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Introduction

I am pleased to be here today to discuss my vision for space and I applaud your continued interest in this highly important arena. As both the Assistant Secretary of the Air Force (Space) and the Director of the National Reconnaissance Office (NRO), I am in a unique, dual-hatted role. As Director, NRO, I have responsibility for the design, acquisition, and operations of all the nation's reconnaissance satellites, reporting to the Secretary of Defense and the Director of Central Intelligence. As you know, in my Air Force role I have responsibility for policy and interagency coordination as well as advising the Secretary and Chief of Staff of the Air Force on space matters. Acquisition and operation of space capabilities are the responsibility of the Assistant Secretary for Acquisition and Air Force Space Command, respectively. In this role I have the opportunity to leverage good ideas from both the Air Force and the NRO as well as facilitate exchanges and partnerships where they make the most sense.

Today I will address both areas of my responsibility, though most of the information concerning the NRO is highly classified and must be covered in closed session. Within the context of the Air Force vision for space, I intend to highlight a number of important programs and concepts. These include the numerous partnerships with other space sectors and organizations, some of the most important space-related investments I foresee, and a number of the challenges the Air Force and the nation face with respect to maintaining dominance in space. With regard to the NRO, I will highlight some initiatives and unique partnerships in the areas of operations, acquisitions, and research and development.

I should note that this year, I look forward to working with two Congressionally chartered commissions. Your committee created the Commission to examine, among many other things, the relationships between "white and black" space. The second commission, I'll call the "NRO Commission," is charted to review the NRO's current organization and practices. I am eager to work with both commissions to explore ways our future programs can better meet national security needs.

Criticality of U.S. Space Capabilities

As highlighted again in Kosovo operations, U.S. space capabilities are an indispensable tool of global leadership. They allow our political leaders to base decisions on remarkably timely, detailed, and accurate information. Space systems enable our military leaders to achieve dominant battlefield awareness by providing global communications, precision navigation, accurate meteorological data, early warning of missile launches, and near-real time signals and imagery intelligence support. The global presence of space systems makes it possible for the U.S. to more effectively respond to the wide range of threats presented by the post-Cold War world.

For example, during Operation Allied Force, the Air Force proved many lessons. Among them, "Reachback" was a particular success story. Relying on satellite communications, warfighters were able to reach back to the United States for real-time information and analysis (some of that space based, as well), while avoiding the need to deploy in-theater systems. Additionally the use of precision weapons was enabled by use of the space based Global Positioning System.

Today, U.S. forces rely on space systems for global awareness of threats, swift orchestration of military operations, and precision use of smart weapons. As we move into the new millennium, one of the key goals of military space power will be the employment of appropriate Intelligence, Surveillance, and Reconnaissance (ISR) sensors. Aerospace power requires ISR assets in space and in the air that are interoperable and that can communicate information back to centers where data can be fused and commanders can use that fused information to command their forces and the battlespace. The constant requirement for data, communications, and systems that turn data into information, in turn, requires capabilities that run the gamut from prediction of solar weather to satellite command and control to computer network defense. In addition to a robust ISR capability, I foresee a time in the not-too-distant future when other military functions will be carried out in, through, and from space. The employment of these military capabilities in space, when combined with global communications and high speed information processing, will facilitate the delivery of precise military firepower anywhere in the world, day or night, in all weather. Our goal is to find, fix, track, and target anything of significance worldwide and to ensure targets are engaged by the most appropriate means available. This capability will allow the U.S. to maintain a non-intrusive global presence and deliver precision weapons on target to maximize combat power while minimizing collateral damage.

The Air Force Vision

In my role as ASAF (Space), I serve to enable the Air Force vision for space. The vision of global reach, global power and global vigilance is the guiding principle behind

our strategic plan and programs for aerospace power. The genesis of the Aerospace Force is the integration of military capabilities across the aerospace medium in order to best shape the military and geopolitical environment on the ground. This merger of air and space operations is a continuing journey. For the past decade, the barriers between air and space planning and operations have diminished substantially. Through further integration, we seek to produce the most efficient military effects for the joint force commander without regard to where platforms reside.

Today's Air Force is in a unique position to continue this shift to an aerospace paradigm. We are developing the right partnerships and making the right investments in programs and technology. It is within the current Air Force trade space to identify functions best suited for air, space, and aerospace.

Air Force / Department of Transportation

The Global Positioning System (GPS), initially developed to provide situational awareness for military forces, has now grown into an international utility for civil and military applications. In 1996, the President established the U.S. GPS policy which directs providing the Standard Positioning Service (SPS) for peaceful civil, commercial and scientific use, free of direct user fees; the intention of discontinuing the use of Selective Availability no later than 2006, and encouraging the international acceptance of GPS as the worldwide standard for position, velocity, and time information. The Interagency GPS Executive Board (IGEB), co-chaired by ASD(C3I) and Deputy Secretary of Transportation, was established to manage this dual-use system and to implement the Presidential policy and congressional direction to enhance GPS.

Air Force / National Oceanic and Atmospheric Administration (NOAA) / NASA

The Air Force's Defense Meteorological Satellite Program will soon converge with NOAA's Polar-orbiting Operational Environmental Satellites into the National Polar-orbiting Operational Environmental Satellite System, a Tri-agency DoD, Department of Commerce and NASA program. The convergence of these operational AF and NOAA meteorological satellite systems will save the U.S. government $1.8 billion and create a more robust environmental sensing architecture. This architecture will also include a European partner, the European Organization for the Exploitation of Meteorological Satellites. Further savings will be realized through this international cooperation where the Europeans are providing one of the three satellites needed to meet U.S. requirements.

Air Force / Industry

In addition to the formal partnerships within the government, the Air Force and the NRO have reached out to private industry in some innovative ways. Until very recently, military and other government users have been the primary customers of the U.S. space industry. That trend, however, has taken a dramatic shift. Commercial space revenue now outpaces government spending. Private industry now provides high-resolution imagery, global communications, and exploits the navigation solution transmitted by our GPS constellation. Industry is now in a position to lead, rather than follow, the government customers. The changes we've made to our launch procurement strategy reflect this new reality.

Built with a focus on cost savings, improved reliability, operability, and maintainability, the Evolved Expendable Launch Vehicle (EELV) team will re-engineer the entire Government launch process. No longer does the Government buy individual launch vehicles tailored to specific missions, but instead the Air Force buys a fixed price commercial "launch service," ensuring for the first time that the contractor will have total systems performance responsibility for each launch under a single contract for a single price.

This commercial approach, when coupled with contractor cost sharing and partnering arrangements, has permitted the contractors to lease government land, launch facilities, and support buildings, thereby reducing government launch site presence and ensuring equitable sharing of launch base O&M costs between Government and commercial missions.

The EELV program has instituted a fundamental shift in the way DoD develops and acquires space related products and services. Cost-sharing, civil/military integration, and commercial services are now part of DoD's ever-growing acquisition reform arsenal. In addition to innovative partnering relationships, the Air Force has planned critical investments in numerous space programs. The next several paragraphs discuss a number of key investments the Air Force is making as we move into the 21st Century.

Air Force Investments

The Air Force is investing heavily in space systems, programs, and technology as it moves toward its vision of an Aerospace Force. Key investments include the Global Positioning System (GPS) Modernization, the Evolved Expendable Launch Vehicle

(EELV), the Space Based InfraRed System (SBIRS), satellite communications programs, Space Control, and a number of important technology demonstrators such as the Space Based Laser (SBL), Discoverer II, and spaceplane.

GPS Modernization

The Air Force continues to sustain and modernize the GPS Space, Control, and User Equipment (UE) segments. Current satellites continue to perform longer than expected. The Mean Mission Duration (MMD) for Block IIA satellites has increased from 8.6 to 10.6 years, and the MMD for Block IIR and Block IIF satellites is contractually required to be 7.5 and 12.7 years respectively, and will likely increase with on-orbit experience. Twenty-one Block IIR satellites have been produced to replenish the current aging constellation from now to 2003 – everything is on track to support the next launch in Apr 00. To provide long-term sustainment of the GPS constellation, the first six Block IIF satellites have been procured to support launches projected to begin in 2005.

While sustainment of the constellation is a top priority, navigation warfare (Navwar) requirements and inherent system vulnerabilities have driven the need to modernize. The President's FY01 Budget includes the funding to modernize all segments of GPS. Modernization of the space segment targets the last 12 Block IIRs and includes the addition of a second civil signal (C/A on L2) and new military signals (M-code) to enable more robust Navwar operations in the future. The first 6 Block IIFs, called IIF "Lite," will include all of the above enhancements as well as a third civil, safety-of-life signal (L5). The remaining Block IIFs, called "fully modernized," will also include a +20dB M-code spot beam. We are also progressing with user equipment modernization.

In the near term, our UE modernization activities include integration of the Selective Availability Anti-Spoofing Module (SAASM) into GPS receiver applications modules (GRAM); investments in anti-jam (AJ) filters and direct access to the encrypted signals; and the integration of these capabilities onto receiver cards to support FY01/02 procurements of hand-held and avionics units. In the mid-term, UE investments include digital receivers, small, high-AJ antennas, as well as a security module (and receiver) to process the new military signals. The modernization of the control segment includes the transition from the legacy mainframe to a distributed architecture system that will ensure command and control of all Blocks of GPS satellites on orbit (II/IIA/IIR/IIR Modernized/IIF "Lite"/etc.). Since the submission of the FY01PB, OSD has completed a Defense Science Board review of the modernization plan and made recommendations to DepSecDef. As soon as adjustments are determined, this new plan will be brought forward to Congress. Finally, the Air Force is supporting a Joint Staff review of current and projected future prevention systems to enable military operations without the need for Selective Availability. All of these activities reflect our commitment to implementing Presidential policy and congressional direction to enhance GPS.

Evolved Expendable Launch Vehicle (EELV)

On October 16th 1998, the EELV Program culminated a three year effort to begin modernizing the U.S. space launch fleet with the award of two $500 million EELV development agreements and two EELV Initial Launch Services (ILS) contracts valued at $2 billion. The ILS contracts cover 28 launches, 12 payload types, and 15 first-time payload integration efforts, with the first government launch in FY02 and the first

commercial flights projected in FY01. In addition to the establishment of two internationally competitive commercial families of launch vehicles capable of meeting all Government and commercial needs, EELV's benefits include a 31% life cycle cost reduction over current Atlas, Delta, and Titan launch systems and $6.2B in validated savings. EELV will provide enhanced mass-to-orbit capability, broader operational flexibility, over $1B in launch infrastructure upgrades, and the formal transition to commercial launch services for all Air Force and NRO payloads. Challenged with the primary goals of meeting DoD's key performance parameters (mass-to-orbit, reliability, standardization) and reducing the cost of space launch by at least 25% over current launch systems, the EELV Program Team crafted and executed a comprehensive acquisition strategy. Their efforts simultaneously leveraged commercial competition and international market forces to reduce development risk, dramatically shorten first article delivery time to less than 36 months, incentivize industry investment of over $2.5B of their own funds, and create a true dual-use national launch system.

EELV represents a quantum leap in product, process, and service improvements over current launch systems. Examples include the introduction of a standard payload interface (SIS), standard launch pads, and contractor assumption of all launch site operations and maintenance (O&M). The SIS, a common mechanical, electrical, and environmental payload to booster interface, is an industry first. The benefits include a standard 24-month payload integration timeline, a common set of checkout/mating procedures, the ability to substitute payloads, and a rapid 45-day call-up capability (a 400% improvement over current 180-day call-up cycles). Beyond shortening integration timelines by up to 50% and streamlining integration activities, the SIS establishes a

civil/military baseline for current and future satellite designs, potentially reducing payload development costs and schedules.

Standard launch pads and processes are also reducing launch costs and shortening on-pad cycle time. EELV is expected to be on the pad for 1-8 days versus 60-180 days for today's Atlas, Delta, and Titan systems. Pad operations have been further enhanced through the use of commercial launch operations and ISO 9000 quality standards versus old Military Standards. Over the past year, the Air Force has sponsored numerous meetings with industry, NASA, FAA, and other interested federal, state and local agencies to ensure that we understand the needs of the civilian space industry. We will continue to work in partnership with industry and civilian agencies as we modernize our ranges for the future. We believe the EELV program will provide the U.S with the critical launch capability necessary to compete more successfully for launch services in the international commercial marketplace and will ensure a more cost-effective space transportation capability for future national security space missions.

Space Based InfraRed System (SBIRS)

The Defense Support Program (DSP) has been a vital ISR system for many years. As the DSP nears the end of its service, the Air Force will gradually replace it with the more capable SBIRS, adding significant capability to our Theater Missile Defense (TMD) architecture. The global coverage of SBIRS-High, with improved sensitivity and revisit rates over DSP, will allow better launch point determination, missile trajectory determination, and impact point prediction. These improvements will also ensure we can continue to detect, track, and assess the increasingly complex ballistic missile threats being

fielded. SBIRS-Low will provide critical mid-course track data to the battle manager to allow accurate targeting and engagement of hostile threats. SBIRS' improved early warning and tracking capabilities reduce the military utility and terror value of the weapons of mass destruction by greatly enhancing the response and effectiveness of active and passive defenses. In addition, SBIRS supports the missions of Technical Intelligence and Battlespace Characterization, which will greatly improve our assessment of enemy capabilities, our situational awareness during conflict, and our engagement results. SBIRS will provide the nation with new and improved warning and sensing capabilities for the next century, allowing the accomplishment of a greater number of missions from space. As we initiate our SBIRS deployments, the DSP program, which currently has four replacement satellites awaiting launch, will be sustained to allow continuous global surveillance during this transition period.

The completed SBIRS will consist of constellations of geosynchronous earth orbit (GEO), highly elliptical orbit (HEO), and low earth orbit (LEO) spacecraft as well as a supporting ground infrastructure. SBIRS-High will be composed of 4 GEO spacecraft to provide hemispherical coverage and 2 HEO sensors to provide polar coverage. SBIRS-Low will be composed of approximately 24 LEO satellites, with the actual number to be determined during the program definition phase. The SBIRS ground segment consists of a consolidated ground station, overseas-based Relay Ground Stations, and Mobile Multi-Mission Processors.

SBIRS-High first GEO launch is now scheduled for FY04. The Ballistic Missile Defense Organization's National Missile Defense Capability 1 (NMD C1) will have initial operational capability in FY06; the current SBIRS High constellation supports this date.

The SBIRS-Low first launch is now scheduled for FY06. A SBIRS-Low launch in FY06 supports the NMD schedule for Capability 2 in FY10.

Satellite Communications

Our space-based communications systems continue evolution towards Air Expeditionary Force and *Joint Vision 2010* operations based on seamless movement of information to joint warfighters in any theater of operations around the globe. The mix of MILSATCOM systems being acquired by the Air Force for DoD provides responsive and flexible connectivity with a range of services from high survivability to wide-band capacity to one-way broadcast. These systems meet the DoD MILSATCOM Architecture as validated by the Joint Requirements Oversight Council (JROC).

We continue to pursue the Defense Satellite Communications System (DSCS) upgrade to provide a more than 200%-increased capacity to theater tactical users on the last four satellites. In addition, we are deploying the Global Broadcast Service (GBS) Phase 2 infrastructure that will provide very high data rate communications directly to small terminals in the battlefield. Also, commercial-like Wideband Gapfiller satellites launched in 2004 and 2005 will augment DSCS and early GBS as we transition to the Advanced Wideband satellite scheduled for first launch in 2008. GBS, Wideband Gapfiller and Advanced Wideband will reduce costs and fielding time by making maximum use of commercial technology and practices.

We will continue to launch Milstar, the Air Force's highly survivable SATCOM system, and plan to replenish it with the higher capacity Advanced Extremely High

Frequency (AEHF) system starting in 2006. To support the AEHF development, we are investing in the enabling technologies to reduce cost and risk, and take maximum advantage of commercial digital satellite investments. All these new systems will be acquired with supporting control subsystems and terminals for the new frequency bands and waveforms being fielded. Specifically, we plan to begin developing and procuring more airborne terminals to communicate over Milstar and the higher capacity AEHF system. Our program also includes the development and acquisition of terminals to replace unsupportable MILSATCOM terminals.

Space Control

The Air Force is committed to maintaining leadership in space with technology readiness for a full range of space control capabilities. Our overall strategy is to deter threats to our assets in space, protect them, and, when directed, to deny space capabilities to our adversaries. Our approach is to provide a balance between space surveillance, protection, prevention, and negation capabilities commensurate with emerging threats. The Air Force has budgeted approximately $10M per year across the FYDP to sustain development of a comprehensive space control plan and a range of space control technology activities.

To ensure the Air Force has the proper oversight of this important mission area, we have formed the Counterspace Oversight Council to oversee the requirements generation process.

The Air Force, in coordination with the NRO, the other Services, and NASA, is leading a task force focused on defining our future space surveillance capabilities. The Air

Force requires a robust space surveillance capability; this task force will be instrumental in the development of the required interagency modernization strategy and investment plan to make this requirement a reality. In the areas of protection, we are working to enhance the Global Positioning Satellite system to protect its use by friendly forces and to have the capability to prevent its use by adversaries. Additionally, we are conducting a comprehensive review of our space-related infrastructure. This review will provide us the information required to determine system vulnerabilities and identify those actions necessary to assure space-related services to our warfighter in the field. Consistent with the Deputy Secretary of Defense's testimony to you last year and the additional $3M Congress provided for FY 00, we are planning to pursue negation efforts that could lead to capabilities that have localized, temporary, and reversible effects as part of our broader information and force protection capabilities.

The Air Force has played a leading role in the Defense Department's Space Control Broad Area Review (BAR). This BAR was initiated early last year and will report final recommendations within the next few weeks. The Air Force FY02 and future POM submissions will likely reflect many of the recommendations from this important effort.

Space-Based Laser (SBL)

The Air Force and the Ballistic Missile Defense Organization (BMDO) awarded a Joint Venture (JV) contract in February 1999 to the SBL Community Team of Boeing, Lockheed Martin, and TRW. The SBL team will develop an Integrated Flight Experiment (IFX) to accomplish the technical advancement and collection of engineering data needed

to make sound decisions on the future of an operational SBL system. The IFX will integrate the high energy laser, beam control system, and acquisition, tracking, and pointing elements into a space platform. After launch in the 2010-2012 time frame, the IFX will perform a series of on-orbit experiments to acquire engineering design and performance data consistent with extrapolation to an operational system, determine the capability of the integrated system to deposit enough energy in a short enough time span to destroy a boosting ballistic missile, and investigate possible contributions to global aerospace superiority. The SBL Joint Venture team is best positioned to resolve the technical challenges and conduct a successful experiment to demonstrate boost phase intercept capability from space, while enhancing competition for future procurement.

Thus far the SBL program has been successful in reducing the cost and technical risks of deploying and operating multi-megawatt lasers in space. The high power laser testing completed in 1998 and 1999 successfully demonstrated the capability to operate critical SBL laser and beam control subsystems at high power. The SBL program has developed, simplified and proven several key subsystems such as uncooled optics and mirrors, resulting in a 40 percent reduction in spacecraft weight and significantly reducing optical component production cost and time.

In spite of the SBL program's technical achievements, there was concern that an IFX would not be launched soon enough to enable an operational SBL system in time to meet the projected threat. In response, the Air Force and BMDO increased funding for the SBL program to $139M per year through the FYDP. This additional funding will be used to accelerate risk reduction and technology development prior to the IFX. BMDO sponsored a third Independent Review Team (IRT-3), chaired by General (Ret) Larry

Welch, as part of the assessment of technological readiness, role, and content for an effective IFX. The IRT-3 concluded the range of appropriate time frames for an IFX launch is 2010 to 2012. Currently planned budget levels and priorities lead to a launch planned for 2012. The team noted that achieving operational capability is less dependent on an IFX launch date than DoD commitment to deployment and "the IRT perceives that the Department is embarking on such a program." The IRT-3 recommended the Air Force lay out a specific series of near-, mid-, and far-term milestones to ensure disciplined progress toward the IFX and enhance readiness to deploy an operational system. The team also recommended including deployable optics in the IFX to reduce risk for the overall SBL effort. Finally, IRT-3 reiterated the need for a ground facility to provide end-to-end system checkout before launch, and that such a facility should be operational at least 2 years before planned launch.

Space S&T

The Air Force is committed to transitioning to a fully integrated Aerospace Force. Preparatory work in Science and Technology must lead the way. Building on the Air Force "Doable Space" Study, the Air Force Scientific Advisory Board (SAB) produced a detailed "Space Roadmap for the 21st Century Aerospace Force." In response to this and in preparation for the transition to an Aerospace Force, the Air Force S&T community has more than doubled its S&T investment in "space-only" technologies from about 13% in FY 1999 to 32% a year by FY 2005. This increase in investments is primarily focused in five areas: space-based radar, space-based lasers, reusable launch vehicles like the space operations vehicle, satellite survivability, adaptive optics, and hyperspectral imaging--all

areas highlighted in the SAB Roadmap. Furthermore, AFRL, SMC, and AFSPC are working together more closely than ever through the Air Force's Modernization Planning Process to link S&T investments to mission needs.

As space technology requirements are growing, it is important to leverage all the S&T efforts of government and industry in development of space technology to avoid duplication and overlap. The Space Technology Alliance was founded to coordinate the development of affordable, effective space technology products among all space technology developers for the greatest return on investment of government technology funds. The STA is developing coordinated roadmaps which will increase leveraging.

The technology pipeline is bearing fruit. For example, miniaturization is an important ingredient of developing space technology and the Air Force is doing this across the board from microcontrollers that fit on postage stamps to Transmit/Receive Antenna Modules (TRAMs) that are 75% smaller than current state of the art and from phased array antennas to miniaturized on-board satellite natural space hazard alert warning systems. One of these systems is scheduled to fly on a Defense Support Program (DSP) mission. The pervasive impact of Air Force Space S&T is not always clear. For example, a majority of U.S. satellites (government and commercial) incorporate AFRL sponsored electronics technology.

The Air Force recognizes it is in the best interest of national security to have low cost reliable access to space. While NASA has the lead in developing reusable launch vehicle (RLV) technology efforts, the Air Force has been the lead for ensuring that technologies to support unique military requirements for reusable launch vehicles are developed. For example, the spaceplane includes the Space Operations Vehicle (SOV), an

upper stage like the Space Maneuver Vehicle (SMV), the common Aero Vehicle, and the Modular Insertion Stage. The SMV is envisioned to be a reusable, unmanned orbiting vehicle with integral propulsion that completes an on-orbit mission, reenters the atmosphere and lands for retasking. On August 11, 1998, a 90% scale model SMV demonstrator made a very successful test at Holloman AFB, New Mexico. This unmanned vehicle demonstrated an autonomous, unpowered approach and landing following release from an Army helicopter 9,000 feet above the ground. As the next step in developing SMV technologies, the Air Force has partnered with NASA following their selection of Boeing's X-37 Advanced Technology Vehicle (ATV) as a NASA Future-X Pathfinder. The Air Force is investing $11.1M beyond the $5M from the FY98 funds to make the ATV more SMV-like (i.e., more militarily useful) by primarily increasing its ability to stay on orbit and to maneuver. We are also working plans for a second demonstration vehicle as directed in the FY00 appropriations act.

Discoverer II

Before I consider my unique NRO responsibilities, I would like to highlight our flagship program for black/white space integration. The Discoverer II program takes the concept of "Force Multiplier" to a new level by putting teeth in the front-end of the Find Fix Track Target and Engage (F2T2E) construct. Furthermore, it serves as a program for Air Force partnership with the NRO in space, leverages Defense Advanced Research Project Agency (DARPA) expertise and investment in advanced sensor and information technologies, and directly integrates operational Army C4ISR assets for data exploitation.

The objective of this technology demonstration program is to establish the technical feasibility and affordability of a robust operational space-based Ground Moving Target Indicator (GMTI) and Synthetic Aperture Radar (SAR) imaging system. We envision such a system providing near-continuous global surveillance, reconnaissance, and precision mapping directly to the theater or joint task force commander. The Air Force, NRO, and DARPA jointly and equally funded the program in response to the Defense Science Board's recommendation to develop leading edge, higher-risk technologies to meet warfighters' needs at lower cost. The Army will contribute a tactical ground system and funding to integrate the system into the demonstration. The program is jointly managed and Air Force administered and is structured to provide for a phased decision process leading to launch and on-orbit demonstration in FY05. The on-orbit demonstration ends in FY05, at which point key decision-makers can make an informed decision for fielding an operational radar constellation that will support our troops in the 2010 timeframe. Assistant Secretary Larry Delaney and I are committed to the successful deployment of this revolutionary system.

NRO Initiatives and Partnerships

As Director of the National Reconnaissance Office, I direct vital national security space programs that are indispensable tools of U.S. global leadership. As I said earlier, much of what we do in the NRO must be discussed in closed session; however, I would like to address a few unclassified points. First is the area of partnerships. We are aggressively pursuing partnerships in operations, acquisitions, and R&D. In this era of tightened budgets, the nation cannot afford, nor should it accept, completely separate

domains for intelligence, military, and civil space programs. Continued U.S. space dominance will rely on the successful collaboration between the NRO, Air Force, and NASA to deliver future space systems faster, better, and cheaper. The NASA Administrator, Dan Goldin, CINCSPACE, now Gen Eberhart, and I meet regularly to ensure we are exploring and implementing every opportunity for collaboration across our national, military, and civil space programs.

Operations Support

With the unequivocal support of General Eberhart, we will continue to provide "one stop-shopping" for the warfighter by fully coordinating "black and white" space operations. Combined national space capabilities are bearing fruit every day with proven results ranging from our nation's efforts in Kosovo to the skies over Iraq.

Training as we fight is one of our major requirements. Last year I requested your help in authorizing funds that were appropriated to expand our operational support activities. I would like to thank the committee for your action on this request. Your authorization of these funds has helped ensure our military customers are fully engaged in NRO programs. In fiscal year 1999, the NRO supported 39 military exercises of which, 34% were Joint sponsored, 24% were with the Air Force, 19% were with the Army, 12% were with the Marine Corp, and the remaining 11% were with the Navy.

The NRO has also partnered with the Navy in a joint program called "Quick Bolt". This Advanced Concept Technology Demonstration (ACTD) created with enthusiastic support from this Committee, uses National capabilities and infrastructure to support the suppression of enemy air defense. This ACTD, sponsored by the U.S. European

Command, will integrate a miniaturized Trap Data Dissemination System (TDDS) receiver into an upgraded High Speed Anti-Radiation Missile (HARM) in order to provide the shooter with the latest tactical data prior to launching a missile. Quick Bolt will also integrate a low probability of intercept transmitter into the missile to report missile position and other battle damage indicators back to the shooter and to the theater in near real time.

Research and Development

In 1997, Major General Dick Paul, Commander of the Air Force Research Laboratory, Dan Goldin, the Director of NASA, and I created the Space Technology Alliance (STA) to coordinate the development of affordable, effective space technologies. This will allow us to avoid duplication of effort and ensure that we get the most out of our R&D funds. The program includes an exchange of personnel among the three agencies and biannual senior technology summits to review programs.

During the past year, the STA has kicked off a major effort to coordinate technology programs across the government in the area of space power, spectral imaging, large optics, advanced communications, and micro-satellites. A first-ever community technology roadmap for space power has been completed as well as a roadmap for spectral imaging. The space power roadmap has also been reviewed by industry while the spectral imaging is now being reviewed. We are well on our way to completing a community technology roadmap for large optics. These roadmaps, and the process by which they were created, have identified fruitful areas for collaborative efforts. They have also given the managers of technology programs a far more comprehensive picture of the

R&D activities ongoing in their respective areas - allowing them to better plan their programs, and more effectively focus on the breakthrough mission enabling technology.

In 1999, the NRO joined with the Air Force Research Laboratory, NASA, the Department of Energy, and Intel Corporation to develop a new radiation-hardened computer chip for space and defense applications. The chips will mark at least a 10-fold increase in processing capability over currently available radiation-hardened microprocessors at much reduced power consumption compared to the current Pentium design. If successful, this chip would allow the NRO to develop higher performance, smaller satellites that are resistant to the effects of radiation in space while providing enhanced information to our customers.

In an effort to create a foundation for identifying and investing in revolutionary new ideas and concepts, I have created the Director's Innovation Initiative. This is a program that awards small studies and initiatives of limited duration to "outside the box" thinkers using the Internet to solicit proposals. Our strategy here is to transform the few "golden nuggets" into future solutions. This year 523 respondents submitted ideas for further investigation. Of these, 58 were awarded small dollar contracts. For only a small investment, we have the potential to reap tremendous dividends.

The Air Force – NRO Integration Planning Group

The Air Force – NRO Integration Planning Group was established in June 1998 to find opportunities where cooperation will save taxpayer dollars or increase mission effectiveness. This small investment will pay huge dividends. They've spearheaded initiatives to operationalize tools that provide rapid precision targeting for our nation's

most advanced weapons, share communications infrastructure to avoid redundancy, and increase awareness of exploitable national contributions to Air Force visions & needs. They're currently exploring the cost and capability benefits of multi-mission space systems and the possible efficiencies of acquiring these systems through a joint Air Force and NRO program office. A similar effort is also beginning between the NRO and the Navy.

Budgetary Stability

Through partnerships and investments, this nation is clearly positioned to continue its leadership role in space and is well on the way to achieving the vision of an integrated Aerospace Force. That is not to say, however, that the path will be easy. We must overcome important challenges to this vision. The primary challenge is funding.

We have demonstrated our commitment to space in our stable funding of key space programs and our increased investment in space-related technology. We've reached out to the rest of the government and to private industry to create relationships which increase our efficiency and effectiveness. Finally, we are looking hard at our own internal organization to ensure we are best positioned to exploit space and all that it offers the military and the nation. We do, however, need your help in providing robust, stable funding. We must be fiscally prepared to maintain the readiness and force structure required for today's needs while still preparing for tomorrow's challenges. With your strong support we can vigorously exploit the technologies required to create operational capability.

Conclusion

The Air Force and NRO are proud to be the nations leaders in military space operations and stewards of the taxpayers' dollars. In an environment of declining budgets we have consistently been able to deliver more bang for the buck. We are also working hard to deliver more breakthrough programs for the future. These investments in space programs and technology are a strategic investment for the national security of the United States. I ask that Congress support our efforts in space with a robust and stable budget that will allow us to maintain reliable support to our warfighters and to the nation. This Committee and the two Space Commissions have the opportunity to define our future roles and missions and establish the imperatives for 21st century space systems. I look forward to working with this Committee and the Commissions to chart a course for the future.