 aircraft and still provide the full execution of all TAMD functions.

Fig. 6-5 and 6-6. Tailored for theater-level joint operations, the Force Projection Tactical Operations Center's System of Systems was staffed by a 35-soldier cadre.

In addition to the large systems, the ASEDP has developed technologies that affect the communications available for the individual soldier or unit. The Iridium phone system, supported by a constellation of 70 satellites, provided the first truly global phone system for the soldier in the field. Early warning technology was first tested and deployed, during fiscal year 1998, with the Pager Alert Warning System (PAWS). The PAWS notifies troops in the expected impact zone of tactical ballistic missile attacks. Meanwhile, the soldier equipped with the Joint Expeditionary Digital Information (JEDI) program combines these capabilities with a laser range finder, GPS satellite positioning, and text messaging to send and receive information (troop locations, target data, special requirements) via satellite. Researchers continue to evaluate commercial off the shelf technology and government initiatives to develop innovative systems that bring the capabilities of space to the warfighter.

Force Development and Integration Center (FDIC)

The 1997 Memorandum of Agreement between the Space and Strategic Defense Command and the Training and Doctrine Command designated the USASSDC as the Army's proponent for Space and National Missile Defense (NMD). The USASSDC was given the lead on all NMD issues that required integration across TRADOC. The MOA specified that the Commanding General of USASMDC was the Army's specified proponent for space.[13] The FDIC was established on 1 October 1997 to provide the USASMDC with this capability. Its mission was to "coordinate and execute USASMDC's specified proponency and integrating responsibilities for missile defense and space." To carry out this mission it has four functions. As originally stated, it would develop Army concepts for missile defense and space. The FDIC would develop, manage and prioritize missile defense and space future operational capabilities (FOCs), as well as develop and/or integrate and validate DTLOMS solutions to missile defense and space FOCs by seeing to their inclusion in Army doctrine, FORCE XXI and Army After Next activities, training and leader development programs and methods. The FDIC would also see to their inclusion in new/upgraded materiel/systems and organizations and soldier proponency issues/programs. Finally, the FDIC would, in coordination with Headquarters, Department of the Army, develop and promote Army missile defense and space plans, policies and strategies. In order to carry out this mission and these functions, the FDIC was divided into four divisions, three concentrated on the TRADOC DTLOMS domains while the fourth served as the nexus for developing and articulating USASMDC's position on space and missile defense issues and worked to maintain liaison with external organizations and agencies.

The Concepts and Doctrine Division ensured a vertical and horizontal approach in developing, integrating and synchronizing space and missile defense warfighting concepts, doctrine and future operational capabilities. It also examined Army and Joint doctrine for space and missile defense implications and ensured consistency with associated warfighting concepts. The Training, Personnel Proponency and Leader Development Division translated space and missile defense training and leader development requirements into programs, methods or devices, assessed the adequacy of space and missile defense training and education programs throughout the Army and developed the USASMDC space literacy program. In this division, the Personnel Proponency Office was responsible for Functional Area 40 (Space Operations) and skill identifier 3Y (Space Activities) for officers and made sure that soldier proponency issues with future national missile defense organizations were addressed properly during planning and execution. The Combat Developments Division developed or integrated and synchronized Army space and missile defense materiel and organizational solutions and participated in all TRADOC combat developments processes. Finally, the Plans, Policy and Joint Coordination Division developed and coordinated Army space and missile defense strategies and policies in conjunction with the Army Staff and provided a liaison function between the command and outside organizations.

The FDIC's activities were pursued with vigor. The FDIC participated in the Army After Next Missile Defense and Space Game at Schriever AFB, Colorado in February 1999. Over the ten-day event, the Center drew the following six "emerging insights." The results of the game showed "the increasing importance of commercial space activities." The Center believed that the U.S. military "must have the means to leverage future commercial space capabilities," and urged military planners to pay attention to and understand the "rise of transnational space consortia." The Center noted that as the Army increases its reliance on GPS and other space capabilities, this "necessitates assured protection." In the future, the Army would have to confront "uninhibited surveillance from military and commercial space systems. Counter RISTA capabilities and deception measures will be critical in achieving information dominance." The Center also noted that the United States "may have to tolerate low-level attacks on space systems to avoid rapid geographic and conflict escalation." Finally, "adequate terrestrial missile defense capabilities are needed to avoid premature conflict escalation into space."[14]

From the inception of the program, the FA 40 specialty was a hot commodity and attracted many officers. In a 2000 interview, the FDIC Director, Colonel Glenn C. Collins, Jr., noted "We have a 400 per cent application rate - officers who want to be space officers versus how many we can actually accept."[15] FA 40 officers assist in managing, planning and integrating space capabilities to the benefit of the warfighter. The course of study involves both military and civilian schooling. However, despite its technical nature, this functional field draws officers from all the branches.

In the years since its founding, the FDIC in particular has been engaged in normalizing doctrine by including space and missile defense in significant Army and Joint publications.[16] As the Army continues its transformation efforts, the FDIC works to refine the Army's space and integrated missile defense requirements and prioritize them to support these efforts.

Space and Missile Defense Technology Center

In the mid-1990s, the U.S. Army Space and Strategic Defense Command underwent a series of reorganizations to better address its dual missions and the Army's priorities. New directorates replaced those originally established to align with the organization of the SDIO. The Staff

Realignment Study established a Missile Defense and Space Technology Center, to reflect more clearly the roles and missions of the Huntsville-based technical organizations.[17] The Tech Center also underscored Huntsville's reputation as a national center of excellence for missile defense[18] and realized plans to expand Huntsville's role in the Army space mission. In essence, the Tech Center serves as the command's technology developers, identifying and developing improvements to current systems and developing new materiel technologies. Recognized for leadership in missile defense technology, on 10 November 1995, Secretary of the Army Togo West designated USASSDC a Reinvention Laboratory to develop new, innovative and streamlined business practices.[19] Five years later the organization's accomplishments were again recognized as Lieutenant General Ronald Kadish, BMDO Director, appointed the USASMDC as the executive agent for ballistic missile defense science and technology.

This organization's continued achievements can be seen in the progress made by the variety of missile defense systems under development. While technology associated with interceptor systems remains its primary focus, the Tech Center continues to explore innovations. Directed Energy is once again the focus of attention and the USASMDC prepared the first Directed Energy Master Plan in 1999. Sensor technology also advanced. One example sought to improve the interceptor systems' ability to interpret what they see, while another was designed to expand the area covered. All in all, the overall goal of the Space and Missile Defense Tech Center is to be "more flexible, and [able] to respond more rapidly to new programs and marketing opportunities."[20]

Directed Energy Initiatives

In its short history, the High Energy Laser Systems Test Facility (HELSTF) has performed many tests, experiments and support work for the DoD, NASA, and other scientific communities. As one former HELSTF commander observed "lasers for shooting down missiles or aircraft are no longer something dreamed up by science fiction writers."[21] As if to underscore the commander's words, in the 1990s HELSTF overcame Army opposition and successfully demonstrated the feasibility of laser systems in anti-satellite and missile defense roles.[22]

Data Collection Exercise

In 1989, the Directed Energy portion of the Anti-Satellite Acquisition Decision Memorandum tasked the Army to develop the prime candidate for the DE ASAT weapon, based upon the Army-managed, SDIO GB-FEL TIE.[23] The HELSTF conducted the first satellite lethality experiment in August 1991. With the success of the Mid-Infrared Chemical Laser (MIRACL) in tests against rockets, Congress imposed a ban on testing the laser against satellites.[24] The ban expired in 1995 and the Army began preparations to attempt to lase an orbiting satellite in 1997.

The HELSTF took the first step towards the experiment tracking the MSTI-3 satellite with the laser in March 1997. The Data Collection Exercise (DCE) called for the MIRACL, a 1-million megawatt laser, to target an Air Force satellite to assess the ability of a laser to blind an orbiting satellite.[25] Given the increased dependence by American forces on satellite/space systems, this proposed experiment was vital to determine potential vulnerabilities in the space systems.

Fig. 6-7. At left, mounted on a 5-inch naval gun mount, the SEALITE Beam Director, with a 1.5 meter aperture, aims laser beams at moving targets. An infrared photo shows the MIRACL lasing a high altitude drone during a 1991 propagation test. At right are the results of a MIRACL beam directed against a TITAN ICBM stage.

As the time neared for the proposed test, however, the project met with controversy. Although the test did not violate existing treaties, a number of groups expressed opposition to it, arguing that it would result in the militarization of space and lead to a new arms race.[26] While the Pentagon had defined the experiment as a defensive test, opponents, including the Russian government, countered that the data could be used for offensive purposes.[27] Nevertheless on 2 October 1997, Secretary of Defense William Cohen approved the proposed laser test.

During five tests conducted between 8 and 25 October, the USASMDC successfully completed the DCE at White Sands Missile Range, New Mexico. The exercise began on 8 October when the Low Powered Chemical Laser (LPCL) acquired, tracked and illuminated the five-foot satellite orbiting approximately 260 miles above the Earth. In the next stage, on 17 October, both the MIRACL and LPCL successfully tracked and scanned the satellite. Although the satellite's systems failed to collect data, a camera on the sea-light beam director detected the laser beam on the satellite. Due to a technical malfunction, only the LPCL completed the last three phases of the experiment. The LPCL, which operates at 30 watts, dazzled or temporarily blinded the satellite on three successive nights. The tests provided data on atmospheric propagation and showed that even a low-powered laser could have a negative affect on a satellite's performance with only "a momentary or inadvertent exposure."[28]

Tactical High Energy Laser (THEL) and Mobile THEL

In the 1980s, the MIRACL system demonstrated the potential of directed energy systems to destroy targets using grounded missiles and helicopters. The next phase was to demonstrate the effectiveness of a more compact tactical laser to intercept a missile in fight - the Nautilus program. In 1995, the Army designated the Air Defense Center and School as the lead agency for the development of a tactical high-energy laser.[29] The USASSDC meanwhile oversaw the technical issues. As defined by the Technical Center, the THEL system, mounted on a five-ton truck, would have a range of one-kilometer for hard kills and up to 10 kilometers for sensor kills. With an engagement rate of 10 kills per minute, the THEL would be a cost-effective addition to the air defense arsenal.

Conducted by the USASSDC and the Israeli Ministry of Defense, the Nautilus program began testing in 1996. In its first attempt MIRACL achieved a successful intercept of an armed, short-range 120mm missile in flight on 9 February 1996, marking the first time that a laser had destroyed a rocket in flight. The success of this test generated increased interest in the Nautilus demonstration program and the THEL concept. In April 1996, President Clinton promised to support Israel to field a THEL by the end of 1997.[30] The Army committed additional funds to the effort and on 11 May Secretary of Defense William Perry elevated the THEL to a first priority as an Advanced Concept Technology Demonstration. Also in July 1996, the United States and Israel signed an MOA to explore the use of a THEL to negate the threat posed by short-range rockets, such as the Katyusha.[31]

Fig. 6-8. In this series of photos the Tactical High Energy Laser heats the warheads of two missiles to detonate and neutralize them.

As work began on a prototype system, the command began to address the requirement for the future, releasing a notice for a mobile fire unit for the forward battle area capable of intercepting anything that flies at low ranges and disrupts airborne sensors.[32] Defense officials, however, were not convinced. Army Chief of Staff General Dennis Reimer, for example, testified that the truck-mounted system was "not as robust as we would like" and remarked upon its short-range limitations.[33]

With funding issues, and problems with near-term options, it initially appeared that General Reimer's assessment might be correct. Under the new agreement the design and construction phase for the THEL demonstrator was allocated 21 months with an additional 12-18 months of field testing in the United States and Israel. In that time, the contractor, TRW, would develop a transportable, tactical, deuterium fluoride chemical laser able to interface with a radar system supplied by Israel and support equipment.[34]

While the proposed 1997 field testing was delayed, testing did continue. On 14 March 1997, for example, THEL Test 8A demonstrated tracking and lasing capabilities against multiple in-flight targets. Funding however remained an issue. Despite support from Israel and members of Congress, the administration had not requested funding for the program beyond fiscal year 1999, because the Army had no formal requirement for the THEL. In 1999, the two governments, however, agreed to contribute additional funding to continue the program. They also negotiated a new contract with TRW to address schedule delays and cost overrun issues.

Fig. 6-9. Two soldiers stand beside the Tactical High Energy Laser beam director.

Despite these financial concerns, at its introduction at Roving Sands '98, the THEL demonstrated an 80-90% success rate against a variety of threats.[35] In June 1999, the THEL ACTD laser subsystem achieved first light, the first successful test of a laser, in tests at TRW's Capistrano Test Facility in California. Within the year, on 6 June 2000, the THEL demonstrator, in its first attempt, tracked and destroyed a Katyusha rocket in flight during tests at the HELSTF site. By the end of August 2000, the THEL had graduated to dual salvo tests - tracking and destroying two rockets in quick succession. Two additional dual salvo tests were successfully completed by the end of September.[36]

Between June 2000 and July 2001, the THEL destroyed 23 rockets in testing at White Sands. The next challenge, however, was to develop a more mobile version of the THEL. The Army began exploring this concept in 1999 in response to an operational needs statement from the Eighth U.S. Army in Korea.[37] As the political situation in Israel changed, they too expressed an interest in a mobile system. The resulting Mobile THEL or MTHEL system was designed to defend against a greater variety of threats - short-range rockets and mortars, aircraft, unmanned aerial vehicles, and possibly cruise missiles. In tests conducted on 5 November 2002, the MTHEL successfully demonstrated its capabilities against this set of threats. The system tracked and destroyed three 152mm projectiles fired from a howitzer.[38] The MTHEL Program transferred from the USASMDC to the Program Executive Office, Air and Missile Defense's Short Range Air Defense (SHORAD) Project Office on 28 February 2003.

Fig. 6-10. Introduced to the public in December 2002, the ZEUS laser neutralization system is a laser system designed to heat a target until the ordnance explodes. The prototype ZEUS deployed to Afghanistan in March 2003 to neutralize land mines and unexploded ordnance

TMD Critical Measurements Program

In the mid-1990s, as head of the Cooperative Targets effort, the Sensors Directorate participated in the BMDO's Midcourse Space Experiment (MSX). In one series of experiments, the satellite based MSX focused on identifying and tracking ballistic missiles and penetration aids after booster burnout and before reentry.[39] Using infrared, ultraviolet, visible light and spectrographic sensors, the MSX collected real-time data against terrestrial, earth and celestial backgrounds. The space-based sensor allowed scientists to conduct assessments not feasible in previous target data studies.

While, the MSX provided additional signature data for national missile defense system, the TMD Critical Measurements Program (TCMP) was a product of Operation Desert Storm.[40]

Fig. 6-11. The Theater Missile Defense Critical Measurements Program collects flight test data for the missile defense program's interceptor and sensor systems.

Following the war, the ability to distinguish between warheads and missile debris became a priority. In a series of campaigns beginning in 1993, the TCMP collected optical and radar data on various tactical ballistic missile target packages. The goal was to reduce TMD systems risks by characterizing "potential countermeasures and [developing and testing] computer algorithms."[41]

In the initial TCMP flights, only tested radar and sensor packages, such as the AST, the High Altitude Observatory and the USAKA based radars, participated in the data collection exercise. As the program progressed however, new products were integrated into the effort. Each test focused on the requirements of one or more TMD systems. Ultimately, all of the Army's radar systems - the GBR, the Patriot, THAAD, and Medium Extended Air Defense System, - the Navy's AEGIS and the Air Force's Space and Missile Tracking System would participate and benefit from these tests.

Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System

During the 1990-1991 Persian Gulf War, U.S. forces successfully intercepted ballistic missile threats. With the systems available at the time, however, those intercepts tended to occur over friendly territory. In the mid-1990s, with the proliferation of cruise missiles, sometimes referred to as the "poor man's air force", the Defense Science Board recognized a need for a sensor that could – adapt to any terrain and essentially see over the horizon.[42] In 1995, Under Secretary of Defense for Acquisition and Technology, Dr. Paul Kaminski, directed the USASSDC to evaluate aerostats as sensor platforms for cruise missile defense.[43] The 1995 Mountain Top experiment provided positive data on the feasibility of an aerostat-based sensor. In January 1996, Dr. Kaminski and Joint Chiefs of Staff Vice Chairman Admiral William Owens directed the Army to form a joint program office and initiate an aerostat program and field two operational Aerostats by fiscal year 2002.[44] The Army assigned operational control of this first priority program to the USASSDC and established the Aerostat Project Office on 6 February 1996. By the end of the year, a million-dollar concept definition contract was awarded to H&R Co., a joint venture between Hughes Aircraft and Raytheon.

An aerostat is a tethered balloon designed with an inner ballonet. The ballonet contains air and is used to control the altitude of the system by increasing and decreasing the volume provided for the helium gas. This design and the Mylar construction provide stability for the system. A puncture from a bullet or missile would only produce a very slow helium leak. The unmanned sensors, suspended in a compartment below the aerostat, provide a 360° picture enhanced by the Identification Friend or Foe System. This data is relayed to a ground-processing center via a fiber optic tether, which would notify relevant interceptor systems. An aerostat can provide 24-hour surveillance for periods up to 30 days.

Fig. 6-12. The cost effective Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System employs an aerostat, a tethered helium-filled blimp, outfitted with radar and communications equipment that operates at altitudes between 10,000 and 15,000 feet to see over the horizon.

The primary focus of the Aerostat Program, renamed Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS) in 1996, was missile surveillance, tracking and fire control for the various anti-missile systems. The program overcame availability issues and conducted its first experiment during Roving Sands '96. The system demonstrated BM/C^4 functions by successfully tracking 65 targets each hour from a distance of 200 miles and relaying data to the Force Projection Tactical Operations Center located 60 miles away. The data was then forwarded to the Air and Missile Defense Command Center which alerted Patriot and

SHORAD units.[45] This "proof of principle" test illustrated the systems "ability to significantly increase battlespace awareness."[46]

Despite repeated Congressional funding cuts, the JLENS program initiated its demonstration program and was cited as "one of the real success stories at Roving Sands '98."[47] Operating in the simulation mode, the JLENS provided the air picture for the Army Air and Missile Defense Command sending data for Patriot, Aegis and SHORAD units. In March 1999, the JLENS proved its utility in a joint operational environment. During All Service Combat Identification and Evaluation Team '99 exercises, a 15-meter aerostat served as a relay platform between an Aegis cruiser and a Patriot battery at Fort Stewart, Georgia, providing the first live real-time data exchange between the two services.[48] This exercise was a test of the JLENS processing station, which correlated data and created a single integrated air picture.[49]

Original designs called for two radar systems for the JLENS system: precision track and surveillance. A lack of funding remained a problem, however, and early in fiscal year 1999 officials opted to pursue only the precision track radar needed to relay data to the Patriot batteries.[50] With a new, slower development pace, the surveillance radar would remain an option for the future. The 2002 demonstration goal was subsequently pushed back to 2005.

The Army however remained committed to the JLENS program. In February 1999, the command submitted a proposal to convert the program from an Advanced Concept Technology Demonstration to an acquisition category II program.[51] This transition would define the program's direction and possibly solidify funding by creating a stable program. In March 1999, DA officials approved the transition. Perhaps more importantly, in May 1999 the Joint Theater Air and Missile Defense Organization identified the JLENS as a "central player in the future cruise missile defense architecture."[52] The good news continued in November 1999, when *Popular Mechanics* magazine awarded the JLENS Program Office a 2000 Design and Engineering Award. Magazine editors observed that the JLENS "represented a very clever use of existing technology to solve an extremely difficult problem."

April 2000 and the Forward Pass Mission saw the next major advance in the JLENS program. In these demonstrations, the JLENS successfully completed two target intercepts guiding a surface-launched interceptor (an Advanced Medium Range Air to Air Missile) beyond the range of its own organic radar. The concept required two types of radar, a surveillance system and a precision track and illumination radar, to identify the target and cue the system to intercept. The April test represented several firsts: the first live, over-the-horizon engagement of a cruise missile target using an elevated sensor; the first program to demonstrate the Forward Pass concept; and, the first time that control of a missile in flight was handed over to another radar (the forward pass) to intercept a low flying target.[53]

The JLENS mission includes detection and tracking of low altitude threats (cruise missiles and aircraft), tactical ballistic missiles in the boost phase, and surface moving targets; support for air-directed surface-to-air missile engagements (e.g. Forward Pass), and support for developing and displaying the single integrated air picture. By the end of 2000, the program successfully demonstrated its abilities in each of these areas. In May 2001, the JLENS program sought to demonstrate the system's versatility and a possible secondary mission of signal and intelligence support. During the Signal Symposium at Fort Gordon, Georgia, the JLENS communications package transmitted voice, video, and data from a mobile HUMVEE to the exhibit center. Following the tragic events of 11 September 2001, the Army staff and the JLENS Program Office also began to explore possible Homeland Defense missions for the elevated networked sensor.[54] On 1 October 2001, the JLENS Program Office transferred to the PEO-AMD for formal acquisition, testing and fielding.

Office of Technology Integration and Interoperability (OTII)

The significance of the Single Integrated Air Picture (SIAP), illustrated by the JLENS, was recognized by the Joint Requirements Oversight Council in March 2000 with their decision to establish a SIAP Engineer Task Force. The task force's focus was to investigate the integration and interoperability issues faced by warfighting commanders associated with emerging and legacy systems. In July 2000, the USASMDC Commander, Lieutenant General John Costello, chartered the Office of Technology Integration and Interoperability, as a Major Subordinate Element of the command, to address this issue and serve as the subject matter center for the Task Force.

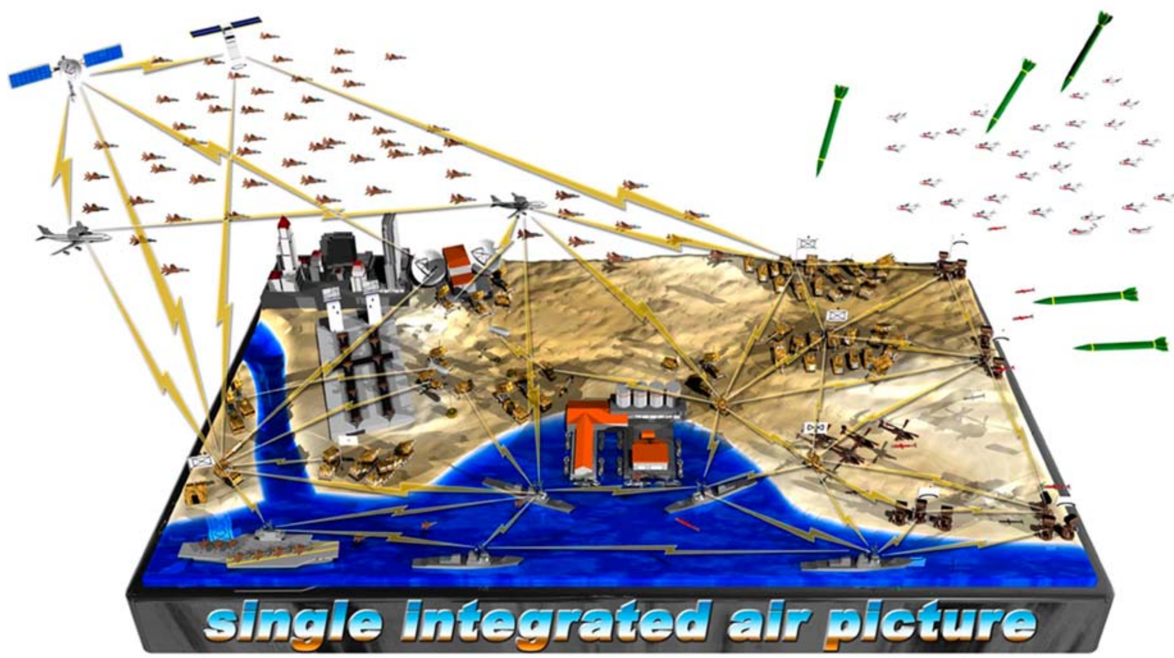

Fig. 6-13. As military maneuvers become increasingly joint, the services are working together to develop a Single Integrated Air Picture.

The OTII's immediate mission is to identify and prioritize the Army's interoperability requirements for the four pillars of Joint Theater Air and Missile Defense. The goal is to link together all Army TAMD systems, and those of the Navy and the Air Force. The broader mission requires the OTII to assess and leverage technology efforts from the Department of Defense and industry with regard to TAMD as well as space and missile defense. One such initiative is the Low Cost Interceptor - a long-range interceptor costing less than $100,000 each to manufacture.[55] The program is evaluating propulsion, seeker, missile guidance and lethality components in existing and maturing technologies to develop a cost-effective counter to the proliferating threat posed by unsophisticated cruise missiles.

The USASMDC, the Army Space Master Plan and the Objective Force

In 1997, the Army established a new major command, the U.S. Army Space and Missile Defense Command, to sponsor its efforts in space and national missile defense and as overall integrator for theater missile defense.[56] Creating the command brought the Army's interest in space to a new level. The Army's earlier efforts in space have already been noted and described. They played out against a background of war and Cold War. The way space-based systems were used in the Gulf War vindicated the Army senior leadership's decision of the mid-1980s to re-enter space in order to influence the ways in which the systems it used would be developed. The challenge was to keep space-based systems in the Army's consciousness as it reorganized to face the post-Cold War world.

In 1996, the Army initiated the Army After Next (AAN) Project to craft requirements for the Army of the near future, to focus on future warfare, specifically between the years 2010 and 2025. The AAN's brief was to "explore the nature of warfare thirty years into the future and to help develop a long-term vision for the Army." Its specific mission "was to conduct broad studies of war . . . frame issues vital to the development of the U.S. Army after about 2010, and provide issues to senior Army leadership in a format suitable for integration into TRADOC combat development programs."[57] In 1997 and 1998, a series of war games initiated as a part of this project, gave the Army's senior leadership an appreciation of just how crucial space assets had become and would remain to modern land warfare.[58] The games emphasized futuristic thinking about the Army. In the first round, the AAN imagined a radically different Army - one that could self-deploy easily to anywhere in the world and one not constrained by the limits of contemporary doctrine and technologies. These virtual units enabled the players to examine notions about future warfare marginally connected to contemporary realities to stimulate unconventional thinking.

The AAN Space Game Two took place in Colorado Springs under the auspices of the USASMDC, TRADOC and the National Reconnaissance Office (NRO). The game's object was to show how space support could be integrated into a cohesive theater campaign. Its results gave the Army a better understanding of the ways in which space-based resources might affect military operations on the ground. The game also pointed out ways commercial space-based systems could amplify the commander's knowledge of the battlespace with improved position and navigation capabilities and imagery systems.[59] Many of the Army's senior leaders identified space as the battlefield's new "high ground." According to USASMDC's first commanding general, Lieutenant General Edward G. Anderson, III, "Space has become a permanent platform for capabilities whose possession or loss can decisively influence the conduct and outcome of the land battle."[60]

However, possession or loss of space is only part of the effort to learn how to use this new medium, this new area of operations. A Memorandum of Agreement between the Army's newest command and the Training and Doctrine Command explicitly enumerated the new command's role as the Army's proponent for space and national missile defense and theater defense integrator. It specifically identified USASMDC's authority and responsibility to participate in TRADOC processes and to develop DTLOMS products in the areas of space and missile defense. The MOA also authorized establishing a Space and Missile Defense Battle Laboratory. A Force Development Integration Center was also created to work with the USASMDC Battle Lab to exercise control over this process. The work of these organizations has already been described.

The USASMDC had the primary responsibility to ensure soldiers had access to space-based assets. This would be accomplished by validating space as an important part of Army and joint training operations, acting as the Army proponent for space-based systems in the military and industry in developing and testing technology to use in space-based systems and fielding and operating successful space products.[61] If the primary workhorse for achieving these goals would be ARSPACE then the vehicle would be the Army Space Master Plan (ASMP).[62] Published in March 2000, the plan concentrated on the goals of "operationalizing, institutionalizing and normalizing" space in the force structure.[63] The plan's executive summary called for the Army to integrate space into every aspect of its daily routine, including planning, training and exercises. Officers and enlisted soldiers needed to be "literate in space support," while the Army had to develop space systems that would deliver accurate and timely information directly to the battlefield.

The Army would determine the requirements, conduct the research, develop, acquire and shape the future design and application of space systems. Additionally, commanders and soldiers alike would be continually trained about space-based systems to become accustomed to using space in actual operations. Learning about space-based systems would be part of the Army schools' curricula from pre-commissioning through the advanced service schools for officers and Department of the Army civilian employees and through technical schools for non-commissioned officers and enlisted personnel. In addition, ways to use space-based systems would be placed into all Army doctrinal publications to insure that using them would become habitual and both their advantages and limitations would become known.

The ASMP itself is composed of an executive summary, an introduction, six substantive chapters and a conclusion. It starts by defining the current and future space environment, and the continued by delineating the Army space requirements determination process, non-materiel activities, current systems and modernization strategy, Army space initiatives, capabilities assessment and conclusions and challenges.[64] The ASMP provides the over-all direction and necessary guidance to implement the Army's space policy. The plan's objective is to present the necessity for embedding space systems and technologies into the Army's force structure and creating a well-trained and innovative cadre of space-literate personnel who understand the benefits space-based systems can bring to the Army. To accomplish this goal, the Army would ingrain space into its way of life, increasing understanding about the ways space-based systems can help the soldier as well as the limitations of these systems.

The ASMP begins by defining the "space environment."[65] The environment, however, is not space itself (the medium), but is the "body of policies, plans, organizations, agencies" and threats that "influence, enhance and enable the space missions, warfighting concepts, programs, initiatives and experiments." The plan reviews the documents that set the direction for future space activities and programs: the National Space Policy[66], the National Space Security Space Master Plan[67] and the United States Space Command Long Range Plan.[68]

The space requirements determination process is managed by USASMDC and coordinated with the various TRADOC branch proponents. The ASMP then explains the process specified in the 1997 TRADOC-USASMDC MOA. The plan turns to the Army's role in determining joint requirements, and outlines the national and joint policy documents that affect the determination of space requirements.[69]

The fourth chapter examines the non-materiel means to improve readiness. It outlines the three pillars forming the foundation of the institutionalized space mind-set. They are (1) leader development training and education, (2) embedding a special staff section at corps level and investigating the need at division-level and below and (3) documented space integration across the spectrum of cornerstone documents and publications. The plan's authors advocate focused integration of space throughout the Army's colleges, schools and centers as well as unit training.[70]

The fifth chapter, Current Systems and Modernization Strategy, presents an overview of the space systems and their related ground segments of most interest to the Army through 2005. It then extrapolates this overview to 2020. The modernization strategy is based on improving past capabilities while preparing for the changes that will occur when the first digitized division joins the force in 2000 and when the first digitized corps joins in 2004. The chapter assumes that the promise inherent in digitization will be realized and that the promise of success is dependent upon assured access to adequate space, related ground assets and their seamless integration.[71] The sixth chapter outlines Army Space Initiatives. The chapter defines the space initiatives; that is, the technology developments, experiments and demonstrations designed to satisfy the Army's space future operational capabilities.[72]

The seventh chapter assesses whether or not these capabilities are adequate enough to enable the Army to meet its future operational challenges in the near-term (FY 00-04), the mid-term (FY 05-10) and the far-term (FY 11-20). The capabilities are rated against the operational requirements for each time period. According to the ASMP, it appears that the future operations capability process is proceeding according to plan and will be able to attack the combat capability multipliers. Needless to say, in those areas where the Army is traditionally supported by other Services, Army space initiatives are lacking.[73] The final chapter draws conclusions from those previous and completes the ASMP methodology. It connects the goals and analyses and sets a course for the Army in the near-, mid-, and far-terms.[74]

Through the last years of the 20th century, the Army focused on modernizing its heavy mechanized units. However, in 1999 a slightly different Army transformation effort began, one that attempted to create medium weight units that could deploy swiftly and destroy an enemy with overwhelming speed. This Objective Force is built on new weapons systems, but its intellectual underpinnings for using space-based system to support it may be found in TRADOC Pamphlet 525-3-14, *Concept for Space Operations in Support of the Objective Force*.[75] It is the Army's "holistic concept" for "space and land force operations" and will be used to develop solutions across the DOTML-PF (doctrine, organization, training, materiel, leader education, personnel and facility) spectrum. The objective for TRADOC is to provide a concept that will "serve as a baseline" for developing "space-related operational capabilities and requirements."

Four space mission areas are enumerated in the Joint Doctrine for Space Operations (Joint Publication 3-14): force enhancement, space support, space control and force application.[76] The latter exists only in the minds of planners and technologists since it involves attacking forces or objects on earth from space. Space support refers to the actions taken to maintain space-based system, while space control refers to the means used to ensure access to space-based systems by friendly forces while denying access to adversaries.

Force enhancement includes what most believe is the true meaning of "support from space." This includes (1) satellite communications (SATCOM) links that ensure connectivity when terrestrial links are unavailable or nonexistent, (2) space-based and space-enabled surveillance and reconnaissance systems, (3) space-based position, velocity, navigation and timing systems, (4) space-related weather, terrain and environmental monitoring systems and (5) space-derived missile warning information. In order to achieve success, the Objective Force units must see first, understand first, act first and finish decisively. Because it will be space-enabled, the force will be able to use, as a matter of routine, the entire overhead constellation of military and commercial space platforms to accomplish these goals.

Developing the space essential operational tasks comes from wargaming and analysis and historical analyses and lessons learned derived from training exercises and actual operations. If space forces provide the necessary support for these tasks, the Objective Force will achieve operational success. There are five essential space operational tasks: (1) Supporting increased deployability and reduced theater footprint by enabling global reach to the home station operations center through 24x7 global SATCOM; (2) Enabling situational understanding of the operating environment upon arrival during entry operations. This would include space-based weather monitoring, mapping and terrain analysis that would support the intelligence preparation of the battlefield; (3) Supporting precision maneuver, fires, sustainment and information by reducing the fog, friction and uncertainty of warfare by using accurate and jam resistant GPS as well as combat identification and in-transit visibility; (4) Enabling continuous information and decision superiority to allow commanders on the scene to operate on their own terms, at times and places of their own choosing through space control protection and surveillance; and (5) Protecting the committed force during all phases of the operation including timely and accurate theater ballistic missile warning and defeating enemy attempts to use space systems. Thus, the Army and the Joint community have realized that space, an operational medium like the land, sea or air, is the new high ground and it must be seized in order to dominate the battlespace on earth.

The Army is growing more dependent upon space-based force enhancement capabilities and this means its vulnerability to disruption is also increasing. The increased use of commercial space-based systems has altered the definition of the space environment and to a certain extent represents a potential leveling of the playing field. Since the early 1990s, commercial space imagery satellite systems have improved the accuracy, quantity and timely delivery of the data they gather. Therefore, an adversary can use satellite reconnaissance photos without owning any satellites.

The Objective Force is designed to take a decisive role in joint and multinational military operations. It will be strategically responsive and immediately deployable. Units will be modular while organizations will be designed to be tactically flexible. Underpinning the new capabilities will be soldiers trained in a way that increases their mental agility and initiative.

As outlined above, control of space and space-based systems play an important role in preparing for tactical operations. Space control's contribution to the Army's Objective Force and to the joint force commander cannot be overemphasized. The Objective Force's employment of sophisticated space control capabilities should degrade or substantially diminish an adversary's military decision making process. Technology and war are interrelated, but innovative technology does not by itself win battles and wars. The doctrinal and training implications of space control technology hold the potential for changing warfare.

Underneath the story of the Army's return to space and its technological breakthroughs in the field of missile defense lay the virulent partisan political debate over national missile defense. Held temporarily in abeyance at the end of the Cold War and by the reconfiguration of national missile defense concepts, it flared up again as guided missile proliferation and nuclear proliferation continued apace.

National Missile Defense: Politics and Threat Assessment

In the early years of the Clinton administration, national missile defense was not an issue. In January 1992, the Russian government announced that it would accede to all treaties of the former Soviet Union.[77] On this date in an address to the United Nations Security Council, Russian President Boris Yeltsin described the ABM Treaty as "an important factor in maintaining strategic stability in the world." He also proposed the elimination of existing ASAT programs and suggested a ban on such weapons.

In July 1993, the Clinton administration announced its position on the ABM treaty.[78] President Clinton adhered to the "narrow" or "traditional" interpretation of the treaty. Thus the treaty prohibited the development, testing and deployment of sea-based, air-based, space-based and mobile-land based ABM systems, regardless of the technologies employed. One year later, Presidents Clinton and Yeltsin issued a joint statement that both nations "agreed on the fundamental importance of preserving the viability and integrity of the ABM Treaty."[79]

The debate over National Missile Defense reemerged in 1994 with the Republican Party's Contract with America. In this document, the 350 Republican candidates for the U.S. House of Representatives pledged to introduce and support the National Security Restoration Act. This legislation included the promise to "renew the U.S.'s commitment to an effective national missile defense by requiring DOD to deploy anti-ballistic missile systems capable of defending the U.S. against ballistic missile attacks."[80] The subsequent proposed Missile Defense Act of 1995 stated that it was the policy of the United States "to deploy at the earliest practical date highly effective theater missile defenses" and "to deploy at the earliest practical date a national missile defense system that is capable of providing a highly effective defense of the United States against limited ballistic missile attacks."[81] This document called for up to 100 ground-based interceptors at a single site or a greater number of interceptors at a number of sites as deemed necessary, fixed, ground-based radars, space-based sensors, and BM/C^3 be deployed by 2003. The language implied the abrogation of the ABM Treaty and, consequently, President Clinton vetoed this legislation in December 1995.[82] The resulting legislation advocated the deployment of an affordable and operationally effective TMD and "a cooperative, negotiated transition to a regime that does not feature an offense-only form of deterrence."[83]

In 1996, the NMD deployment question produced two conflicting proposals. Arguing that the "best defense is a good defense," the Republicans introduced the Defend America Act of 1996, which sought to deploy an NMD system by the end of 2003.[84] The stated policy was to deploy a system capable of defending the continental United States, Alaska and Hawaii, against a ballistic missile –launch, whether accidental, unauthorized or deliberate. A second criterion required DoD to develop a system that could be augmented to provide a layered defense against larger and more sophisticated missile threats. Rather than rely solely on a land-based ABM system, the proposal incorporated a variety of space-based options.[85] Congressional Budget Office cost estimates put deployment of this system, composed of 100 ground-based interceptors, ground-based radars, a constellation of 24 space and missile tracking sensors and a constellation of 500 space-based kinetic energy interceptors, at $31 to $60 billion. As a result of these estimates the bills never came to the floor for a vote.

The Clinton administration countered that a missile defense system is not required because, "No rogue nation today has ICBMs; only the established nuclear powers have ICBMs . . . [O]ur ability to retaliate with an overwhelming nuclear response [would] serve as a deterrent."[86] The administration's NMD Deployment Readiness Program, known as "3 plus 3", called for three additional years of development, followed by a review of the ballistic missile threat, to be conducted in the year 2000. If warranted the program would then proceed for three more years to deploy a system.[87] This treaty-compliant deployment focused on a single site - the former SAFEGUARD Complex in North Dakota - and included 100 ground-based interceptors, a GBR, an upgraded early warning radar, an adjunct forward based radar in Alaska, and in-flight interceptor communications for BM/C^3. As designed, this NMD system could provide a defense against a limited attack by a rogue nation or a small accidental launch.

Critics questioned the administration's commitment to its program, pointing to a lack of procurement funding in the long-range plans for defense spending.[88] Nevertheless, repeated attempts to enact legislation requiring the deployment of an NMD system by the end of 2003 failed to reach a vote in Congress. With the support of the Joint Chiefs of Staff and others, the 3 plus 3 program remained the standard throughout the Clinton Administration.[89]

Some change did appear in 1999. Responding to a new threat analysis, the Clinton administration included an additional $6.6 billion in the fiscal year 2000 budget for the development of NMD technology to be deployed by 2005.[90] Later that year, the President reversed his initial opposition and agreed to support the National Missile Defense Act of 1999. Public Law 106-38 was signed into law on 23 July 1999. The law states that it is the policy of the United States to (1) deploy as soon as technologically possible a National Missile Defense (NMD) system capable of defending U.S. territory against limited ballistic missile attack (whether accidental, unauthorized, or deliberate) and (2) seek continued negotiated reductions in Russian nuclear forces.[91]

Under the "3 plus 3" program, the year 2000 was pivotal to the NMD program. President Clinton was to decide whether or not to deploy the NMD system following a June 2000 technology review. In fact, to meet the proposed 2005 deployment date a decision would be needed no later than September, as weather conditions in the North dictated ground-breaking for construction.

A General Accounting Office report, written in May 2000, found that although DoD had taken measures to reduce program risks, performance and schedule risks remained.[92] Opponents revived the "rush to failure" criticism of the NMD program. In June, however, the NMD Independent Review Team "concluded that the technical capability to develop and field the limited system to meet the defined C1 threat is available."[93] The report added that the 2005 deployment remained "high risk" but did not propose to change the schedule. Secretary of Defense William Cohen's recommendations, however, would hinge on the 7 July test of the ground-based interceptor. Defense officials wanted two successful intercepts before making their recommendations. With two tests completed, the interceptor had one successful intercept and one failure. Due to a problem with the surrogate booster, the EKV failed to separate and did not achieve a target intercept. Later that month, administration lawyers advised the President that preliminary construction on an X-band radar on Shemya Island, Alaska, would not violate the ABM treaty. Despite the test results, Secretary Cohen recommended that the United States proceed with deployment.

In a speech at Georgetown University, on 1 September 2000, President Clinton announced his decision to defer the decision to deploy an NMD system to the next president. While Clinton recognized the existence of the threat posed by ballistic missiles and the advances made by the Defense Department, he placed greater emphasis upon the significance of treaty negotiations. With regard to NMD Clinton stated: "I simply cannot conclude with the information I have today, that we have enough confidence in the technology and the operational effectiveness of the entire NMD system, to move forward to deployment. Therefore, I have decided not to authorize deployment of a national missile defense at this time."[94]

Throughout this decade, a key distinction between the proposed missile defense systems was the threat assessment. During the mid-1990s two documents served to define this aspect of the American missile defense policy. The first document, the National Intelligence Estimate, was presented to officials in 1995. The second document, produced by the Commission to Assess the Ballistic Missile Threat to the United States, was released in 1998.

In November 1995, the National Intelligence Council presented its National Intelligence Estimate (NIE 95-19) entitled "Emerging Missile Threats to North America During the Next 15 Years." The report determined that "no country, other than the major declared nuclear powers, will develop or otherwise acquire a ballistic missile in the next 15 years that could threaten the contiguous 48 states or Canada." At the same time, it asserted that North Korea was developing a missile, the Taepo Dong 2, which could have a range sufficient to reach Alaska. The report's authors however did not expect North Korea to achieve the technological capability to develop a system able to reach the contiguous 48 states within the time parameters of the study. A third assessment was that "no other potentially hostile country has the technical capability to develop an ICBM in the next 15 years." Fourth, those nations with an indigenously developed space launch vehicle could produce an ICBM within five years, but any such activity would be detected. Finally NIE 95-19 accepted that foreign assistance could affect the rate of development of a missile program, but did not expect any country currently owning ICBMs to sell them.[95]

Republicans, such as Congressman Curt Weldon (R-PA), claimed that the report was highly politicized and downplayed the threat to the nation. Others, including Lieutenant General Malcolm O'Neill, BMDO Director, expressed concern with the manner in which uncertainties were handled.[96] As a result of these and other concerns, Congress established a bipartisan panel, headed by the former Director of Central Intelligence Robert Gates, to review the report and its findings. In his presentation to Congress, Gates testified that the report, while not politicized, was "politically naïve and not as useful as it could have been" and added that the "methodology was deeply flawed."[97] Nonetheless, the team believed that the NIE-95-19 findings were valid and no threat was anticipated within the next 15 years.

The July 1998 report of the Commission to Assess the Ballistic Missile Threat to the United States presented a radically different assessment of the ballistic missile threat. Established by the 1998 Defense Authorization Act and chaired by former Secretary of Defense Donald Rumsfeld, the Commission found that "the ballistic missile threat to the U.S. is real, credible and could appear sooner than early intelligence predictions." Specifically the Commission found:

> Concerted efforts by a number of overtly or potentially hostile nations to acquire ballistic missiles with biological or nuclear payloads pose a growing threat to the United States, its deployed forces and its friends and allies. These newer, developing threats in North Korea, Iran and Iraq are in addition to those still posed by the existing ballistic missile arsenals of

> Russia and China, nations with which the United States is not now in conflict but which remain in uncertain transitions. The newer ballistic missile-equipped nations' capabilities will not match those of U.S. systems for accuracy or reliability. However, they would be able to inflict major destruction on the U.S. within about five years of a decision to acquire such a capability (10 years in the case of Iraq). During several of those years, the U.S. might not be aware that such a decision had been made.[98]

Finally the Commission concluded that "the threat to the U.S. posed by these emerging capabilities is broader, more mature and evolving more rapidly than has been reported in estimates and reports by the Intelligence Community." They further recommended that the "U.S. analyses, practices and policies that depend on expectations of extended warning of deployment be reviewed and, as appropriate, revised to reflect the reality of an environment in which there may be little or no warning."

One month after the report was released, on 31 August, North Korea launched a three-stage ballistic missile to put a satellite into orbit. Although the launch failed, such a missile would have a range of 4-6,000 kilometers sufficient to reach Alaska and Hawaii. Citing a CIA Briefing, Representative Weldon later added that the Taepo Dong I, "depending upon the payload can hit well into the central part of the mainland."[99] At the same time another "rogue nation" Iran tested an intermediate range ballistic missile and is developing a longer-range version.[100] Also during the summer of 1998, both India and Pakistan tested nuclear weapons.

The Welch Reports

In 1998, the Pentagon also received the first report from "Task Force on Reducing Risk in Ballistic Missile Defense Flight Test Programs." Headed by retired Air Force General Larry Welch, the committee presented its findings to Congress in February 1998. The Welch report warned the government that the NMD's "3 plus 3" program was on a "rush to failure" due to an over-emphasis on compressed time schedules. As a result, tests were defeated "by poor design, test planning, and preflight testing deficiencies; poor fabrication; poor management; and lack of rigorous government oversight." The Welch panel recommended that all ballistic missile programs adopt a more realistic sequential schedule, pointing out that "accelerating schedules by simply adding risk carries a very high risk of failure." [101] Reviewers also advocated increased ground testing with simulations and test facilities to reduce the risks associated with flight testing. Ultimately the Welch panel advised the Pentagon to restructure the flight program to ensure sequential testing and allow adequate time to correct deficiencies, increase funding for flight tests and the number of planned tests, provide support for ground tests and continue the development of key technologies and follow-on system capabilities.

By 1999, the Army had awarded the contract to Boeing to serve as the lead system integrator for the NMD program and the BMDO had restructured the program. In January 1999, Secretary Cohen announced that the second phase, the deployment period, would be extended to five years.

The new schedule sought to allow developers additional time to conduct further testing and delay if necessary critical decisions on final production versions of the various system elements.

The BMDO reconvened the Welch Panel in 1999 to reassess the NMD program. They discovered that delays in test programs and the development of simulation and test facilities had already compressed the revised schedule. Panel members also found the organizational structure and lines of authority to be unclear causing further schedule delays and confusion. In general the reviewers placed less emphasis on the deployment readiness decision to be made in 2000, as the restructured program had phased the decision milestones through the year 2003. In addition, the panel recommended against focusing strictly upon the Capability 1 deployment and 2005 initial operating capability date to the neglect of future technology growth. The detailed report found that the restructured program had reduced the associated risks, yet NMD remained a high-risk initiative.[102]

The Structure of Missile Defense

During the 1992 reorganization, responsibility for National Missile Defense had transferred from this command to the Program Executive Office GPALS. With the commitment to the "3 plus 3" NMD deployment readiness program, in 1996 Under Secretary of Dense for Acquisition and Technology, Paul Kaminski ordered that NMD be designated an acquisition category 1D Major Defense Acquisition Program.[103] At the same time, Dr. Kaminski recognized that the development of an NMD system is a joint commitment involving the military services, industry and DoD agencies. As such, he directed the BMDO to create a Joint Program Office for National Missile Defense (JPO NMD) by 1 April 1997. The JPO NMD would provide management oversight for NMD program elements and is responsible for the design, development, and demonstration of an NMD system to defend the United States from ballistic missile attack by 2003.[104] To further streamline the organization, the JPO NMD commander reports directly to the BMDO Director.

Also in 1996, the Joint Requirements Oversight Council (JROC) approved the capstone requirement document, which requires the NMD system to intercept incoming ballistic missiles 95 percent of the time.[105] The Army received the task to write the draft joint operational requirements document (ORD) for NMD. The JROC validated the ORD on 10 March 1997 and designated the Army as the executive agent.

The Army's role in the joint NMD continued to grow when in September 1999, the JROC recommended that the Army be designated the lead service and user-representative for the land-based NMD system. Mr. Jacques Gansler, Under Secretary of Defense for Acquisition and Technology, accepted the recommendations and assigned these duties on 15 November 1999.[106] The Army was at the same time granted ORD approval authority for land-based NMD systems that are not a part of specific key performance parameter requirements.

The USASMDC's organizational duties during these developments were many. For example, in April 1998, the command submitted to TRADOC a force design update for the future NMD system.[107] In August of the next year, General John Abrams, TRADOC Commander, approved the charter for the National Missile Defense TRADOC Systems Manager Office. Assigned to the USASMDC, this new agency was authorized to act as the Army's representative, manager and integrator for the entire spectrum of doctrine, training, leader development, organizational, materiel, and soldier products associated with the land-based NMD system. Then, on 22 March 2000, Lieutenant General Ronald Kadish, BMDO Director, issued a memorandum appointing USASMDC as the executive agent for ballistic missile defense science and technology.

A New Direction in Missile Defense

While the BMDO and other organizations had focused primarily upon theater level systems and a limited NMD in the 1990s, the arrival of the new administration of President George W. Bush signaled renewed interest in a vigorous missile defense at the highest levels of authority. In September 2001, Mr. Kenneth Oscar, Acting Army Acquisition Executive announced that Secretary of Defense, Donald Rumsfeld, was "actively transforming the [BMDO] into an organization that focuses on strategic missile defense."[108] As a result of this directive, the BMDO gained operational control of the THAAD, Arrow and Ballistic Missile Targets Joint Project Offices from the PEO-AMD and USASMDC and returned the elements of the Lower Tier Project Office to the PEO-AMD.[109]

In January 2002, Secretary of Defense Donald Rumsfeld further restructured the BMDO and elevated it to the status of agency, in recognition of the national priority and mission emphasis on missile defense.[110] The newly renamed Missile Defense Agency reports to the Under Secretary of Defense Acquisition Technology and Logistics. In the same document, Secretary Rumsfeld identified the top four missile defense priorities and granted the MDA the means to accomplish them.[111] For example, to expedite the development process, officials devised a system of "streamlined executive oversight and reporting." Similarly, the evolution of the Ballistic Missile Defense System would be managed by a three-phased program of development, transition, and procurement and operations, guided by the MDA Director and the Defense Acquisition Board. In addition, "to encourage flexible acquisition practices," the MDA was granted the authority to use transactions other than contracts, grants, and cooperative agreements to conduct its research. The document also exempts the BMD system from the traditional requirements generation process and assigns responsibility for the Developmental Testing and Evaluation of the BMDS and its elements to the MDA itself. Although these and other decisions generated considerable controversy in both the Congress and the press for eliminating outside and Congressional oversight from the program, the MDA continues to hold these unique powers to develop and deploy effective missile defense systems in a timely manner.

Withdrawal from the ABM Treaty

Throughout his campaign, President George W. Bush had questioned the relevance of a 30-year-old treaty to the current missile defense situation. Soon after his inauguration, in a speech at the National Defense University, Bush announced that he had tasked Secretary of Defense Rumsfeld to explore all available technologies and basing options for an effective missile defense to protect the United States, our deployed forces, and our friends and allies. Beginning in May 2001, the United States sent envoys to allied leaders "to seek their input on all the issues surrounding the new strategic environment." Bush argued that the ABM treaty "does not recognize the present, or point us to the future. It enshrines the past." President Bush continued, stating "No treaty that prevents us from addressing today's threats, that prohibits us from pursuing promising technology to defend ourselves, our friends and our allies is in our interests or in the interests of world peace"[112]

In November 2001, President Bush met with Russian President Vladimir Putin at Crawford, Texas, to negotiate the ABM Treaty. No agreement was reached. One month later, on 13 December 2001, President Bush announced that he had given formal notice to Russia that the United States was going to withdraw from the ABM Treaty, exercising Article XV of the 1972 treaty.[113] As Bush explained, one of the signatories, the Soviet Union, no longer exists and neither do the hostilities that created the treaty. Terrorism, such as the attacks against the United States on 11 September 2001, now represent the greatest threat to both nations. At the same time, President Bush reiterated a pledge made earlier with President Putin to reduce the American nuclear arsenal by 1,700 and 2,200 operationally deployed strategic nuclear weapons.[114]

The President's decision was not universally welcomed. On 12 June 2002, a group of 30 Democrats filed suit against the President, Secretary of Defense Donald Rumsfeld, and Secretary of State Colin Powell in an attempt to block the American withdrawal from the ABM Treaty. The group argued that it was illegal for the president to pull out of a treaty without the approval of Congress. Nevertheless, the United States formally withdrew from the 1972 ABM Treaty on 13 June 2002.[115] In a four-paragraph statement released by the White House, President Bush remarked, "With the Treaty now behind us, our task is to develop and deploy effective defenses against limited missile attacks. As the events of September 11 made clear, we no longer live in the Cold War world for which the ABM Treaty was designed. We now face new threats from terrorists who seek to destroy our civilization by any means available to rogue states armed with weapons of mass destruction and long-range missiles….I am committed to deploying a missile defense system as soon as possible to protect the American people and our deployed forces against the growing missile threats we face. Because these threats also endanger our allies and fiends around the world, it is essential that we work together to defend against them, an important task which the ABM Treaty prohibited."[116]

A New Deployment Decision

Following the terrorist attack of September 11th, President Bush outlined a new policy or doctrine of pre-emption to the graduating class at West Point on 1 June 2002. Bush argued that deterrence and containment, the doctrines of the Cold War, have a limited role in the battle against terrorist networks and "unbalanced dictators." On the home front, both homeland defense and missile defense are "essential priorities for America." Bush explained that a proactive stance is necessary to win the war on terrorism - "the only path to safety is the path of action."[117]

The order to deploy a missile defense system came on 17 December 2002.[118] President Bush gave the Pentagon two years to deploy a system to defend American territory, troops and allies against missile attack. The President described this initial move, which builds upon the testbed at Fort Greely, as "a starting point for improved and expanded capabilities" which will be augmented as needed given developments in research and technology and changes in the threat. Ultimately the system will protect American territory, troops and allies from ballistic missiles in all stages of their flight.

The initial 2004 deployment, which plans to address the near-term threat, calls for both land and sea-based interceptors.[119] To counter the ICBM threat, up to 20 ground-based interceptors will be located at Fort Greely, Alaska (16) and Vandenberg AFB, California (4). To counter short- and medium-range ballistic missiles, the plan envisions two systems: sea-based interceptors to be deployed on existing Aegis ships, and the deployment of an unspecified number of air-transportable PAC-3s. These systems are supported by an array of land, sea and space-based radars and sensors.

President Bush's proposal was not uniformly accepted. Opponents criticized the deployment of systems that had not yet been fully tested. Nevertheless, given its modest nature and the existing threat, some Democratic leaders, such as Representative John Spratt (D-SC), have described the proposal as the "best first step to take." As Representative Curt Weldon (R-PA) has observed "It's giving us a capability that we've never had and do not have today. If a missile were launched today there would be nothing we could do to take it down - nothing." [120]

Ground-based Midcourse Defense (GMD): The System to be Deployed

On 7 December 2000, during the Association of the United States Army Symposium in El Paso, Texas, Lieutenant General John Costello, USASDMC Commander, announced a new initiative in cruise, theater and national missile defense. General Costello declared that he would develop an operational concept for globally integrated missile defense, as the line between theater and national missile was increasingly blurred. Three months later, Secretary of Defense Donald Rumsfeld, in a joint press conference with NATO Secretary-General George Robertson, observed that "tagging the missile defense effort as either theater or national is 'unuseful.'" He further stated, "What's 'national' depends on where you live, and what's 'theater' depends on where you live." "Over time," Rumsfeld added, "it's every bit as important to us to be able to defend this piece of real estate and our population in this location as it is to defend our deployed forces and to have our allies feel equally secure to the extent that's possible."[121] From this point forward, the National Missile Defense effort was redesignated the Ground-Based Midcourse Defense or GMD segment.

The current missile defense system, as defined by the Missile Defense Agency, has no final or fixed architecture. Officials adopted an evolutionary deployment concept. In the first phase, DoD will field an initial capability as defined by the President. During the next two years, 2006-2007, additional networked sensors will be added to increase the effectiveness of the interceptors. These sensors will be forward-deployed ground-, sea- and space-based systems. Additional interceptors will be added in the next phase. Then as the technology develops more advanced weapons and sensors will be added to the ballistic missile defense system.

Upgraded Early Warning Radars (UEWR)

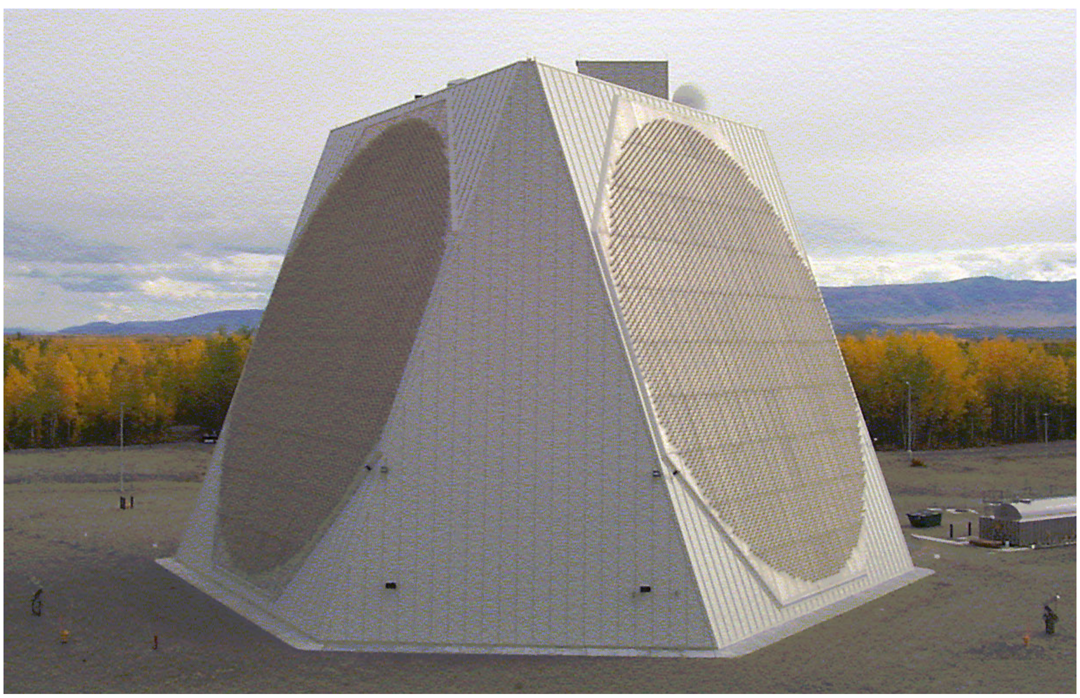

Fig. 6-14. Part of the Ballistic Missile Early Warning System of radars, this site at Clear Air Force Station, Alaska, is a potential addition the Ground-based Midcourse Defense deployment as an Upgraded Early Warning Radar.

The UEWR system focuses on the nation's existing early warning system composed of early warning radars[122] and defense support program satellites. The satellites, which fly in a geosynchronous earth orbit, are a relatively simple system with an unalterable scan pattern. As the technology becomes available, they will be replaced with the Air Force's Space-Based Infrared System. Designed to detect incoming ballistic missiles, the radars are deployed at sites, for example, in Massachusetts, California, and the Alaskan Aleutian Islands and across the globe. The upgraded software and hardware will enable the radars to acquire, track and identify small objects near the horizon, without increasing radar outputs. At the same time, the radars will be able to detect and track ballistic missiles in their midcourse phase. In 2003, the United States received permission from Denmark and the United Kingdom to pursue the upgrades to the radars deployed in their countries in support of the GMD mission.[123]

X-Band Radar (XBR)

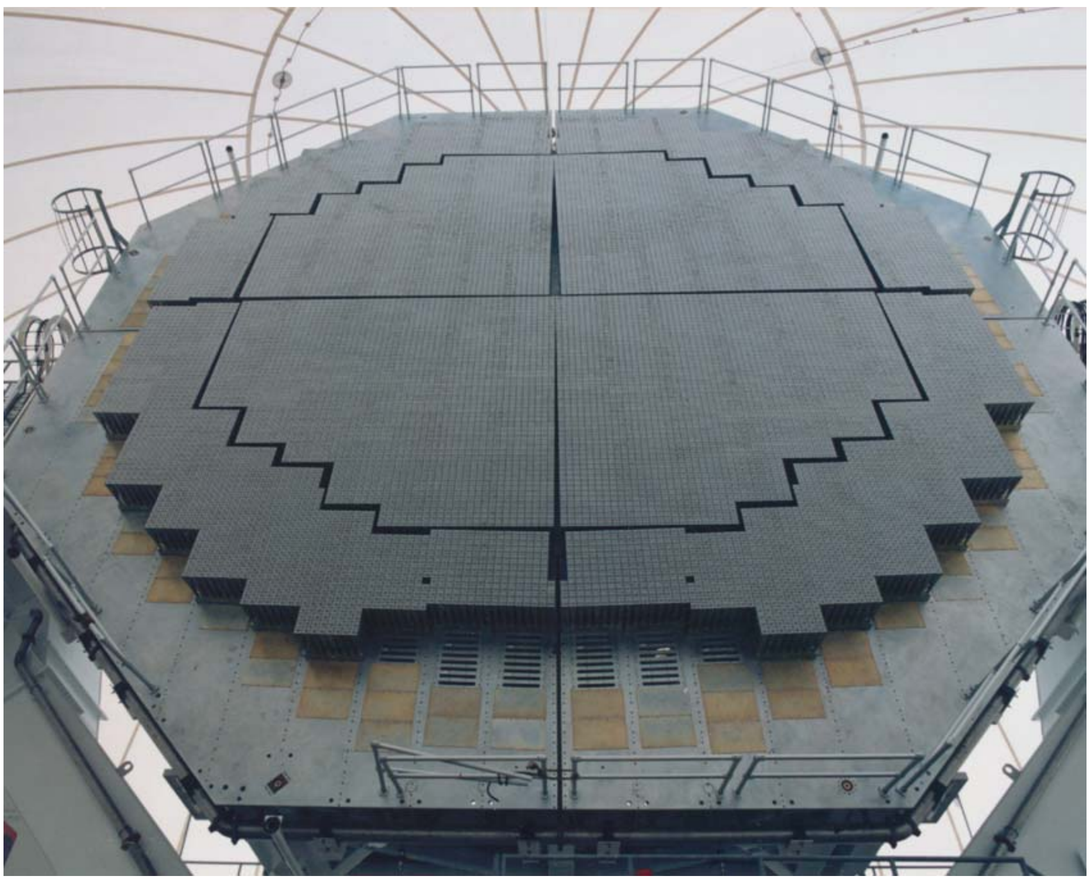

Fig. 6-15. The X-Band Radar can be populated with 69,632 transmit/receive modules. The massive radar stand requires an area of 7 hectares (17.46 acres) for the radar alone.

Construction began on the testbed prototype on Kwajalein Island in January 1997. Expanding upon the technologies of the GBR-prototype and the THAAD radar, the XBR is a ground-based, forward deployed phased array radar. It operates in a bandwidth that ranges from 8 to 12 gigahertz and will provide cued search, detection, track, discrimination and kill assessment. Improved target resolution and processing technology enable the system to identify closely spaced warheads, debris and penetration aids. High resolution waveforms enable the X-band radar to determine a reentry vehicle's diameter, length, spin rate, velocity, and mass, the position of other objects and the respective nose wobble patterns facilitating discrimination.[124] Systems tests began in 1998, just six days after receiving approval to operate at full power. In this test, the radar successfully tracked a satellite demonstrating the system's ability to gather data for radar calibration and validating the electro-mechanical scan technology.[125] Since then, the prototype has participated in every intercept test for the EKV and has successfully provided real-time data - acquiring the target complex, tracking the objects, discriminating the target and providing kill assessment.[126]

Fig. 6-16. The Ground- Based Radar-Prototype constructed at Kwajalein (picture taken at night).

Under the initial deployment proposal, the XBR would be constructed at an Air Force facility on Shemya Island, Alaska. In 2002, the Missile Defense Agency began to explore the possibility of a sea-based system. In August 2002, the Pentagon announced the construction of a floating X-Band radar station off the coast of Alaska.

Inflight Interceptor Communications (IFICS)

The GMD BM/C^3 network is composed of two elements: the BM/C^2 and the IFICS. The data processing capabilities of the BM/C^2 make it the "brains" of the network. In the event of an attack, this element receives and processes data from the various sensor systems and plans, selects and adjusts courses of action. The IFICS meanwhile relays target updates and status information from the BM/C^2 to the interceptor during the intercept flight. An IFICS data terminal consists of a radio transmitter receiver enclosed in a radome and an equipment shelter. These terminals would be located at possibly 14 pairs of geographically dispersed sites near NMD elements and in New England.[127] A prototype IFICS terminal was installed at Kwajalein and has been incorporated into the GMD integrated flight tests

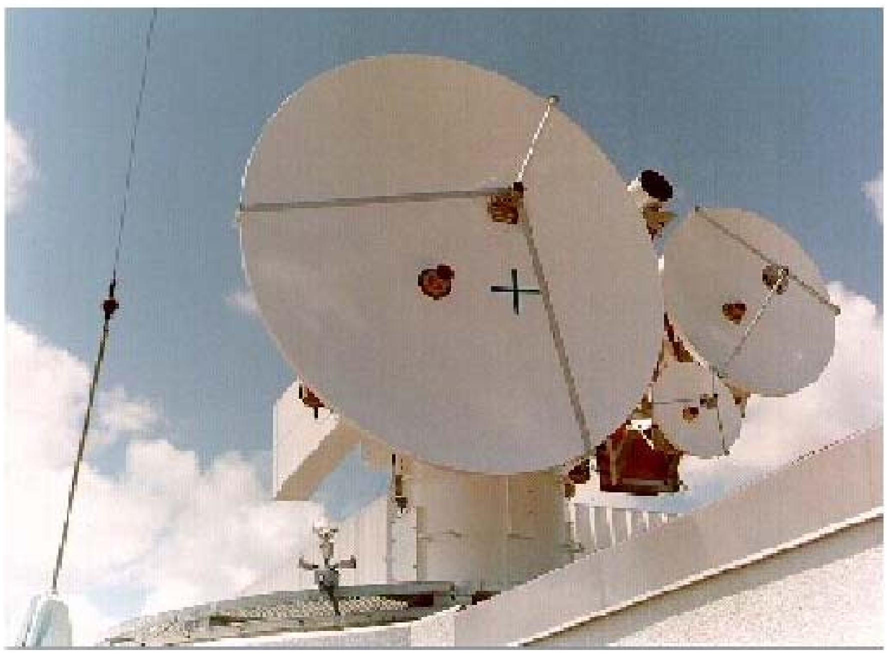

Fig. 6-17. The unmanned In-Flight Interceptor Communications data terminals are approximately 10 feet in height to include the 3-foot radome.

Ground-Based Interceptor (GBI)/Exoatmospheric Kill Vehicle (EKV)

The GBI is composed of an EKV and a booster. The program entered its next phase in December 1998. Following very successful fly-by tests with both of the competing EKV designs, the NMD Joint Program Office decided in favor of the Raytheon sensor.[128] This sensor integrates a series of modularized subsystems that facilitate upgrades and replacements. In addition to the infrared seeker, the EKV is composed of propulsion, communications link, discrimination algorithms, guidance and control system, and computers to support target selection and interception decisions.[129]

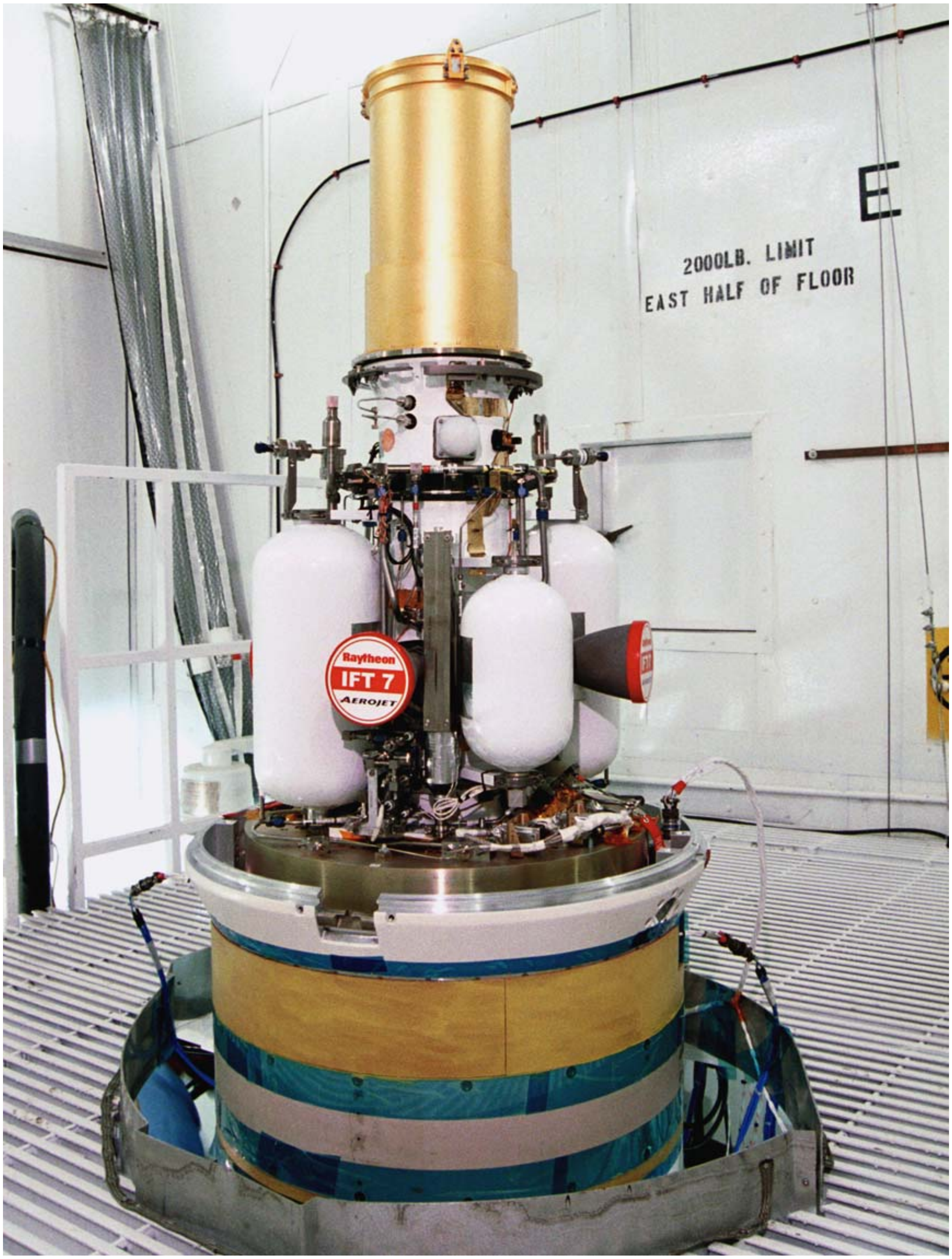

Fig. 6-18. The 121 pound Raytheon (Hughes) Exoatmospheric Kill Vehicle is navigated by an inertial navigation system updated exoatmospherically by star sightings.

The EKV attempted its first intercept on 2 October 1999. The system successfully distinguished between the warhead and a decoy. A clogged cooling pipe and problems with a surrogate booster had a negative impact on the two subsequent tests.[130] The GBI system overcame these problems, however. Integrating all elements of the GMD system, in four consecutive tests conducted between July 2001 and October 2002, the EKV successfully identified the elements of the target complex and intercepted the warheads.[131] A booster separation problem arose again during a December 2002 intercept test, bringing the EKV test record to five successful intercepts out of eight attempts.

Fig. 6-19. During an intercept, the Exoatmospheric Kill Vehicle approaches the target at a speed of 7,000 mph. The target itself is traveling at a speed of 16,000 mph. This photo was taken during IFT-6 on 14 July 2001.

Deployment: Fort Greely, Alaska

Initial concepts for the deployment of an NMD system focused upon a single ABM treaty compliant site: the former Stanley R. Mickelsen SAFEGUARD Complex near Grand Forks, North Dakota. With the recognition of the increasing threat posed by such nations as North Korea, authorities questioned whether or not this single site could protect the entire United States. A study conducted by the BMDO determined that while the North Dakota site could address "most threats," it was "not optimal against threats to Alaska and Hawaii."[132] The BMDO proposed at this time that a second site be added to provide increased protection and extend it to all 50 states. A second site however would require an amendment to the ABM Treaty as would a system that provided protection to the entire nation.[133]

In June 1998, BMDO announced that the best site for an initial limited NMD system would be central Alaska. Based upon the type of projected threat and the state's proximity to the North Pole, officials deemed that Alaska was the "optimum" location to protect the nation.[134] A team from USASMDC and the Corps of Engineers began site surveys in Alaska in August of 1998.[135] Nevertheless, a deployment of a single NMD site in Alaska would require an amendment to the ABM Treaty which limited each nation to an ABM complex located either at the national command center or near an ICBM base. At the end of the year, sites in both Alaska and North Dakota were still under consideration.

Although no location would be announced until President Clinton made his decision on the deployment readiness, by all accounts the NMD would be constructed in Alaska. Recognizing the constraints imposed by the weather conditions, Secretary Cohen recommended a limited go-ahead for the construction phase for the X-band radar. He was supported by administration lawyers who had concluded that the initial construction work associated with radar on Shemya Island would not violate the ABM Treaty. On 1 September 2000, during his speech at Georgetown University, in which he opposed NMD deployment, President Clinton added that he would not authorize the Pentagon to award construction contracts.

Fig. 6-20. Installation of the first of six Ground-based Midcourse Defense missile silos at the GMD Testbed at Fort Greely, Alaska in 2003. The 75-foot long silo weighs 130,000 pounds.

In July 2001, the Pentagon submitted a request to Congress for funds to support a missile defense test bed at Fort Greely, Alaska.[136] This test site with its command center and five silos could if required provide a limited defense against missile attack. The test bed, meanwhile, would create a triangle with assets in Hawaii, Kwajalein, and the Alaskan and California coasts, providing the military with a means to test different trajectories and geometries for several types of missile systems. One month later, the BMDO issued a Record of Decision to conduct initial site preparation activities and a construction company began clearing the site on 27 August. None of this work violated the ABM Treaty.

In December 2001, President Bush stated that the United States would withdraw from the ABM treaty. This announcement allowed Pentagon officials to proceed with the construction plans. The Corps of Engineers awarded the first construction contract in April 2002. Two days after the official withdrawal from the ABM Treaty, on 15 June 2002, the JPO GMD oversaw a ground-breaking ceremony at Fort Greely for six underground silos, part of the GMD Testbed. At the end of 2002, officials declared that the construction efforts were on schedule.

End Notes

[1]General Ronald H. Griffith, Memorandum for Space and Strategic Defense Command, Subject: Realignment of the Space and Strategic Defense Command, 12 July 1996. The HQDA Redesign Functional Area Assessment had recommended realigning USASSDC with TRADOC.
[2]Memorandum of Agreement between the United States Army Training and Doctrine Command and the United States Army Space and Strategic Defense Command, signed by General William W. Hartzog and Lieutenant General Edward G. Anderson III on 18 February 1997. The Force Development and Integration Center and the Space and Missile Defense Battle Lab were both products of this agreement.
[3]Department of the Army General Orders 5, dated 1 March 1998.
[4]Unlike other Battle Labs, the USASSDC BIC was not associated with its own proponent or school. The other Army battle labs addressed Battle Command, Combat Service Support, Early Entry Lethality and Survivability, Mounted Battle Space, Dismounted Battle Space and Depth and Simultaneous Attack.
[5]Signed on 11 May 1995, the MOA also made the USASSDC a voting member of the Battle Lab Board of Directors.
[6]MOA between the TRADOC and USASSDC, signed by General Hartzog and Lieutenant General Anderson on 18 February 1997.
[7]The lab would also employ attack operations models developed by the Air Force for the F/A-18 and F-16 aircraft and the Navy for the Aegis ship-based TMD. Lieutenant General Garner cited in Daniel G. Dupont's "SSDC Working to Create Battle Lab for Theater Missile Defense, Space," *Inside the Army* 24 October 1994: 1.
[8]The EADTB Product Office was disestablished in June 2002, although the EADTB continues to function as part of the Office of Technology Integration and Interoperability.
[9]This Battle Lab mission can be traced to the Army Space Exploitation Demonstration Program begun in 1987. The mission transferred from the ARSPACE to the Battle Lab in 1997. The ASEDP systems employ a combination of commercial off the shelf and government technologies.
[10]Space and Missile Defense Battle Lab, "Army Space Exploitation Demonstration Program," 21 August 1998.
[11]The system transferred to the Army Air and Missile Defense Command, Fort Bliss, Texas, in November 1997.
[12]Begun in 1999, the FOC TOC was designed with guidance from the commanders of the USASMDC, the U.S. Army Air Defense Artillery School and the 32nd AAMDC.
[13]Military space mission areas were defined as force enhancement, force application, space control and space support.
[14] *FDIC Newsletter* 1.2 (April 1999): 4.
[15]Jonathan Pierce, "Functional Area 40 Continues Growth," *The Eagle* October 2000: 6.
[16]By 2001, these included Field Manual 3-14.6 *Army Space Support Team Operations*, Joint Publication 3-01.3 Joint Doctrine for Defensive Operations for Countering Air and Missile Threats and Field Manual 3-01.1 *National Missile Defense Operations*.
[17]Later renamed the Space and Missile Defense Technology Center, the Tech Center was originally composed of five directorates (Advanced Technology, Sensors, Systems, Targets, Test and Evaluation and Weapons) and the Cost Analysis Office, the Program Integration Office, the Public Affairs Office and the Staff Action Control Office. A Space Technology Directorate was added in 1997.
[18]The five areas of excellence include kinetic energy weapons, lethality, discrimination and phenomenology, targets development and range support and radar and ladar (laser radar).
[19]The command was given the authority to waive DA Regulations and DoD Initiatives, with justification and legal review. However, legislative regulations, etc. cannot be waived.
[20]Memorandum dated 4 November 2001.
[21]Jack Moore, "HELSTF puts Tularosa Basin into laser weapons age," *Alamogordo Daily News*, 8 March 1992: 2-E; *FDIC Newsletter* 1.2 (April 1999): 4; Jonathan Pierce, "Functional Area 40 Continues Growth," *The Eagle* October 2000: 6. By 2001, these included Field Manual 3-14.6 *Army Space Support Team Operations*, Joint Publication 3-01.3 Joint Doctrine for Defensive Operations for Countering Air and Missile Threats and Field Manual 3-01.1 *National Missile Defense Operations*.
[22]In January 1995, for example, Members of Congress urged Secretary of Defense William Perry to continue HELSTF operations despite Army's plans to remove funding from its budget.

[23]The Air Force was tasked to develop a candidate based on alternate technologies.
[24]Caspar Weinberger, "Testing the MIRACL" *Forbes*, 6 October 1997: 37. The monograph, by SAIC and the USASMDC Historical Office, *DCE: Army Leadership at the Cutting Edge of Space Control,* (Huntsville: USASMDC, June 1999) provides a thorough overview of the Data Collection Exercise and the history of ASAT efforts.
[25]The Air Force's Miniature Sensor Technology Integration (MSTI-3) satellite provided a suitable target. It had exceeded its planned life span and was scheduled to be switched off.
[26]The satellite's manufacturer also opposed the test stating that the $60 million satellite was still viable.
[27]The parameters set by the experiment would not destroy the satellite, produce orbital debris or pose a risk to other spacecraft. William J. Broad, "White Sands to test laser," *El Paso Herald-Post,* 3 October 1997: A-1, A-2.
[28]Robert Bell, National Security Council arms control specialist, quoted in Bill Gertz, "Shared satellite laser test weighed," *Washington Times*, 2 January 1998: 1. An unclassified summary of the DCE findings can be found in *DCE: Army Leadership at the Cutting Edge of Space Control*.
[29]The Marine Corps had developed a mission need statement for a mounted THEL system in 1994. Daniel G. Dupont, "Army to Propose ACTD for Low-Cost, Tactical High Energy Laser System," *Inside the Army,* December 1995.
[30]John Donnelly, "Perry Puts U.S.-Israeli Tactical Laser on Fast Track," *Defense Week,* 20 May 1996: 1.
[31]First announced in April 1996 by President Clinton and Israeli Prime Minister Shimon Peres, the U.S. would assist Israel in developing a defensive capability against terrorist rocket attacks with the THEL. Soviet made Katyusha rockets had been used by Hezbollah, for example, in northern Israel. The agreement had been delayed due to a technology transfer ban restricting the sale of THEL technology.
[32]Daniel G. Dupont, "While U.S., Israel Discus Tactical Laser Prototype, Army Looks to the Future," *Inside Missile Defense,* 16 May 1996.
[33]"SASC-funded Nautilus laser seen winner in conference," *Aerospace Daily,* 10 May 1996.
[34]The support equipment would include for example the development and testing of the laser/fluid supply assembly, the pointer/tracker, and a command, control and communications and fire control system.
[35]A complete overview of the role of THEL in Roving Sands '98 appears in "Tactical High Energy Laser" *ADA Magazine Homepage* Summer 1998 at http://147.71.210.21/summer98/newpage16.htm.
[36]In November 2000, *Popular Science* magazine recognized these achievements, selecting the THEL Demonstrator as the Grand Winner in the General Technology category for its "Best of What's New" awards for 2000.
[37]Daniel G. Dupont, "SMDC Eyes Tactical Laser for Korea, Touts Directed Energy Development," *Inside the Army* 3 May 1999: 1; "Space & Missile Defense Command Seeking Information on Mobile THEL," *Inside the Army,* 9 August 1999.
[38]The projectiles are eight feet shorter than the Katyushas, fly at a faster rate and emit less heat.
[39]"Midcourse Space Experiment goes into orbit," USASSDC Public Affairs Office News Release, undated [April 1996].
[40]Specific tests using Scud missiles were conducted in the Willow Dune Program.
[41]Gerda Sherrill, "TCMP Successful Again," and Cynthia Brewer, "TCMP born in Desert Storm," *The Eagle* September/October 1996: 12-13.
[42]The Defense Science Board conducted its study in 1994.
[43]The U.S. Army first used tethered balloons during the Civil War for meteorological data collection, reconnaissance, and fire control. Telegraphers relayed information to the ground. Balloons were subsequently employed by the military for anti-aircraft support (barrage balloons) and scientific exploration.
[44]The management structure for the JPO calls for an Army Program Manager, with Navy and Air Force Deputy Program Managers. Support is also provided by the Advanced Research Projects Agency.
[45]Connie M. Davis, "Aerostat Rises to the top at Roving Sands '96," *The Eagle* July 1996: 11.
[46]"Army Happy With Use of Cruise Missile Defense Aerostat in Roving Sands," *Inside the Army* 1 July 1996.
[47]In this test the JLENS aerostat measured 233 feet in length and was filled with 590,000 cubic feet of helium, two and one half times the volume of the current largest advertising blimps. JLENS Over-the-Horizon Surveillance & Tracking Fact Sheet, USASMDC Public Affairs Office Fact Sheet, dated November 1997.
[48]The 15-meter aerostat, with a cubic volume of 8,000 feet, is designed to fly at 1,000 feet. The Marine Corps has expressed an interest in this platform to relay ship to shore information. The optimum Army aerostat however is a

71-meter platform which flies at a height of 15,000 feet. LuAnne Fantasia, "Carr's Crew Ready for Roving Sands '99," *The Eagle* May 1999: 1.

[49]A Single Integrated Air Picture is defined as "the product of fused, near-real-time and real-time data from multiple sensors to allow development of common, continuous, and unambiguous tracks of all airborne objects in the surveillance area." Capstone Requirements Document (CRD) for Theater Missile Defense, dated July 1998.

[50]Michael C. Sirak, "Participation in CEC-Patriot Link Set for Next Month; Administration Requests $25 Million for JLENS in Fiscal Year 2000 Plan," *Inside Missile Defense* 10 February 1999.

[51]Stephanie G. Rosenfeld, "SMDC Requests Approval to Make JLENS An Official Acquisition Program," *Inside Missile Defense* 10 March 1999. According to Army guides, ACAT II status requires eventual research, development, test and evaluation expenditures in excess of $75 million or eventual procurement of more than $300 million.

[52]Created in 1997, the JTAMDO generates the DOD's requirements for TMD. Estimated operating costs for the JLENS are $400 per hour compared to $4,000 to $5,000 for an aircraft. David Mulholland, "Army Ties Balloon Radar to Missile Defense," *Defense News* 17 May 1999: 1.

[53]Gerda Sherrill, "JLENS hits over-the-horizon cruise missile," *The Eagle* October 2000: 19.

[54]Emily Hsu, "JLENS Officials Awaiting Army Decision on Homeland Defense Role," *Inside Missile Defense* 26 June 2002: 1, 5, 6.

[55]Debra Valine, "Low Cost Interceptor seeking ways to balance cost per kill," *The Eagle* October 2000: 6 and Low Cost Cruise Missile Defense Initiative Low Cost Interceptor Fact Sheet, USASMDC Public Affairs Office, dated April 2002.

[56]U.S. Department of the Army, General Order Number 5, 1 March 1998.

[57]Walter Perry, Bruce Pirnie, John Gordon, IV, *The Future of Warfare: Issues from the 1999 Cycle Army After Next Study Cycle* (Santa Monica: RAND Corporation, 2001), pp. xi-xii. Accessed at http://www.rand.org/publications/MR/MR1183/ on 13 March 2002.

[58]William B. Scott, "Wargames Underscore Value of Space Assets for Military Operations," *Aviation Week and Space Technology* 28 April 1997:60-61; U.S. Army Training and Doctrine Command, *Knowledge and Speed: Battle Force and the U.S. Army of 2025: The 1998 Annual Report on The Army After Next Project to the Chief of Staff of the Army* (Fort Monroe: TRADOC, 1998), pp. 11-21.

[59]Martin Burkey, "Defense Official Urges Planning for Space Warfare," *Huntsville Times*, 9 February 1998: D-2.

[60]Lieutenant General Edward G. Anderson, III, "The New High Ground," *Armed Forces Journal International* October 1997:66; Martin Sieff, "Space Dependence: A Vulnerability," *Washington Times* 2 February 1998:12; "Is Space the Pentagon's Final Battleground?" *Business Week* June 15, 1998; Frederic W. Kagan, "Star Wars in Real Life: Political Limitations on Space Warfare," *Parameters* Autumn 1998:112-130.

[61]Lieutenant General John Costello, "Space and Missile Defense," *Army* December 1998:12; "Update: SMDC Commander on Space," *BMD Monitor* 30 April 1999:2.

[62]The USARSPACE is organized to weave space into the fabric of the Army's daily life. The ARSPACE controls the 1st Space Battalion, the 1st Satellite Control Battalion, an Operations Division and Regional Space Support Centers. The Satellite Control Battalion is in charge of the day-to-day operations of the DSCS. The Operations Division develops, manages and archives remote sensing products for the ARSSTs and other DoD users and the Regional Space Support Centers, in Hawaii, Germany, and Florida, coordinate satellite communications products to the various regional combatant commanders.

[63]*United States Army Space Master Plan* (2000) (hereafter referred to as *ASMP*), ES-2.

[64]The following is based on *ASMP*, ES-2-15. Unless otherwise noted, all direct quotations come from this source.

[65]The following is based on *ASMP*, 2-1-30. Unless otherwise noted, all direct quotations come from this source.

[66]The National Space Policy, updated in 1996, outlines five goals of the U.S. space program. (1) Strengthen and maintain the national security of the United States. (2) Enhance our knowledge of the earth, the solar system and the universe through human and robotic exploration. (3) Enhance American economic competitiveness as well as its scientific and technical capabilities. (4) Encourage state, local and private investment in and use of space technologies. (5) Promote international cooperation to further American domestic national security and foreign policies. The Secretary of Defense and the Director Central Intelligence oversee national security space activities. There are eight ways national space security space activities contribute to national security. (1) Support the right to self-defense and support American defense commitments to allies and friends. (2) Deter, warn, and if necessary,

defend against enemy attack. (3) Assure that hostile forces cannot deny us use of space. (4) If necessary, counter space systems and services used for hostile purposes. (5) Enhance operations of U.S. and allied forces. (6) Ensure our own ability to carry out military and intelligence space-related activities. (7) Satisfy military and intelligence requirements during peace and crisis and through all levels of conflict. (8) Support the activities of national policy makers, the Intelligence community, the National Command Authority, combatant commanders and the military Services, other Federal officials and continuity of government operations.

[67]This is the DoD's "strategic business plan" for space programs. The plan concentrates on policies, capabilities and practices that should exist beyond the Future Years Program. The plan provides senior leadership with long-range guidelines to make the transition to the future.

[68]The principal themes dominating the USSPACECOM Vision are "dominating the space medium" and "integrating space power throughout military operations." To reach this vision, USSPACECOM created four concepts that provide the conceptual framework to change the vision into a set of capabilities. They are (1) control of space, (2) global engagement, and (3) full force integration and (4) global partnerships.

[69]See *ASMP*, 3-1-3-18.

[70]See *ASMP*, 4-1-414.

[71]See *ASMP*, 5-1-5-14.

[72]See *ASMP*, 6-1-6-22.

[73]See *ASMP*, 7-1-7-14.

[74]*ASMP*, 8-1-8-10.

[75]United States Army, Training and Doctrine Command, *Concept for Space Operations in Support of the Objective Force* (Final Coordination Draft, Fort Monroe: U.S. Army Training and Doctrine Command, 22 February 2003) Unless otherwise noted, all direct quotations are from this source.

[76]This publication is the doctrinal foundation describing military space operations.

[77]On 9 October 1992, in the Bishkek Agreement, the Commonwealth of Independent States (CIS) signed an agreement pledging to support and implement the ABM Treaty.

[78]Federation of American Scientists, Anti-Ballistic Missile Treaty Chronology, located at http://www.fas.org/nuke/control/abmt/chron.htm.

[79]The two presidents also noted that both nations "have an interest in developing and fielding effective theater missile defense systems on a cooperative basis. The presidents agreed that the two sides will conduct a joint exercise of theater missile defenses and early warning." See http://sun00781.dn.net/nuke/control/abmt/chron.htm. The two nations reaffirmed their commitment to the ABM Treaty in a joint communiqué dated 20 June 1999

[80]Republican Contract with America, http://www.house.gov/Contract/CONTRACT.html.

[81]National Defense Authorization Act for Fiscal Year 1996, Subtitle C – Ballistic Missile Defense Act of 1995, H.R. 1530 at http://www.fas.org/spp/starwars/congress/1995/h950614i.htm.

[82]Representative John Spratt, (D-SC) proposed a similar amendment which held that the U.S. should deploy a system that complied with the ABM treaty and its amendments. This amendment, which failed to pass the house, generated considerable debate on the ABM Treaty and its significance. In his editorial, Frank Gaffney interprets this decision as quite decisive stating, "The 221 and fully 21 Democrats who refused to affirm the ABM Treaty suggests that there is … a growing – and bipartisan – appreciation that America's present vulnerability to ballistic missile attack is as reckless as it is absurd." From "Shifted trajectory on anti-missile defense," *Washington Times* 20 June 1995: 16.

[83]Public Law 104-106, 10 February 1996, National Defense Authorization Act for Fiscal Year 1996, http://lcweb2.loc.gov/law/usa/us040106.pdf.

[84]Senator Kay Bailey Hutchison (R-TX) quoted in "Top Republicans offer Defend America Act of 1996," *BMD Monitor* 5 April 1996. S. 1635 and H.R. 3144 – To establish a United States policy for the deployment of a national missile defense system, and for other purposes, 21 March 1996, 104th Congress 2nd Session.

[85]Greg Coines, "Senior NSC Official Blasts Dole-Gingrich 'Defend America' Bill," *Defense Daily* 9 May 1996.

[86]Secretary of Defense William Perry in a speech at George Washington University quoted in Bill Gertz, "Perry: Missile defense unnecessary," *Washington Times* 26 April 1996: 6.

[87]If it was determined that a threat had not emerged by 2000, the program included provisions to continue to advance technology and add new elements.

[88]See for example, Rep. Curt Weldon (R-PA) Dale Eisman, "Bill Introduced in Congress to Make Anti-Missile Shield A National Policy." *The Virginian-Pilot* 6 August 1998.
[89]In 1998, for example, Chairman of the Joint Chiefs General Henry Shelton expressed some doubt about the technical capabilities of the system stating: "If the administration changed its policy tomorrow, the Joint Chief's position would remain the same because we don't think we need to pour a lot of money into something that doesn't work right this minute." Quoted in Erin Q. Winograd, "Shelton Defends Stance On NMD, Labeling Technology 'Just Not There' Yet," *Inside the Army* 14 September 1998: 1.
[90]A risk reduction effort and funding cuts in previous fiscal years delayed the initial fielding to 2005. The threat issue will be addressed in a separate section.
[91]Public Law 106-38 at http://thomas.loc.gov. This measure was criticized both by American allies in Europe as well as the leaders of Russia and China.
[92]General Accounting Office, "Missile Defense: Status of the National Missile Defense Program," GAO/NSIAD-00-131, Mary 2000.
[93]National Missile Defense Independent Review Team, "Executive Summary," 13 June 2000. The report was written by General Larry Welch (USAF-Ret.) of the Institute for Defense Analyses. The C-1 threat is defined as a threat involving a few enemy missiles and simple countermeasures. The Capability 2 and 3 systems would defend against an increased number of missiles and more sophisticated countermeasures.
[94]Speech by President William J. Clinton, Georgetown University, 1 September 2000, at Carnegie Non-Proliferation Project – http://www.ceip.org/files/projects/npp/resources/Presidentdelaysnmd.htm. According to a White House Fact Sheet entitled "White House on National Missile Defense" issued on 1 September 2000, Clinton based his decision upon "the threat, the cost, technical feasibility and the impact overall on our national security." http://www.usinfo.state.gove/topical/pol/arms/stories/00090101.htm.
[95]Emerging Missile Threats to North America During the Next 15 Years, Statement for the Record by Richard N. Cooper, Chairman, National Intelligence Council for Hearings of the 28 February 1996, House National Security Committee, Hearings on Ballistic Missile Defense. Cooper's testimony which was prepared, but not delivered can be located at http://www.ceip.org/files/Publications/NIE1995Cooper.asp?p=8&from=pubtype.
[96]The report stated that these "wild cards" could flair up and produce a threat within the 15 year window.
[97]Among the flaws identified in the report were the failure to address the economic conditions in Russia which could "provide incentives that increase the risk of leakage of hardware and expertise that could help governments aspiring to develop ballistic missiles, cruise missiles, and weapons of mass destruction." Similarly, Gates stated that NIE 95-19 "too easily dismisses missile scenarios alternative to an indigenously developed and launched intercontinental ballistic missile by countries hostile to the United States, alternatives such as a land-attack cruise missile." Robert Gates, Intelligence Analysis on the Long-Range Missile Threat to the United States, 4 December 1996, Senate Select Committee on Intelligence, http://www.fas.org/irp/congress/1996_hr/s961204p.htm.
[98]All direct quotes are from "Executive Summary of the Report of the Commission to Assess the Ballistic Missile Threat to the United States, 15 July 1998," http://www.house.gov/hasc/testimony/105thcongress/BMThreat.htm.
[99]Quoted in Eric Rosenberg, "Reagan's 'Star Wars' Vision Finds Life Under Clinton," *Legislative Focus* 13 May 1999: 26. In October 2002, the government of North Korea admitted that they were pursing a nuclear weapons program, in violation of their 1994 agreement with Washington.
[100]According to the National Air Intelligence Center, Iran is pursuing, with foreign assistance, an "ambitious ballistic missile development program" and could have a missile capable of reaching the United States before 2015. NAIC, "Ballistic and Cruise Missile Threat," Wright-Patterson AFB, Ohio, September 2000.
[101]Report of the Panel on Reducing Risk in Ballistic Missile Defense Flight Test Programs, 21 February 1998, http://www.fas.org/spp/starwars/program/welch/welch-2.htm.
[102]Briefing report located at http://www.acq.osd.mil/bmdo/bmdolink/pdf/welch.pdf.
[103]Memorandum from Paul G. Kaminski for Director, Ballistic Missile Defense Organization, Subject: National Missile Defense Joint Program Office, 9 April 1996.
[104]The NMD Program Elements were located within the U.S. Army Space and Strategic Defense Command and the PEO for Air and Missile Defense in Huntsville, Alabama; the U.S. Air Force Electronic Systems Command, Hanscom AFB, Massachusetts; the U.S. Air Force Space and Missile System Center, Los Angeles AFB, California; and the Joint National Test Facility, Colorado Springs, Colorado. Department of Defense, Memorandum for Correspondents, Memorandum: No. 049-M, 3 April 1997.

[105]U.S. Space Command held the capstone requirement document authority of all NMD systems.
[106]The BMDO remained the Ballistic Missile Defense Acquisition Executive. Memorandum for Secretary of the Army, Director, BMDO, Subject: Designation of Land-Based National Missile Defense System Lead Service, 15 November 1999.
[107]The proposed NMD unit or units would be composed of National Guardsmen and contractors.
[108]Memorandum from Mr. Kenneth J. Oscar, Acting Army Acquisition Executive to Commanders USASMDC, Acting PEO-AMD and Commander U.S. Army Aviation and Missile Command, Subject: Program Realignments, 6 September 2001.
[109]At the same time, the Army sought to restructure the PEOs "with a single integrated commodity focus." To this end, the Lower Tier Program (composed of Patriot and Medium Extended Air Defense System (MEADS)) left BMDO for the PEO-AMD; the Short Range Air Defense (SHORAD) Project Office transferred from AMCOM to PEO-AMD. The new Lower Tier organization was designed to "streamline the management of lower tier systems" and "take maximum advantage from lessons learned from our legacy systems to ensure that interim and objective lower tier systems meet operational requirements at reduced cost."
[110]Memorandum from Secretary of Defense Donald Rumsfeld, Subject: Missile Defense Program Direction, 2 January 2002, with attachment entitled "Missile Defense Program Direction".
[111]The first priority is to defend the United States, deployed forces, allies and friends from ballistic missile attack. The second calls for a Ballistic Missile Defense System (BMDS) that employs layers defenses to intercept missiles at all phases of their flight against all ranges of threats. The third priority is to enable the Services to field elements of the overall BMDS as soon as practicable. The fourth priority is to develop and test technologies, use prototype and test assets to provide early capability, if necessary, and improve the effectiveness of deployed capability by inserting new technologies as they become available or when the new threat warrants an accelerated capability.
[112]Remarks by the President to Students and Faculty at National Defense University, Washington, D.C., 1 May 2001, http://www.whitehouse.gov/news/releases/2001/05/20010501-10.html. During the same speech, the President discussed significant cuts, possibly unilateral cuts, to the American nuclear arsenal.
[113]Remarks by the President on National Missile Defense, 13 December 2001, http://www.whitehouse.gov/news/releases/2001/12/20011213-4.html.
[114]The two nations formalized this agreement on 24 May 2002 with the Treaty of Moscow. Essentially both nations would reduce the number of strategic nuclear weapons to the stated amounts by 31 December 2012, with no restraints upon the number of short-range nuclear missiles, bombers, missiles or submarines. Excerpt from Under Secretary for Arms Control and International Security John Bolton's Remarks to the Fourth RUSI Missile Defense Conference in London, 18 November 2002. The RUSI is the Royal United Services Institute. President Putin submitted the treaty to the State Dumas on 7 December 2002.
[115]In response to this decision, on 14 June 2002 Russia formally withdrew from the START II nuclear arms treaty. The Russian parliament had ratified the agreement in 2000, but tied START II to the preservation of the ABM. The two-thirds reduction in nuclear arsenals agreed to in START II, was reiterated in the Treaty of Moscow signed by Presidents Bush and Putin in May 2002. Note: On 5 May 1997, Lieutenant General Eric Shinseki, DA DCSOPS, had designated the Headquarters, USASSDC as Army Implementing Agent for the Strategic Arms Reduction Treaty (START) and START II implementation.
[116]White House Press Release, Statement by the President, 13 June 2002, located at http://www.whitehouse.gov/news/releases/2002/06/20020613-9.html.
[117]"President Bush Delivers Graduation Speech at West Point," Remarks by the President at 2002 Graduation Exercise of the United States Military Academy, 1 June 2002, located at http://www.whitehouse.gove/news/releases/2002/06/20020601-3.html.
[118]"President Announces Progress in Missile Defense Capabilities," Statement by the President, White House Press Office, 17 December 2002.
[119]News Release from the U.S. Department of Defense, "Missile Defense Operations Announcement," 17 December 2002.
[120]Associated Press, "Missile Defense Plan Draws Some Fire," *The Guardian* 18 December 2002.
[121]Transcript of the Joint Media Availability - Secretary Rumsfeld and Secretary General Robertson, 8 March 2001, http://www.defenselink.mil/news/Mar2001/t03082001_t308sd2a.html.

[122]Developed by the Air Force, these UHF, phased-array radar systems are part of the Ballistic Missile Early Warning System and PAVE PAWS.

[123]Support for the missile defense plan has been a controversial issue for American allies. Australia had already expressed its support for the NMD program in 2001.

[124]Institute for Foreign Policy Analysis, *National Missile Defense: Policy Issues and Technological Capabilities*, July 2000. This work, also available at www.ifpa.org provides a detailed description of the various elements of the GMD system.

[125]"Raytheon Tracks Satellite with Prototype Radar," *Space Daily* 18 September 1998, http://www.spacedaily.com/news/radar-98a.html.

[126]On 14 October 2002, the Missile Defense Agency incorporated a SPY-1 radar system aboard a U.S. Navy Aegis destroyer, the *USS John Paul Jones*, into the GMD intercept test. Participation by the sea-based system was previously prohibited under the ABM Treaty. The SPY-1 radar collected data but was not integrated into the test.

[127]The sites under consideration are in Alaska - Clear Air Station, Eareckson Air Station, Eielson AFB, Fort Greely, the Yukon Maneuver Area at Fort Wainwright and the western Aleutians; North Dakota – Grand Forks AFB, Minot AFB, Missile Alert Facility ECHO (near Hampden), and the SRMSC MSR site.

[128]A flyby test is designed to assess an interceptor's on-board sensor. Launched by a booster, the sensor passes by the target collecting data on the target package, discriminating the warhead from decoys. No intercepts are attempted.

[129]Ground-based Midcourse Defense Segment Exoatmospheric Kill Vehicle Fact Sheet released by Raytheon, 2001. The EKV weighs 121 pounds and is 55 inches in length and about 24 inches in diameter.

[130]A surrogate booster was used during the testing phase. Two competing designs for a three-stage, solid-rocket booster are under investigation.

[131]Despite these successes, opponents criticized the decoys used in the EKV test program. Although tests incorporated increasingly more complex countermeasures, critics held that the decoys did not reflect obstacles faced in an intercept. Some simply argued that discrimination technology simply would not work. In contrast, a recent report by the Union of Concerned Scientists stated: "While using such decoys may be appropriate for early stages of testing, the Pentagon should make clear that these tests do not provide a meaningful test of discrimination that is relevant to real-world situations." Quoted in Mike Nartker, "U.S. Plans: Activist Group Provides More Details on Decoys Used in Intercept Test," *Global Security Newswire*. In September 2000, Philip Coyle, Director of Operational Testing and Evaluation presented a series of initiatives to enhance the test flights. Paul Mann, "Next President Faces Missile Defense Knot," *Aviation Week and Space Technology* 18 September 2000: 27.

[132]Quoted in Bill Gertz, "Single-site missile defense leaves Alaska, Hawaii naked," *Washington Times* 9 May 1997.

[133]Article One of the ABM Treaty prevents the deployed system from defending the entire nation.

[134]The drawbacks to a deployment in Alaska are its decreased ability to defend against attacks from southern locations or to protect Eastern states from a launch by Libya. Michael Sirak, "U.S. Wrestles With Location, Number of NMD Sites," *Inside Missile Defense* 7 April 1999.

[135]Three sites were under review for the missile base - the Yukon Training Area, Eielson AFB, Clear Air Station and Fort Greely. Eareckson Air Station on Shemya Island was the proposed site for the XBR.

[136]Fort Greely was selected in part because it contained much of the infrastructure needed to support the test bed or a deployment. Fort Greely was closed as part of the 1995 Base Realignment and Closure decisions. On 1 October 2002, Fort Greely, Alaska, officially transferred to the USASMDC.