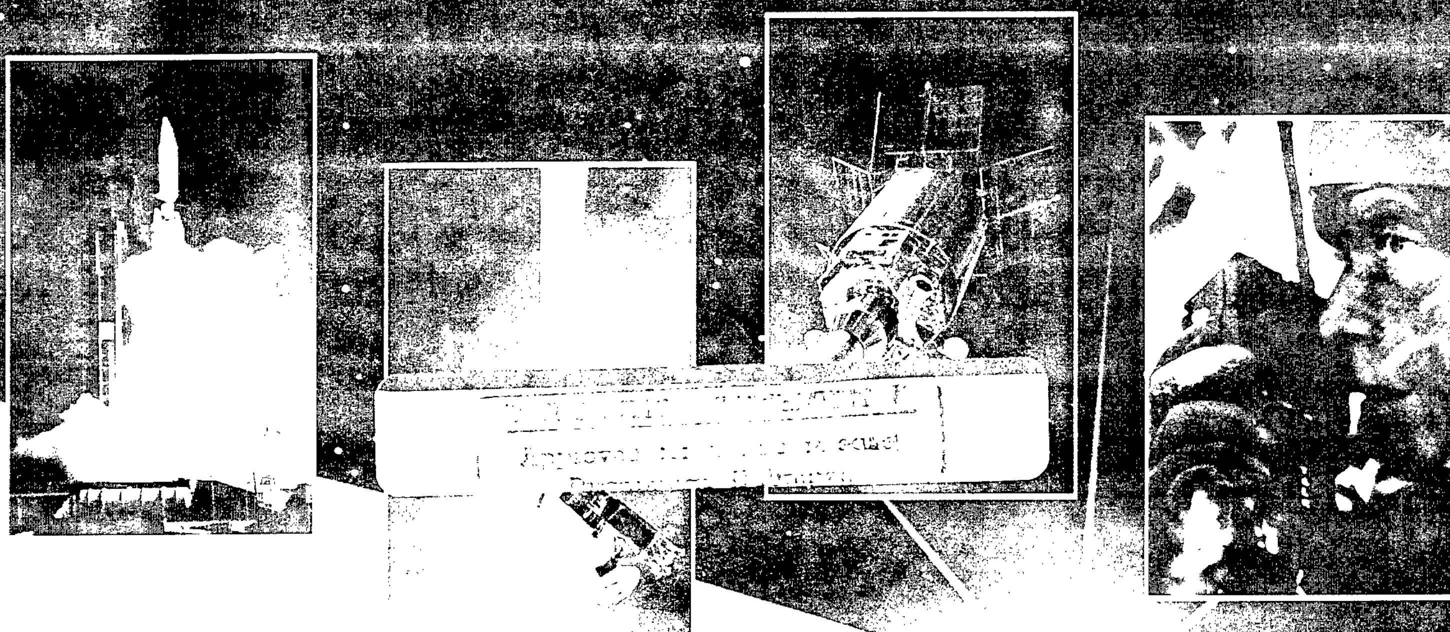
Department of Defense

Space Program



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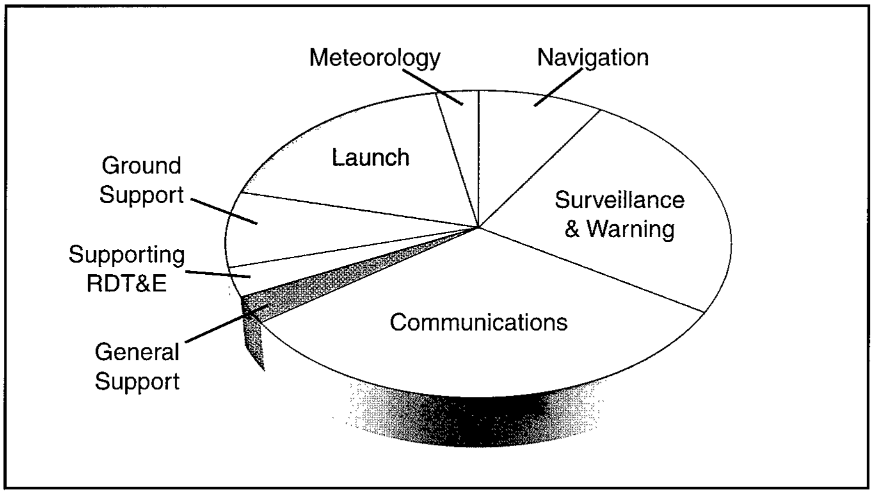
An Executive Overview

for FY 1998 - 2003

March 1997

National security space activities under the oversight of my office include:

- Communications;
- Surveillance, reconnaissance, and tactical warning and attack assessment (TW/AA);
- Navigation (to include location and positioning);
- Meteorology (as part of environmental monitoring);
- Launch vehicles and systems;
- Ground support (to include launch facilities, satellite control, and test);
- All supporting RDT&E; and
- General support, to include space headquarters, training, and special centers.



The DoD Space Budget at a Glance: Funding Shares (FY 1998 – 2003)

I am very proud of what we have accomplished since standing up the DUSD(S) organization, and we have an even more ambitious agenda for the next few years. Key near-term thrusts include:

- Implementing the President's recent space policy decisions via DoD space policy, plans and program oversight;
- Assuring "best practices" and acquisition reform initiatives in our space acquisition programs;
- Increased integration of defense and intelligence activities to support the users;
- Establishing a multi-dimensional framework to help us analyze, integrate and balance our evolving programs;
- Responding to Congressional action and interest items;
- Restructuring our launch capability to make it both more responsive and more competitive; and
- Most important, continuing to normalize and integrate our space capabilities so that they are routine parts of our warfighters' operations.

In summary, DoD has come a long way, but has even further to go. I hope I can count on your continuing support.

Robert V. Davis
Deputy Under Secretary of Defense (Space)

DoD Space Activities:

- *Communications*
- *Surveillance & Warning*
- *Navigation*
- *Meteorology*
- *Launch*
- *Ground Support*
- *Supporting RDT&E*
- *General Support*

The Changing Environment for Defense Space

"Military space operations 'came of age' during the Persian Gulf War ..."

First Uses of Space

Space became part of the military environment with the use of V-2 rockets during World War II. With a range of about 220 miles (350 km), they reached altitudes of 60 miles (100 km).

When the Soviet Union put its first Sputnik into earth orbit in October 1957, followed in January 1958 by the U.S.'s first Explorer, the occupancy of space — whether for civil or for military purposes — became a reality. Unmanned systems were soon followed by manned spacecraft; both types played roles during 30 more years of Cold War, as well as for more benign purposes. Military satellites were used for national intelligence purposes and for operational support missions; both types of activity were usually highly classified.

Space in the 1990s

Military Operations. Military space operations "came of age" during the Persian Gulf War of 1990–91, when used to support tactical operations vice solely strategic C3I. Historically, space systems had supported primarily strategic missions within a bi-polar Cold War context and at a national command level. Space products were highly classified, and their dissemination limited. One of the Gulf War's key outcomes was a broad recognition of the importance of space systems' contributions in a theater context, and from conditions of peace through crisis to hostilities and back again.

The Gulf War itself was an outstanding success, and so were the space systems that supported it. From the unmatched precision of GPS-supported munitions to the tactical warning afforded by space-based missile sensors, our space systems worked just the way they were supposed to, and in many cases better — especially when one considers that many systems were not designed for regional conflict. However, what they did not do was work together. Surveillance satellites told us when an Iraqi Scud tactical ballistic missile was launched, but lacked the ability to give us precise coordinates. These were symptoms of a bigger problem: no one was charged with the responsibility to make sure everything worked together in a theater campaign. While the dedication and hard work of the people managing the systems got the job done, we identified areas for improvement. Moreover, as the Cold War ended and budgets began to shrink, we needed to find ways to do more with less.

We also learned that the process for making intelligence available to combat commanders was also inadequate. Again, the channels for transmitting sensitive data from the "black" world to field commanders operating primarily in the "white" world were constricted, with the result that timely intelligence distribution to operational units was often a problem.

Other Activities. In addition to a different operational environment for government space systems, commercial and foreign space technologies were improving, with the following results:

- The U.S. government no longer "drove" the space technology market in many areas; and
- These other sources provided increasing opportunities to leverage and improve the performance of many space functions.

When combined with shrinking budgets, these forces also added pressures to reassess national security technology investments and operations with non-defense marketplace products.

Space Systems Acquisition. When the government had a virtual monopoly on space system acquisition, the tendency was to procure small numbers of systems designed to meet critical Cold War requirements of specific users, with but secondary regard for cost or competition. However, the 1990s defense-wide trend toward a tactical/operational focus, more flexible and open architectures to avoid "stovepiped" systems, consolidated acquisitions to meet joint requirements and controlled costs all indicated that the DoD would have to change the way it was "doing business" if the U.S. were to retain its space leadership and continue to support evolving post-Cold War national policies.

Space for the Next Century

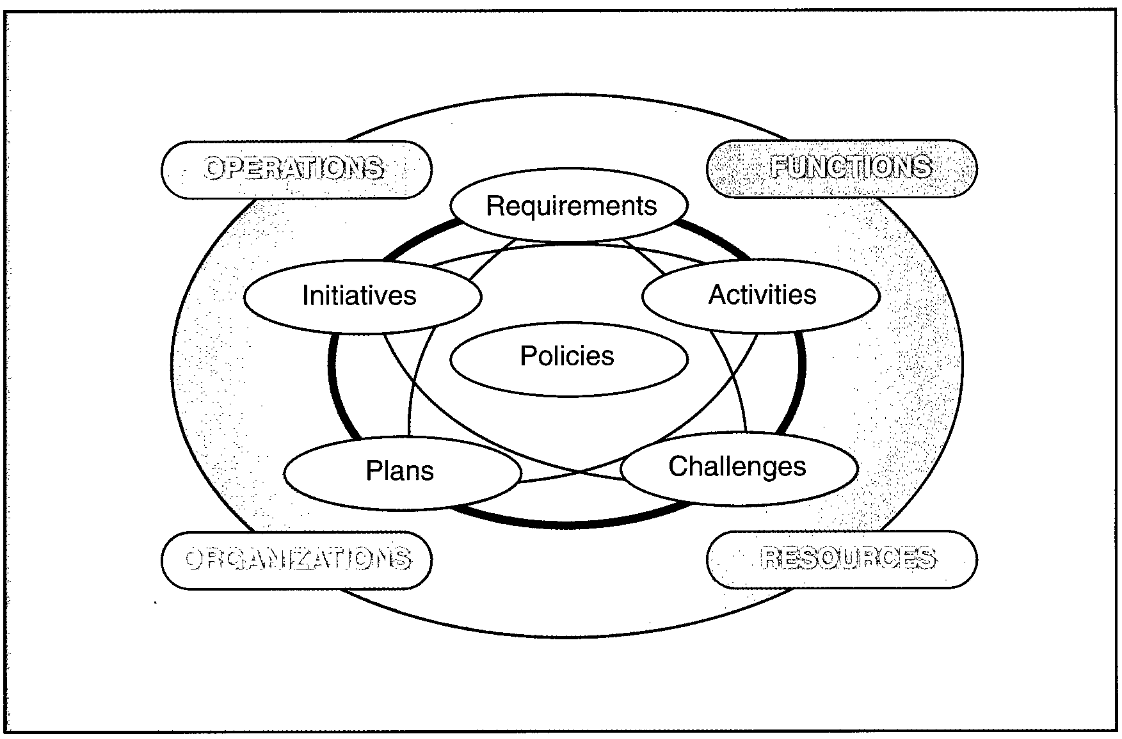
The space world is changing so fast that new, unconventional, "out-of-the-box" approaches are required. Essentially, national security space capabilities are needed for a changing world in which:

- Space capabilities are an essential multiplier for all types of forces and operations — and everybody knows it;
- Space capabilities may be the first and only timely indicator of rapidly developing crises anywhere in the world;
- Uses and users of space are both expanding, and include commercial and foreign capabilities, as well as military and other government applications;
- Sharply decreased defense resources that reduce force structure and conventional weapon systems acquisition are, at the same time, increasing the leverage of space systems;
- Dedicated, stand-alone ("stovepiped") systems must yield to multi-mission, multi-user systems that are the products of consolidated acquisitions and function in open architectures;
- Space systems have clear advantages where national boundaries, landing rights or overflight may be of issue;
- Technological advances are improving space system performance; and
- Compared to most conventional land, sea and aerial systems, space systems — once on orbit — need no special logistics, perform their functions with generally unrivalled precision and timeliness, and do not risk human life in the process.

It became increasingly apparent to both the Congress and the Defense and Intelligence Communities that effective operations in this emerging world require the coordinated involvement of all space participants, both military and civil. The steady change on all fronts requires a centralized approach that will manage multiple variables in the face of uncertainty, as suggested in the graphic below.

DUSD(S)'s role is to "reengineer space" — in the sense of how we will "do space business" in the national security arena and how we will implement the National Space Policy approved by the President in 1996. In pursuing this course, we seek the continued cooperation of the space community as we move forward.

" ... effective operations in this emerging world require the coordinated involvement of all space participants ..."



The Management Challenge: Interactions of Space

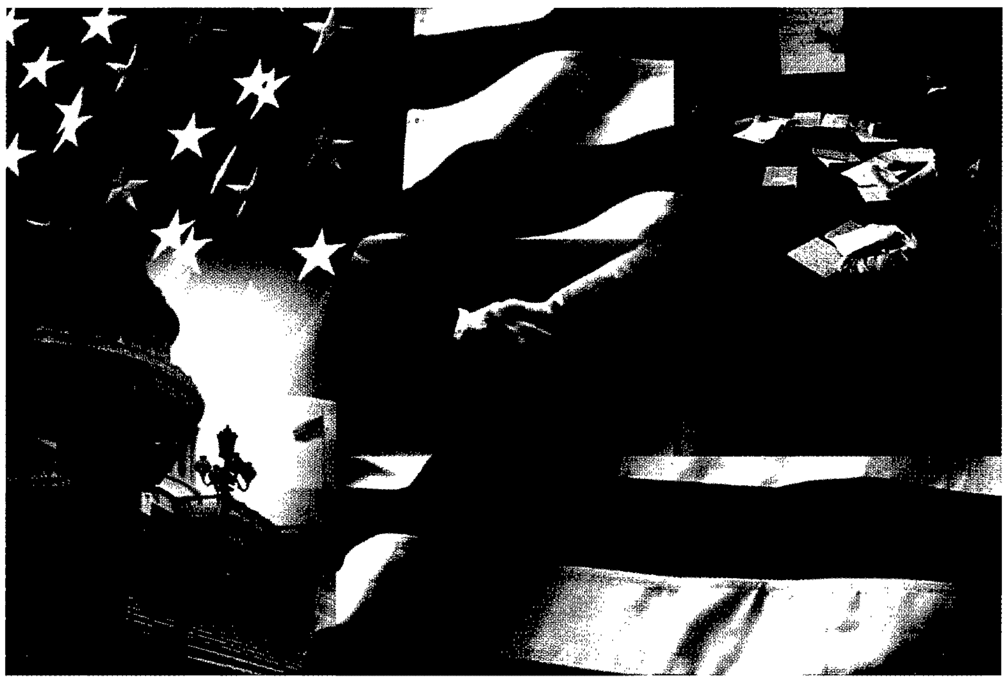
"Our National Space Policy ... updated the goals of the U.S. space program."

National Space Policy

National Space Goals

Our National Space Policy, signed by the President in September 1996, updated the goals of the U.S. space program. They are to:

- Enhance knowledge of the Earth, the solar system and the universe through human and robotic exploration;
- Strengthen and maintain the national security of the United States;
- Enhance the economic competitiveness, and scientific and technical capabilities of the United States;
- Encourage State, local and private sector investment in, and use of, space technologies; and
- Promote international cooperation to further U.S. domestic, national security and foreign policies.



National Security Space Activities

National security space activities will be overseen by the Secretary of Defense (SecDef) and Director of Central Intelligence (DCI); other departments and agencies will assist as appropriate. National security space activities will contribute to U.S. national security by:

- Providing support for the U.S.'s inherent right of self-defense and for our defense commitments to allies and friends;
- Deterring, warning, and if necessary defending against enemy attack;
- Assuring that hostile forces cannot prevent our own use of space;
- Countering, if necessary, space systems and services used for hostile purposes;
- Enhancing operations of U.S. and allied forces;
- Ensuring our ability to conduct military and intelligence space-related activities;
- Satisfying military and intelligence requirements during peace and crisis as well as through all levels of conflict; and
- Supporting the activities of national policy makers, the intelligence community, the National Command Authorities (NCA), combatant commanders and the military Services, other federal officials, and continuity of government operations.

National security space sector guidelines from the National Space Policy are summarized in the first table on the next page. In addition, the National Space Policy's designated intersector guidelines are identified in the second table to illustrate the breadth and scope of national security space interactions with a full range of other activities.

National Security Space Guidelines	
Defense Space Sector	Capability to execute mission areas of space support, force enhancement, space control, and force application Protection of critical space-related technologies and mission aspects Space transportation systems, infrastructure, and support activities, to include the expendable launch vehicle fleet Integrated and robust satellite control capability for all governmental space activities Specific DoD requirements for military and national-level intelligence Consistent with treaties, space control capabilities to ensure (or deny) freedom of action in space Pursuit of ballistic missile defense to enhance theater defenses and provide a hedge against a threat to the U.S.
Intelligence Space Sector	Timely information and data to support policies, military operations, diplomatic activities, indications and warning, crisis management, and treaty verification Advanced technologies to respond to threats and support national intelligence priorities Improved intelligence space capabilities to support military operations worldwide Protection of the nature, attribution and operational details of intelligence space activities, plus provisions for release Classification of other collected information according to its content Protection of imagery product (per Executive Order 12951) Strict security procedures governing public discussion of satellite reconnaissance, to include prior security review

National Security Space Guidelines comprise Defense and Intelligence Space Sector responsibilities

Intersector Guidelines	
International Cooperation	Achieve scientific, policy, economic or national security benefits for the nation, via cost sharing, foreign access, enhanced relations, technology transfer, commercial opportunities, and preservation of U.S. competitiveness and national security
Space Transportation	Assure reliable and affordable access to space through U.S. transportation capabilities, via balanced investment, a strong capability and technology base, cost reduction while improving capabilities, development of reusable systems, cost-effective commercial products and services, and U.S. industry
Space-Based Earth Observation	Protect public health, safety and national security, contribute to economic growth, stimulate educational, scientific and technological advancement, collect and disseminate environmental data, cooperate with other Earth observation system developers, and coordinate Earth observation activities
Nonproliferation, Export Controls, and Technology Transfer	Continue to support MTCR Guidelines and U.S. nonproliferation policies with respect to non-MTCR states and MTCR states, respectively, protect against adverse technology transfer, and, in entering space-related agreements with other countries, consider whether they practice free and fair trade
Arms Control	Consider and formulate policy positions on arms control affecting space, and conclude agreements only if they are equitable, effectively verifiable, and enhance the security of the U.S. and our allies
Space Nuclear Power	Maintain a space nuclear power capability, but use nuclear reactors in Earth orbit only with specific Presidential approval
Space Debris	Minimize or reduce accumulation of space debris, consistent with mission requirements and cost-effectiveness. Take a leadership role in adopting policies aimed at space debris minimization for other space-faring nations and international organizations
Government Pricing	Charge prices for the use of U.S. Government facilities based only on direct costs, use consistent pricing practices, and price residual tooling, equipment and hardware according to the best overall interest of the U.S.

Intersector Space Policy guidelines are designed to attain clear policy objectives

"... maintain a strong, stable and balanced national space program ..."

Implications for Defense Space

The preceding two years of comprehensive review and updating of the U.S.'s space policy both guide and challenge the national security space community. First, the President's policy provides a firm commitment to maintain a strong, stable and balanced national space program to serve U.S. goals in national security, foreign policy, economic growth, environmental stewardship, and scientific and technical excellence. Secondly, in the national security arena, the new policy:

- Reaffirmed the critical role of space in preserving peace and supporting U.S. national security objectives;
- Established as key priorities the needs to:
  - Improve our ability to support military operations worldwide,
  - Monitor and respond to strategic military threats, and
  - Monitor arms control and nonproliferation agreements and activities;
- Directed greater coordination between DoD and Intelligence Community space activities and the integration of space architectures to the maximum extent feasible;
- Stated that the U.S. will maintain capabilities for ensuring our use of, and access to, space;
- Directed the DCI to:
  - Develop and apply advanced technologies to respond to changes in the threat, and
  - Support national intelligence priorities.

Thirdly, the DoD supports relevant space activities and processes under the cognizance of other agencies and communities. Summaries of the major U.S. objectives for these intersector guidelines are listed on the preceding page.

Those guidelines reflect the increased interaction among sectors. More and more providers and users, both domestic and foreign, present increasing supplies and demands for space-related goods and services, many of them under the purview of the DoD. Some of the challenges they present — and initiatives we are undertaking — are addressed under specific functional topics in the pages that follow.

Space Forces and National Defense

Space forces provide a significant net advantage for the U.S., and, by extension, those allied and friendly nations that share in our space products and services. They confer decisive advantages across the peace-through-war spectrum in terms of:

- Collecting and disseminating all kinds of information;
- Contributing to global and battlespace situational awareness;
- Supporting operational maneuver, and enabling the synchronization of multi-user activities;
- Enhancing combat operational timing and tempo; and
- Supporting the application of weapons against targets.

Thus, these advantages support national defense policies from deterrence through victory.

Contributions to the Revolution in Military Affairs

The information-based "Revolution in Military Affairs" relies on technology advances, primarily in the fields of information collection, processing, and transmission. Space systems have long supported, and remain in the forefront of, these three information functions. They are continuing to improve capabilities for command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR). In particular, they provide:

- Near-real-time intelligence, surveillance and reconnaissance (ISR), environmental monitoring, tactical warning/attack assessment (TW/AA) and targeting under day/night all-weather conditions for superior area and battlespace awareness;
- Instantaneous and secure battle management and C4I for rapid and coordinated application of force, wherever required;
- A global three-dimensional grid reference system for standardized location of references, objectives and forces, to include their positioning and navigation; and
- Accurate positioning, timing and velocity data to support the delivery of precision weapons.

The use and control of space enables the U.S. to establish and sustain dominance over an area of operations. Moreover, by providing almost global coverage, space systems help to compensate for reductions in force deployments and infrastructure by providing ISR and C4I (C4ISR) capabilities permanently in place and always ready. These capabilities also support forces operating and training back in the U.S., from exercise support to system test.

Assuring the Usefulness of Space

As space systems directly support the revolution in C4ISR, it is imperative that their capabilities be recognized and used effectively. In the current thrust to make space a routine part of operations, three terms apply:

- **Normalization** — moving space out of the R&D and classified worlds and into the mainstream of defense activities;
- **Integration** — helping to infuse space into the basic processes of land, sea and air operations; and
- **Operationalization** — making space more relevant and responsive to the warfighter and other users.

The goal is that, as space capabilities become more effective and reliably available to the user, they will become less obscure, less "magical," and be considered in the normal campaign planning processes and used as routinely as any other military force capability in the operational environment. Their products and services will become even more integrated in the employment of forces to achieve campaign objectives.

Space Force Structure

The DoD's current space force structure, comprising systems and capabilities in space support, force enhancement, space control and force application, is summarized in tables on the next page.

"Space forces ... confer decisive advantages across the peace-through-war spectrum ..."

"... make space a routine part of operations ..."

SPACE SUPPORT: Systems and Capabilities

Launch	Launch / deploy space vehicles Maintain / sustain spacecraft on-orbit Deorbit / recover space vehicles	Pegasus, Taurus, Delta II, Atlas II, Titan II & IV launchers; Inertial Upper Stage (IUS) and Centaur boosters; Space Shuttle (as required)	Eastern Range – Cape Canaveral Western Range – Vandenberg AFB
Satellite Control	Centralized C2 of DoD satellites Telemetry, tracking & control (TT&C)	Support for Navy satellites Mobile C2 for certain DoD satellites	

The four space mission areas are:

- *Space Support*
- *Force Enhancement*
- *Space Control*
- *Force Application*

FORCE ENHANCEMENT: Systems and Capabilities

Communications	Military Satellite Communications (MILSATCOM): Defense Satellite Communications System (DSCS): SHF secure voice & high-rate data for worldwide military C2, crisis management, relay of intelligence and early warning data, treaty monitoring, diplomatic and Presidential comms, communications for tactical forces, and limited anti-jam worldwide connectivity for critical functions Milstar: EHF voice and low/medium-rate data for worldwide C4I support to warfighting CINCs, anti-jam, survivable and enduring connectivity for tactical forces, and connectivity for critical functions Fleet Satellite Communications System (FLTSATCOM), Air Force Satellite Communications System (AFSATCOM), and UHF Follow-On (UFO) System: UHF and EHF communications for mobile forces, including fleet broadcast services and control communications to SIOP/nuclear-capable users, and other functions
Navigation	Global Positioning System (GPS): Three-dimensional precise navigation, positioning, timing and velocity data to U.S. and allied forces, and to other national security, civil and commercial users
TW/AA	Defense Support Program (DSP): Global detection of missile and space launches to provide the NCA with timely, reliable and unambiguous TW/AA data for force survival and retaliatory decisions vs. air, space and ballistic missile threats Nuclear Detonation (NUDET) Detection System: Timely, reliable and accurate detection, location and yield of NUDETs for: damage and attack assessments; force management; and test ban monitoring
Environmental Monitoring, and Mapping, Charting, and Geodesy (MC&G)	Defense Meteorological Satellite Program (DMSP): Collection and dissemination of global visible and infrared (IR) cloud cover imagery and other meteorological, oceanographic and solar-geophysical data for operational forces. (DoD also uses NOAA and international meteorological satellite systems) Land Remote Sensing System (civil): Provide multi-spectral imaging (MSI) of the earth for many DoD activities, as well as other national security, civil and commercial users
Intelligence, Surveillance, and Reconnaissance (ISR)	Additional classified assets support ISR missions

SPACE CONTROL: Systems and Capabilities

Space Surveillance & Battle Management / C4I	Space Surveillance Network: Space object cataloguing and identification, satellite attack warning, timely notification to U.S. forces of satellite flyover, space treaty monitoring, and scientific and technical (S&T) intelligence-gathering
Protection	DoD space systems are inherently protected by appropriate measures, such as: design, satellite proliferation, hardening, comm cross-links, and security protection
Prevention	Military missions are also enhanced by diplomatic, legal or military measures to preclude an adversary's use of space systems or services.
Negation	Hostile space systems or their data links can be negated.

FORCE APPLICATION: Systems and Capabilities

Defensive	Treaty-compliant research into advanced technologies offering potential for space-based ballistic missile defense (BMD) as insurance against possible future threats
Offensive	No capabilities in the force structure for power projection from space

Restructuring of DoD Space

The Space Management Challenge

Three years of Congressional language paralleled the DoD's own post-Gulf War concerns over how best to manage national security space. Congress criticized the basic processes governing defense and intelligence space programs and policy, requirements coordination, resource management, systems acquisition, space operations and training, and the level of support to the warfighter. A parallel, DoD-wide review of the full range of national security space activities, including DoD's relationship to the Intelligence Community, laid the basis for a series of management initiatives, pursued via a two-step approach:

- Continuing to improve coordination and management of defense space activities; and
- Improving the coordination and integration of DoD space activities with those of the Intelligence Community.

DoD Management Initiatives

Reorganization. The DoD's efforts to restructure the management of national security space activities have included the creation of three elements at the Departmental level:

- The DUSD(S) to oversee DoD space activities, specifically policy, architectures, and acquisition programs;
- The DoD Space Architect to develop integrated space mission architectures that will enable acquisition efficiencies and improve space support to military operations; and
- The Joint Space Management Board (JSMB) to integrate Defense and Intelligence space activities under a senior guiding body.

Their key functions are summarized in the table below.

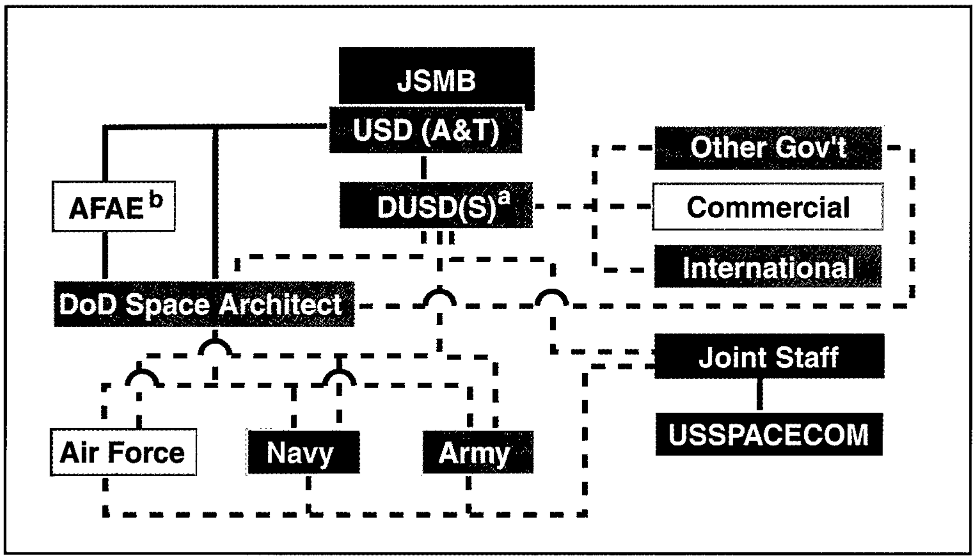
Current Office of the Secretary of Defense (OSD) space organizational relationships are depicted in the figure on the next page. The emphasis is on coordination of the many activities and responsibilities that space affects through its policy, architectural, technological and operational interfaces.

Processes and Procedures. In addition to providing a DoD focal point for space matters, the consolidation of space responsibilities within OSD has facilitated the streamlining of the Department's space policy and acquisition decision-making processes:

"... consolidation of space responsibilities within OSD has facilitated the streamlining of the Department's space policy and acquisition decision-making processes"

New Space Organizations' Major Responsibilities

DUSD (Space)	Serves as principal staff assistant and advisor for space matters, and develops and coordinates DoD policy on space activities, with oversight of architecture and acquisition programs and resources Interfaces with other government agencies and Congress Represents SecDef at interagency deliberations and international negotiations Oversees launch and launch support, surveillance activities, communications, navigation, environmental monitoring, and all supporting R&D
DoD Space Architect	Consolidates the responsibilities for DoD space missions and system architecture development into a single organization Integrates space architectures and systems to eliminate unnecessary program "stovepiping" and achieve efficiencies in acquisition and future operations Integrates space architectures and capabilities with the Intelligence Community to support overall national security requirements
JSMB	Provides executive management of defense and intelligence space programs Reviews and approves trade-offs among requirements, programs, and resources Reviews and approves defense and intelligence space policies, architectures, and program plans Makes recommendations regarding defense and intelligence space program budget matters to the Expanded Defense Resources Board (EDRB) Establishes and integrates defense and intelligence space architectures within a single national security space architecture



a Certain space responsibilities and functions shared with the Assistant Secretary of Defense (Command, Control Communications, and Intelligence) (ASD(C3I)) and the Director, Defense Research and Engineering (DDR&E)

b Air Force Acquisition Executive

OSD Space Organizational Relationships

"... the JSMB now provides a forum for senior management to address defense and intelligence space policy, acquisition, architecture, funding, and related issues."

- The Defense Acquisition Board (DAB) structure has been augmented by a Space Overarching Integrated Product Team (OIPT). The OIPT reviews major defense space acquisition programs and makes recommendations to the DAB. Space program IPTs support the DAB and Space OIPT.
- Acquisition reform initiatives are being applied to space acquisition activities.
- While the Planning, Programming and Budgeting System (PPBS) has not been changed, space subactivity codes are to be established in the OSD Budget Review System to improve the identification and tracking of space activities. This will both improve DoD resource management and provide Congress with greater visibility into programs' funding.
- The Joint Requirements Oversight Council (JROC) now reviews and validates military intelligence requirements, after which they are relayed to the Director of Central Intelligence (DCI) for aggregation with other intelligence requirements. This will ensure that military needs will be met by the development, acquisition, operation and use of both airborne and space-based reconnaissance systems.
- Defense space program acquisition will continue via the Department's decentralized structure (per Title 10, U.S. Code). The Air Force will continue to acquire DoD multi-user space programs (unless another Service makes a better case to the Defense Acquisition Executive), and Service-unique programs will remain with their individual Services.

DoD / Intelligence Community Management Initiative

In addition to the joint reviews conducted by the Deputy Secretary of Defense and the DCI, the JSMB now provides a forum for senior management to address defense and intelligence space policy, acquisition, architecture, funding, and related issues. The JSMB is co-chaired by the USD(A&T) and Deputy DCI. Its Executive Committee includes the co-chairs, the Vice Chairman of the Joint Chiefs of Staff (VCJCS) and the Executive Director, Intelligence Community Affairs (ICA). Its full membership includes: the DoD Comptroller, Service Vice Chiefs and Marine Corps Assistant Commandant; Service Acquisition Executives (SAEs); ASD(C3I); DUSD(S); USCINCSPACE; Director, Program Analysis and Evaluation (DPA&E); Executive Director and Deputy Director for Science and Technology, CIA; Directors of National Security Agency (NSA), NRO, Defense Intelligence Agency (DIA), and National Imagery Management Agency (NIMA); Director, Bureau of Intelligence and Research, DOS; and Deputy Director for Technology, NSA. *Ex officio* members include the DoD Space Architect, NRO's Director, Plans and Analysis and National Aeronautics and Space Administration (NASA).

Space Support for the Warfighter

Space forces play an increasingly important role in prosecuting modern warfare. They provide global and battlefield surveillance, ballistic missile warning, precise navigation, secure communications, weather, and intelligence information. Space assets facilitate effective command and control and enhance the joint utilization of our land, sea, and air forces.

National Military Strategy of the United States of America, 1995; pp. 14-15

Space – A Military Frontier

During the past few years, a succession of Service and joint vision documents have extolled the increasing value of space to our national security strategy. *Joint Vision 2010* (JV2010), designed to guide Service force development efforts to support joint warfighting in the early 21st century, includes space as an operating environment on a par with land, sea and air. In turn, space capabilities will strongly contribute to the *JV2010* operational concepts of *dominant maneuver, precision engagement, full dimensional protection* and *focused logistics,* whose synergies will enable *full spectrum dominance* — the key characteristic sought for our Armed Forces in the 21st century.

In parallel, technical vision documents, such as the Air Force Scientific Advisory Board's *New World Vistas: Air and Space Power for the 21st Century,* directly examine the role of space in future operations and postulate both systems and key enabling technologies to achieve the requisite capabilities. The Air Force, in its recently published *Global Engagement: A Vision for the 21st Century Air Force,* now defines itself as an air *and* space force (italics added) to signify that space has become a fully fledged operating environment (vice simply an extension of the atmosphere) and that "in the 21st Century, the strategic instrument of choice will be air and space power."

" ... the increasing value of space to our national security strategy ..."

Space Operations Today

In 1997, despite generally shrinking defense budgets, space investment and operational accounts are holding their own, even increasing somewhat, in recognition of the growing leverage that space capabilities provide. On the operational side, USSPACECOM's mission structure has long embodied four space mission areas, each with specific operational functions. These missions and functions now contribute to the force operations of other, theater or "warfighting" commanders-in-chief (CINCs), a change from the Cold War days when USCINCSPACE responded primarily to the NCA under strategic nuclear warfare doctrine.

" ... the growing leverage that space capabilities provide."

Operational Space Missions and Functions

Space Support	Force Enhancement	Space Control	Force Application
Launch Satellite Control	Communications Navigation Environmental Monitoring Warning & Attack Assessment Reconnaissance Search and Rescue Mapping, Charting, & Geodesy (MC&G)	Space Surveillance and Battle Management / Command, Control, Communications, Computers, and Intelligence (BM/C4I) Protection Prevention Negation	Defensive Offensive

The Supporting Role of DUSD(S)

In addition to having management oversight authority over most of the programs on which USCINCSPACE relies, the DUSD(S) also acts as a catalyst to help the joint operational command bridge the gap — today and in the future — between current capabilities and the long-term visions projected by both the operational and technical communities. We do this by pursuing several high-leverage thrusts and initiatives under our charter.

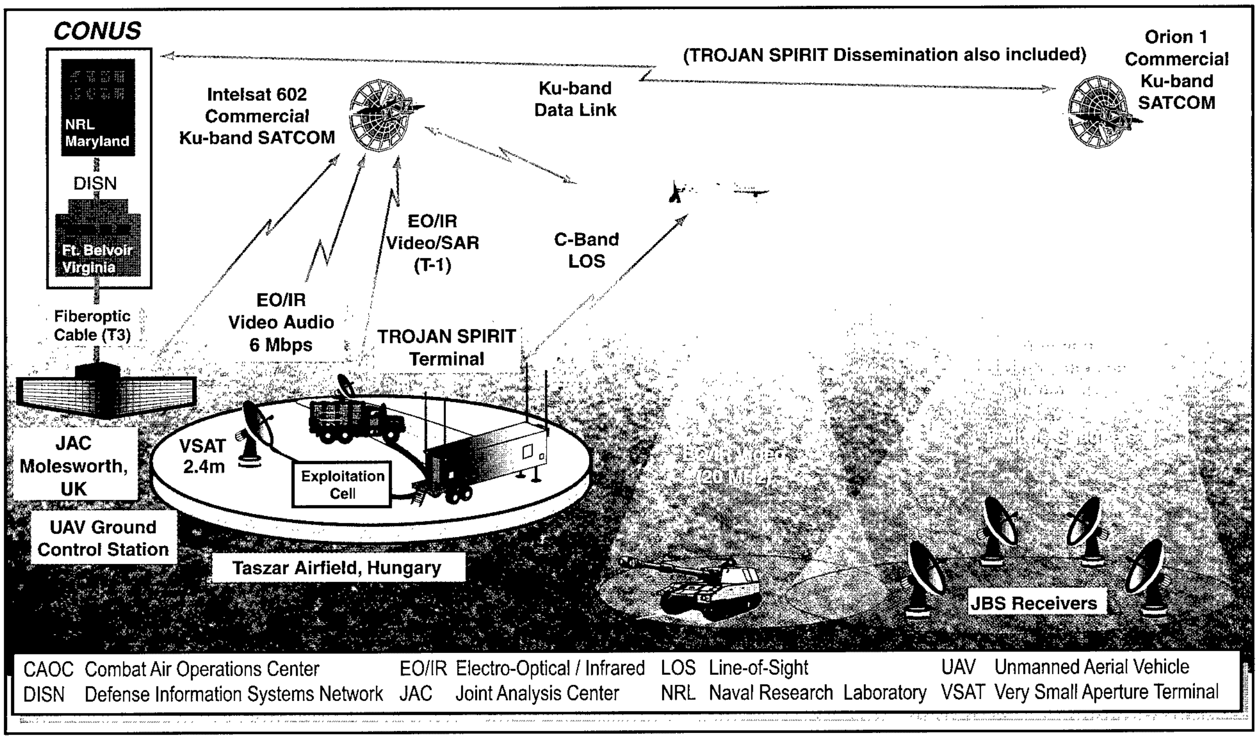
For example, under the area of Space Support we are seeking to revolutionize our launch capabilities. At present, scheduling the launch of a new satellite requires at least a 60-day lead-time. We are working for the day when a launch can be made in a matter of hours, depending on the size and complexity of the system. Accordingly, even though much of our launch and launch support funding goes to sustain our current capabilities, (comprising

"... EELV ... will greatly improve readiness and turnaround times, and hence our access to space."

eight launch vehicles or upper stage boosters and their complex launch facilities), one of our key acquisition programs is the Evolved Expendable Launch Vehicle (EELV), which will greatly improve readiness and turnaround times, and hence our access to space. Beyond that, when NASA's Reusable Launch Vehicle achieves maturity, our ease of space access would improve that much more.

Similarly, under the area of Force Enhancement, we have been working with the National Reconnaissance Office (NRO), the combined DoD-CIA spaceborne reconnaissance agency, to facilitate the cross-coordination of both classified and unclassified space products — and hence ease one of the "speed bumps" of the Persian Gulf War. We are also working with the NRO to establish processes and procedures to ensure seamless support to the warfighter, to include integrating some space support systems.

Another Force Enhancement mission, Communications, saw the employment of space links to broadcast tactical imagery in near-real-time from our forces operating over Bosnia directly to more than 15 users' desk-top receiver-display terminals in both Europe and the U.S. This network, known as the Joint Broadcast System (JBS) is a forerunner of our Global Broadcast Service (GBS); both use commercial wideband direct broadcast satellite technology. Their operational benefits are two-fold: by simultaneously networking the information to multiple users, repeat transmissions are not needed; and very high transmission rates to very small user terminals increase both the amount of information sent and the flexibility of its distribution. The GBS will become part of our Military Satellite Communications (MILSATCOM) architecture.



Joint Broadcast System (JBS) Operation

"... the employment of space links to broadcast tactical imagery ... directly to [multiple users]."

Defense-Intelligence Space Program Coordination

With the waning of the Cold War, the NRO began the process of increasing space intelligence support to the tactical warfighter. While the Persian Gulf War (of six years ago, now) revealed some shortfalls and problems, the U.S. commanders even then had more and arguably the best intelligence on opposing forces than in any previous conflict in history. The NRO led the process of breaking down organizational and procedural barriers, and moving many of its intelligence products from code word security to collateral classifications. Today, we have greatly improved cooperation in U.S. space arenas, and are continuing to improve service to both national and tactical clients.

Management interactions are also becoming more routine between defense and intelligence space organizations. The establishment of the JSMB provided a senior forum for the oversight and coordination of all national security space programs. The DUSD(S) and NRO Director meet regularly to review a broad range of program topics. And finally, DUSD(S) and DNRO jointly hosted a February 1997 offsite meeting for the principal members of the DoD and intelligence space communities.

DoD-Intelligence Space Program Interface

Interactions between DoD and intelligence space programs are taking place in a number of areas. Examples include:

- The Architectural Development Teams (ADTs) addressing the MILSATCOM, Space Control and Satellite Operations architectural studies;
- The National Space System Master Plan (NSSMP), with its initial development of "Guidestars" as top-level goals for both DoD and Intelligence Community (IC) space program planning;
- Technology coordination initiatives, where space technology interactions have included laboratory visits, project reviews, and identification of specific technology area lead responsibilities among the Services and NRO;
- The incorporation of both defense and intelligence space system launch needs into our next-generation launch system, the EELV, and support for this program by both DoD and the IC; and
- Both Defense and IC participation in various studies of future space-based capabilities, such as the future imagery architecture, systems to collect global terrain data, the recent Jeremiah Panel Review of the NRO's mission and business and security practices, as well as several special topic studies.

Civil-National Security Space Program Interface

In this even broader arena, both defense and intelligence space programs are providing support to the environmental sciences and to early warning and relief of natural disasters. Examples include:

- Joint planning by the civil, defense and intelligence space sectors for a National Space Communication System to meet their high data rate (HDR) communication needs. This system is to be on orbit in the next decade to meet both civil and scientific research and defense intelligence needs, and to do so at a significant savings over separate programs;
- IC support to environmental sciences, via participation in the Environmental Task Force/ Project MEDEA, is aiding analysis of ongoing changes in the earth to provide improved strategic warning of potentially catastrophic threats to both our own and international populations; and
- Both DoD and the IC are actively supporting disaster relief and avoidance efforts. For example, in our space-based efforts to identify and report forest fires, DoD and IC data (from a broad range of sensors) is also being shared through the Civil Applications Committee to provide warnings of potential natural disasters around the globe.

Some of these examples will be discussed further in later sections.

" ... increasing space intelligence support to the tactical warfighter."

“ Space ... is a key operating regime within the Joint Staff’s ... ISR ... functional assessment area.”

DUSD(Space): Accomplishments and Challenges

Space Functions

Space has often been referred to as “the high ground,” in the sense of giving its occupier a dominating view (and prospective control) of a potential battlefield. Today it is a key operating régime within the Joint Staff’s Intelligence, Reconnaissance and Surveillance (ISR) functional assessment area. Traditionally, it has provided a global capability for three basic military functions:

- **Sensing** — Determining what is “out there” in the arena or battlespace of interest. This is key to the operational space missions of environmental monitoring, warning and attack assessment, reconnaissance and MC&G.
- **Location** — Determining where objects of interest are, either absolutely or relatively. This both supports the sensing missions and is fundamental to the missions of navigation and search and rescue.
- **Communicating** — Telling people and systems what they need to know or do. As a mission in its own right, this function typically relays commands to forward elements and passes sensor and positioning information back to users.

To support these three functions in space, we need to get them there in the first place and then manage, support, control and exploit them once there. We do this via the following generic functions:

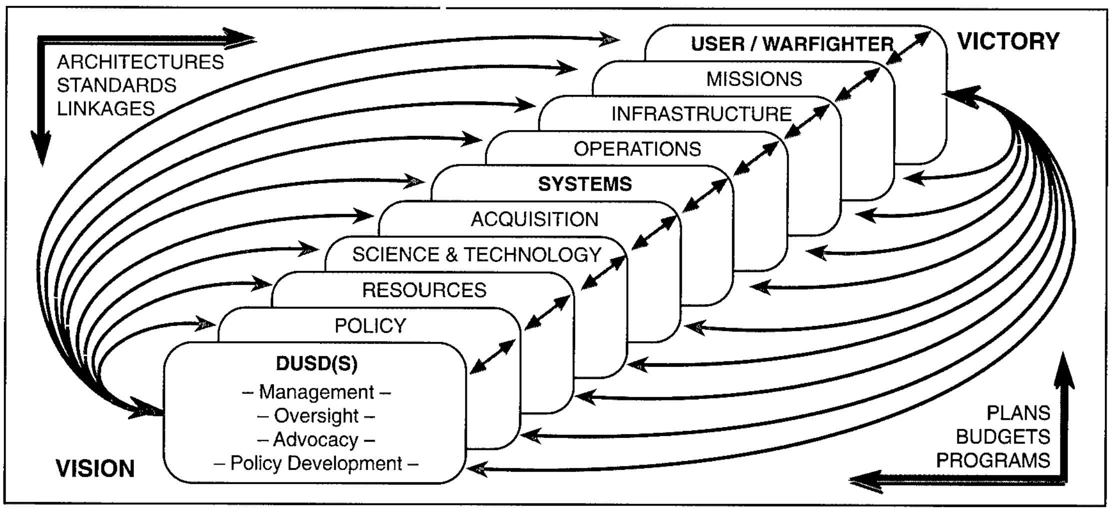
- **Launch** — To include both the vehicles themselves and the facilities that enable and support the launch process;
- **Command and Control (C2)** — The operational infrastructure that manages space assets and their involvement with the rest of the world; and
- **System Interfaces** — The architectural “connections” through which space products and services are provided to user and support systems.

“ Half our space program’s budget — and all its people — go to space systems’ surface components for ... O&S ... activities and facilities.”

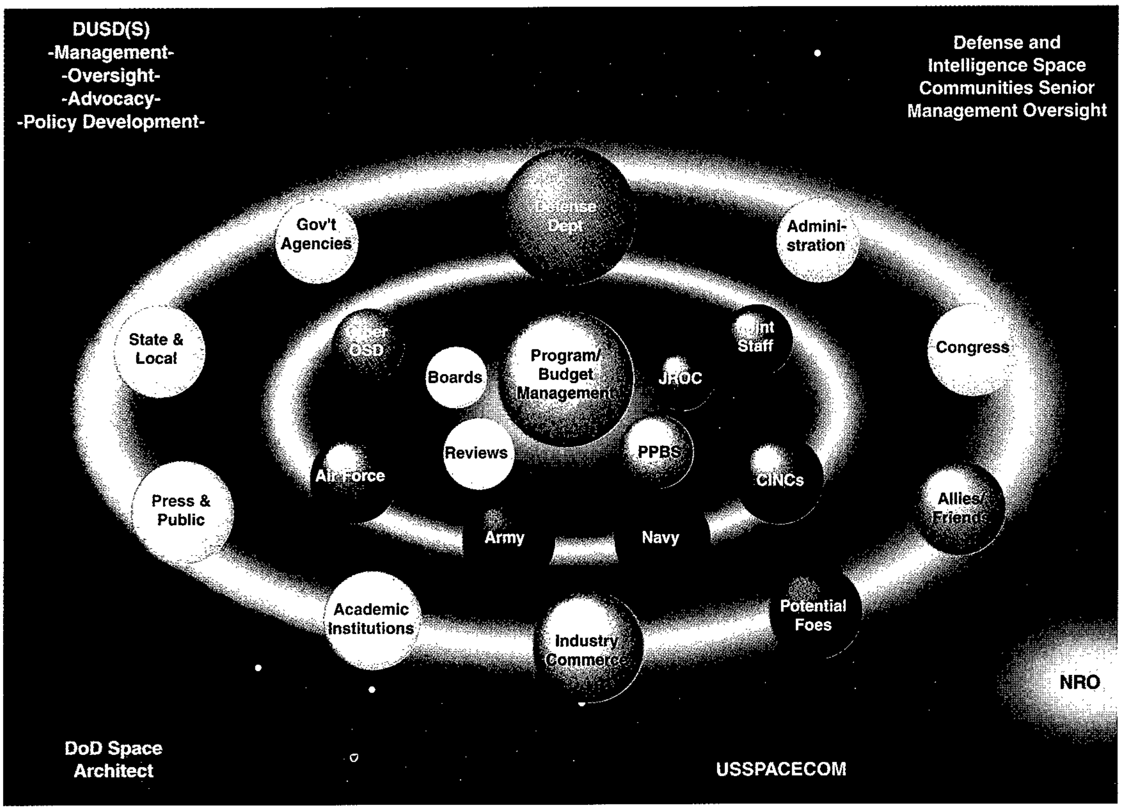
Perspectives

USSPACECOM, as operator, focuses on the operational aspects of these functions while the Services (principally the Air Force, as executing agent for most of the DoD’s space programs) provide, equip and train the forces that perform and support them. Half our space program’s budget — and all its people — go to space systems’ surface components for operations and support (O&S) activities and facilities. These operations are essential, and they are expensive.

Our perspective is both supportive and future-oriented: how to perform end-to-end space activities better and cheaper — to include determining whether they should be performed by different means or even not at all. Therefore, DUSD(S) views space systems differently from the user, or “customer,” to whom they represent capabilities in an operating environment. These differing perspectives are depicted below.



DUSD(S) and User Perspectives on Space Systems



The DUSD(S)'s Space Community

In addition, DUSD(S) is the DoD's space representative in a highly complex and dynamic interagency environment. Interdepartmental and international initiatives require significant attention. In turn, each activity offers new challenges to our space programs and how we do business. This interagency working environment is illustrated above.

The leverage and popularity of our defense space capabilities are indicated by the range of "players" represented in the graphic. For several years, government space capabilities have also been used to foster civil and commercial initiatives, particularly in communications, sensing, and use of DoD launch facilities. Commercial markets have in turn been shaping advanced technology arenas where defense needs had previously ruled. Today, the growing number of space-faring nations offers us both opportunities and challenges. The following examples illustrate the trends.

Success and Challenge #1: Commercial Use of Launch Facilities

For over a decade, the Commercial Space Launch Act and national policy have mandated DoD support for U.S. commercial space activities. As executing agent, the Air Force has done a first-class job of maintaining America's access to space — not just for national security missions, but for civil and commercial activities as well. The Air Force finalized a policy that addresses critical competition issues associated with increasing commercial use of government launch property and defines processes for use of launch ranges. Thus, like other space capabilities developed initially for national security purposes, our launch capability has become a broader national asset. Furthermore, the law requires the DoD to provide this launch support at marginal cost only; i.e., we charge commercial users only what it costs us directly to provide the launch and range support. In June of last year, we testified to this effect before the House Committee on Science's Subcommittee on Space and Aeronautics, and also noted how we were taking steps to meet the challenge presented by our (and the commercial sector's) success.

The challenge arises from the annually increasing ratio of commercial to government launches and their budgetary impacts. Specifically, commercial launches from Cape Canaveral, FL, outnumbered DoD and NASA launches starting in 1995, and they will outnumber DoD and NASA launches from

"... DUSD(S) is the DoD's space representative in a highly complex and dynamic interagency environment."

"... reimbursements for our direct operating costs do not allow for sustainment and modernization of our launch infrastructure ..."

Vandenberg AFB, CA, during 1997. We further project that commercial launch requirements (to deploy and sustain new commercial satellite constellations providing worldwide messaging, voice and data communications and remote sensing) over the next five to ten years will continue to outnumber government launches. Our dilemma is that reimbursements for our direct operating costs do not allow for sustainment and modernization of our launch infrastructure, which will continue to benefit commercial interests as much or more than its government owners. The following table projects these overhead and investment costs.

Launch Infrastructure Cost Projections

Asset	Value	Time Frame
Op'ns & Maintenance (O&M)	$30M	Annually
New Launcher Program[a]	$2,000M	Next 10 years
Facilities	$1,000M+	(Sunk cost)
Ranges (O&M + Investment)	$3,000M	Next 10 years
Services (5,300+ people)	(Not calc)	Annually

[a] Evolved Expendable Launch Vehicle (EELV) development

DUSD(S) Approach. The DoD's efforts to both fulfill its federal role and meet the launch challenges are threefold:

- We are integrating commercial requirements into the EELV and longer-term spacelift planning;
- We have provided seed money for commercial spaceports and continue to foster their development; and
- We still need to assure continued funding support for the Government's launch infrastructure.

The EELV program is aimed at reducing the cost and preparation time for launch — for both government and commercial missions. Payload, standards and launch range working groups, with participation by the commercial satellite industry as well as federal agencies, are assuring that all user needs are considered in the development of the launch vehicle, its facilities, and existing ranges. This $2 billion program will provide a family of modernized launchers with reduced operating costs.

The National Spacelift Requirements Process (NSRP) is seeking consensus among civil, commercial, defense and intelligence space sectors on common spacelift needs. Its resulting document will contain top-level requirements usable in the development or modification of any national launch system capability. Annual review of this document by the National Spacelift Requirements Council (representing DoD, DOC, NASA, and the Federal Aviation Administration's (FAA's) Office of Commercial Space Transportation) will keep it current.

The DoD (especially the Air Force) has already played a pivotal role in bringing spaceports to life as a new element of the U.S. commercial space sector. The Air Force Dual Use Space Launch Infrastructure Grant Program jump-started infrastructure development projects by providing $20 million in matching funds (on a 3:1 federal-to-industry basis) for spaceport construction projects, other commercial infrastructure projects, and related studies in FY 1993 and 1994. Several diverse spaceport projects are underway today, including projects for a variety of new small launch vehicle processing and launch facilities in California, Florida, Alaska, and New Mexico.

On the DoD side, we are examining the potential of commercially operated launch sites to help support government launch programs, especially for small payloads. In 1996, the SecDef approved the demonstration flight of a converted Minuteman II missile to evaluate the concept and costs of using them as launchers. If this initiative succeeds, commercial spaceports could provide a lower-cost alternative for small payloads.

In March 1996, we formed an Interagency Working Group to develop federal guidelines for government interaction with commercial spaceports. Participation included my office (co-chair), the Army, Navy, Air Force, Joint Staff and USSPACECOM from DoD, and the FAA (co-chair), NASA, DOC and DOS. Once in place, these guidelines will enable each federal agency to develop implementation guidelines for interacting with launch site operators and also offer a basis for joint responses to proposed changes to national policy or law.

Meanwhile, we continue to address the increasing stress of commercial activity on our own launch capabilities — especially as we are funded only for our national security activities. We are looking into the potential of fee-for-service and increased contractor participation at launch sites, so that we can recover more of our investment, and thereby achieve a more equitable sharing of launch infrastructure costs.

The loss of a GPS satellite aboard a Delta II booster this past January — the first launch failure in over a year — showed once again how dependent the space community is on ready, reliable launch for timely space access.

The bottom line is that we have a long and successful role in supporting the commercial space sector and helping it compete in the world market. For 1997 and on, we also need to restructure our government launch capability to sustain our assured access to space for defense.

Success and Challenge #2: Defense Use of Commercial Practices

For several years now, the DoD has been "changing its culture" with respect to systems acquisition. Based on both market forces and the need for acquisition reform, the Department has been expanding its use of commercial off-the-shelf (COTS) products, commercial in lieu of military specifications (MILSPECs) and standards, and adoption of commercial "best practices" in contracting and project management. We are looking more and more for commercial space solutions and partnership with industry, partly because DoD is a decreasing factor in the overall space market and partly to save defense R&D money for key military capabilities. In short, the space acquisition and support environment has evolved radically. Industry is more of an equal partner in many areas, and a leader in even some critical areas, like electronics, where the commercial market dominates. The scope of partnership exchange continues its needs to broaden:

- DoD needs to make better use of industry business practices, customer orientation and financial arrangements to maximize the value of its procurements; and
- Industry needs to be more involved in assessing requirements, performing system trades, solving cost problems, and making known its support needs.

The Services and the NRO, as program executing agents, are doing well in transitioning their business processes to incorporate more commercial products and practices. The use of joint government-industry IPTs, for example, also helps to assure that commercial and industrial factors are considered in a timely way throughout defense acquisition programs.

At the same time, specific attention must continue to be paid to those items and practices that need to retain "defense" features. Among them are specific components or capabilities relating to system survivability, security, environmentally stressed performance, and simplicity of operation and support. Rather than duplicate what industry is already doing, we should adapt commercial products where practical and focus our investment on critical national security capabilities, features, and functions.

Success and Challenge #3: Cooperation with Other Sectors

Both before and after the 1996 National Space Policy's provisions, DoD assets have supported civil agency objectives or operations. Cooperative activities have involved DOC/NOAA, NASA, DOE and DOT on a continuing basis. Both national security and civil sensors and communications links have been used for space-based observations of the earth's land, atmospheric and oceanic conditions for both government and commercial purposes.

National Polar-orbiting Operational Environmental Satellite System (NPOESS). This environmental sensing program combines the follow-on to the DoD's Defense Meteorological Satellite Program (DMSP) and the DOC's Polar-orbiting Operational Environmental Satellite (POES) under a tri-agency program office. DOC is program lead, DOC and DoD share the funding, and NASA contributes technology. NPOESS will be the nation's single source of global weather data for operational DoD and DOC use. It will provide force commanders and civilian leaders with timely, high-quality weather information for the effective employment of weapon systems and to protect national resources.

NPOESS is a Presidentially directed program; however, as it transitions from Phase 0 into Phase I, our near-term challenge is to maintain participation and the program schedule in view of likely continuation of selected agency budget and staff downsizing efforts.

" We are looking more and more for commercial space solutions and partnership with industry ..."

"NPOESS will be the nation's single source of global weather data for operational DoD and DOC use."

" With relatively inexpensive user equipment, [GPS's] accurate positioning capabilities have become a routine service for many operations."

" ... the NASA-DoD AACB investigated areas for cooperation that could achieve significant cost reductions and enhanced mission effectiveness and efficiencies."

Global Positioning System (GPS). GPS was acquired and fielded from the start as a dual-use navigation system with initially military applications. The President's March 1996 GPS Policy sees its growing role within the Global Information Infrastructure, with applications ranging from mapping and surveying to international air traffic management and global change research, all of which have fed the worldwide growth of the U.S.'s $8 billion GPS equipment and service industry. Declared fully operational in 1996, GPS's constellation of 24 satellites has been providing positioning and location information to all types and levels of user, from deployed military units during the Gulf War to elementary school classes performing science experiments today. With relatively inexpensive user equipment, its accurate positioning capabilities have become a routine service for many operations.

Domestically, our challenge is a product of our success. The GPS Policy states our intention to discontinue GPS's Selective Availability feature (designed to deny accuracy to adversaries) within ten years; beginning in 2000, the President will make an annual determination on its continued use. Meanwhile, commercial users are achieving increased accuracy by coupling ground-based beacons with GPS in a system called Differential GPS (DGPS). In addition, the promulgation of GPS standard features and specifications for continuous universal use raises the specter that enemies could use GPS capabilities for their own purposes and/or against ours.

The DoD, DOT, DOS and other agencies all have roles to play, both in managing GPS augmentations and in protecting the national interest. Our military is now planning to use a stronger, more jam-resistant GPS signal (called the Precision Code) to drown out competing GPS signals and counter enemy exploitation attempts on the battlefield.

Aeronautics and Astronautics Coordinating Board (AACB). From June 1995 through May 1996, the NASA-DoD AACB investigated areas for cooperation that could achieve significant cost reductions and enhanced mission effectiveness and efficiencies. The seven IPTs and their areas of investigation included:

- **Technology and Laboratories** — Four technology areas: fixed- and rotary-wing aeronautics, spacecraft, and space transportation;
- **Space launch activities** — Space Shuttle, Expendable Launch Vehicle, range and launch base cooperation, Reusable Launch Vehicle, and Evolved Expendable Launch Vehicle;
- **Satellite TT&C** — Shared use of ground stations, Tracking and Data Relay Satellite System (TDRSS) support of DoD and NOAA spacecraft, DoD operation of TDRSS and other NASA satellites, and standardized TT&C;
- **Base/Center Support and Services** — Additional cooperation and sharing opportunities at collocated and nearby facilities (plus 24 initiatives for NASA center directors and DoD base commanders);
- **Major Facilities** — Cost reduction and increased cooperation via management agreements and facility alliances;
- **Interagency Agreements** — Process improvement, with specific dispositions of 679 existing agreements; and
- **Personnel Exchange** — Expansion of the program, with responsibility to be given to functional managers.

Each IPT presented its recommendations at the AACB's 99th meeting, in April 1996. The key fact is that savings and efficiencies are in addition to those identified over previous years.

Success and Challenge #4: International Space Cooperation

Our international space interests are:

- **Military** — If future military operations will use allied or coalition combined forces, it is imperative that we all be able to communicate and operate effectively;
- **Civil** — Government-to-government activities among space-faring nations need to be based on common processes and standards; and
- **Commercial** — Whether space products and services will be developed and provided cooperatively or competitively, we need to assure fair and economical policies and practices where possible.

GPS Operations

Communications. As communications are a key to the effective operations of joint and multinational forces, for the past several years, the DoD has called for international cooperation in military space programs. The next-generation military satellite communications system (MILSATCOM) is our test case for cooperation to attain military interoperability.

At present, our French, German and British allies are planning to pursue an all-European option called TriMilSatCom — a four-satellite system with geostationary orbits whose space and ground components are estimated to cost $2.6 billion. The U.S. could then find itself in the position of having to invest in a national system to assure that its own military and civil requirements are met. While both U.S. and European governments are encouraging cost savings by acquiring each other's commercial subsystems, the opportunity for four-way cost savings via acquisition of a common system may be decreasing. At the same time, it would be mutually beneficial if we can participate in each other's programs in specific areas of expertise to avoid duplicating existing capabilities.

"The next generation ... MILSATCOM ... is our test case for cooperation to attain military interoperability."

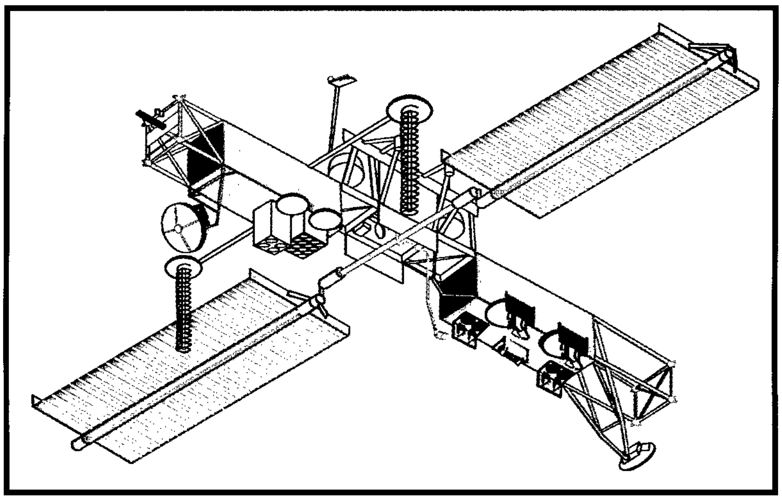
GPS. In accordance with the GPS Policy's international goals, the U.S. will:

- Continue to provide the GPS Standard Positioning Service for peaceful civil, commercial and scientific use on a continuous, worldwide basis, free of direct user fees;
- Cooperate with other governments and international organizations to ensure an appropriate balance between the requirements of international civil, commercial and scientific users and international security interests; and
- Advocate the acceptance of GPS and U.S. Government augmentations to it as standards for international use.

Accordingly, the DoD is directed to:

- Maintain the Standard Positioning Service (SPS) for general users worldwide and the Precise Positioning Service (PPS) for the U.S. military and other authorized users;
- With the DCI, DOS and others, assess national security implications of these uses of GPS and other positioning-navigation satellite systems; and
- Prevent hostile use of GPS to ensure retention of the U.S.'s military advantage, without unduly affecting civilian uses.

Our domestic program initiatives will also support our international objectives.



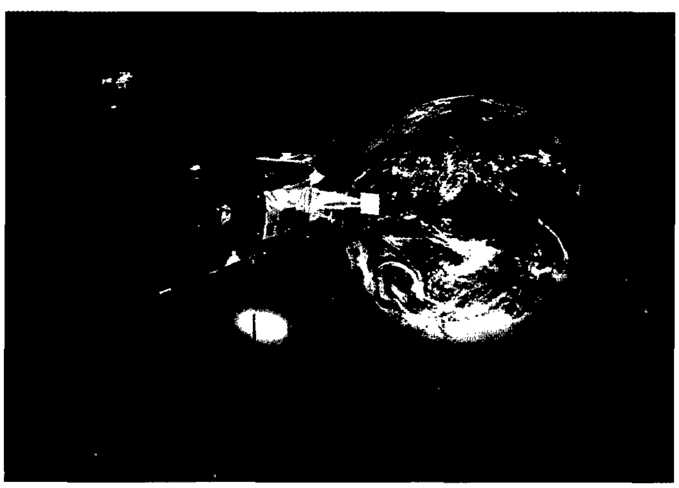
U.S. Milstar II

"Our current challenge is ... to encourage as much commonality and interoperability as our community of nations can attain."

We, like our allies, want to foster economic advantages for our industry, but not at the expense of major military benefits for all four nations (and other allies) as a whole. Our current challenge is to continue working in the international arena to encourage as much commonality and interoperability as our community of nations can attain.

Space-Based Infrared System (SBIRS). Another goal we share with our allies for future coalition operations is accurate and timely warning of enemy missile launches. SBIRS is designed to replace DSP, which provided Scud launch warnings during the Gulf War, with a dual scanning and staring sensor configuration expected to improve on DSP's sensitivity and response time by at least an order of magnitude. Last year, the Air Force let contracts to develop the ground, high and low components of the SBIRS program, and will contract in FY 1999 to build its low earth orbit (LEO) component, the Space and Missile Tracking System (SMTS).

Meanwhile, we have already offered our NATO allies access to missile warning data. For joint and coalition operations, it is highly desirable that all forces benefit from timely missile warning.



SBIRS Program

"Defense space systems must be designed to operate in a higher threat radiation environment ... than commercial space systems."

Success and Challenge #5: Radiation Hardening (Rad Hard) for Future Systems

One of the inherently government functions in military systems acquisition is to ensure the availability, reliability and survivability of the fielded system. Defense space systems must be designed to operate in a higher threat radiation environment and have a higher degree of reliability and survivability than commercial space systems. As the commercial market is now the "driver" of both product design and manufacturing process decisions, DoD must determine if there are and will be sufficient capabilities to meet national security space systems' long-term needs for rad-hard microelectronics. Rad-hard electronics also help reduce space systems' weight and power requirements.

Although near-term industrial capability is not endangered, rad-hard technology advances and production infrastructure have declined significantly in the past several years, due to an insufficient business and investment base for existing suppliers. Moreover, rad-hardening becomes more difficult with each new generation of microelectronics technology, and a significant knowledge-skill base is needed to meet the mix of "soft" and "hard" requirements for different systems' components.

We recommend a combination of:

- Restored funding invested equally in rad-hard science and technology (S&T) and manufacturing producibility;
- Coordinated oversight by DoD and other government users; and
- Collaboration with industry to explore procurement approaches that would stabilize supply and demand, and thus leverage the commercial space market — which could also benefit from rad-hard components' reducing effects on systems' weight and power needs.

Summary

From the above selected examples, our DoD space programs, operations and initiatives are increasingly intertwined with commercial factors in the worldwide marketplace, civil agency programs and operations at home, and the policies and interests of other countries abroad — whether they are our allies or potential foes. Many hard choices and difficult processes lie ahead, but we need to be pro-active rather than reactive, both in enhancing cooperation where possible and in meeting the competition where necessary.

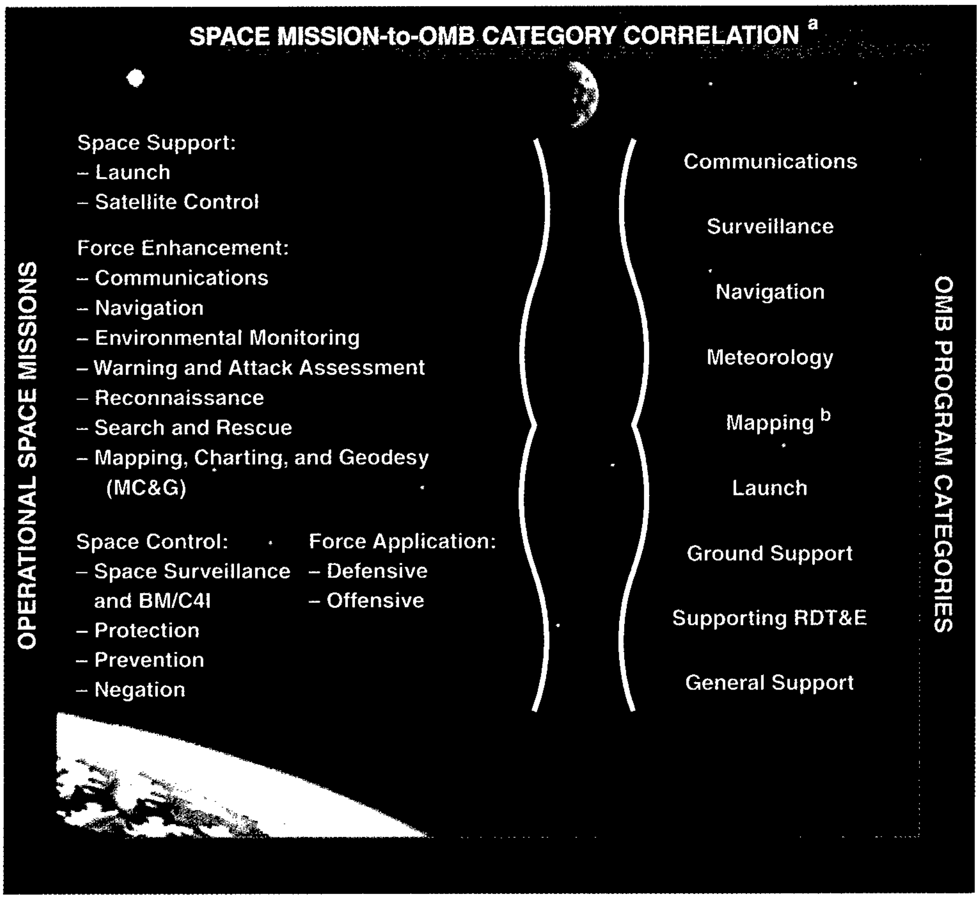
Correlation of Space Missions to Programs

Space Justification Book (SJB)

The reference document for DoD space programs will be the ODUSD(S)'s Space Justification Book (SJB), being developed for the first time this year. That document will contain detailed programmatic and budgetary information, up to the SECRET level, on space-related programs grouped under eight Office of Management and Budget (OMB) program/budget categories. A ninth category, Mapping, currently has no DoD funding. (Two additional categories, Intelligence and Missile Defense, are managed by other government agencies.) There is no explicit cross-walk between operational missions and specific DoD programs as several mission objectives are or will be met by multiple and/or non-DoD space programs, both domestic and foreign, and other mission objectives do not yet have programs in place to achieve them.

The summary figure below and the more detailed figure on the next page illustrate the mission-program correlation followed.

"The following seven sections summarize selected programs ... more detailed data will be available in the SJB itself."



[a] Two additional OMB categories, **Intelligence** and **Missile Defense**, have space aspects of interest to DUSD(S), but are managed by other Government agencies.

[b] **Mapping** currently has no DoD-funded programs.

Introduction to Program Areas

This document complements the SJB by addressing, at the UNCLASSIFIED level, a few of the key DoD programs and functional areas whose issues and initiatives currently require focused management and planning at the Departmental level. The preceding sections have discussed the major organization, policy and activities that are driving the management of defense space. The following seven sections summarize selected programs and the information that supports those discussions; more detailed data will be available in the SJB itself.

The programmatic information that follows is derived from the President's Budget for FY 1998 – 2003, and all funding is in current (i.e., then-year) dollars.

Overview of the DoD's

The DoD's Space Budget for FY 1998 –

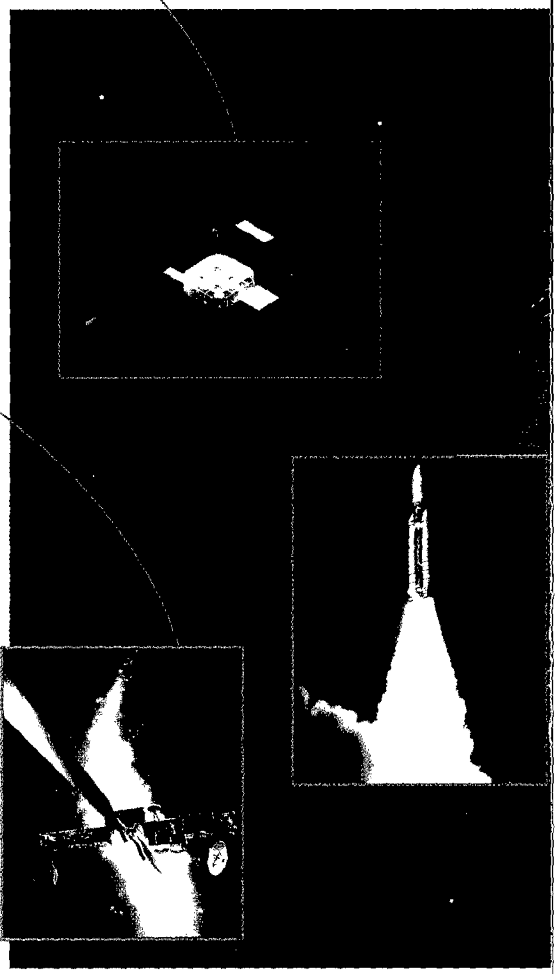
The DoD Space Budget

COMMUNICATIONS

COMMUNICATIONS	Space Segment	Ground Segment
UHF	– **UHF Follow-on (UFO)** — Satellite Communications (*) – Fleet Satellite Communications (FLTSATCOM) — Satellite Communications (*)	– SATCOM Ground Environment (*) — Army Spitfire (former EMUT) — Army Mini-DAMA Terminals – UHF Satellite Communications — Air Force Miniature Air Terminals – SATCOM Ship Terminals, SATCOM Shore Terminals, Spares–SATCOM Ship and Shore (*) — Navy UHF Satellite Communications
SHF	– Defense Satellite Communications System (DSCS) — DSCS Service Life Extension Program (SLEP)	– SATCOM Ground Environment (*) — Army SHF Terminals — Army SHF Tri-band Advanced Range-extension Tactical terminal (STAR-T) — Army Terminal Upgrade and Replacement – SATCOM Ship Terminals, SATCOM Shore Terminals, Spares–SATCOM Ship and Shore (*) — Navy SHF Satellite Communications – Satellite Communications Terminals — Air Force SHF Terminals – Long Haul Communications (*) — DISA Standard Tactical Entry Point (STEP)
EHF	– **Milstar LDR/MDR Satellite Communications** – Polar Adjunct	– SATCOM Ground Environment (*) — Secure Mobile Anti-jam Reliable Tactical Terminal (SMART-T) — Single Channel Anti-jam Man-Portable (SCAMP) terminal – EHF Satellite Communications — Navy EHF SATCOM Program (NESP) – Milstar Terminals — Air Force Command Post Terminals — Air Force Launch Control Center Terminal (LCCT) — Automated Communications Mgt System (ACMS) – Joint Terminal Program Office (JTPO)
Commercial		– SATCOM Ship Terminals, SATCOM Shore Terminals, Spares–SATCOM Ship and Shore (*) — Challenge Athena – Long Haul Communications (*) — Mobile Satellite Services (MSS) (with Iridium) — Commercial Satellite Comms Initiative (CSCI) – TROJAN SPIRIT – Support to National Communications System — Enhanced Satellite Capability
Future	- **Military** – Advanced MILSATCOM — Advanced EHF — Future SHF System - **Commercial** – Global Broadcast Service (GBS)	

Defense Support Program (DSP)
- DSP

Space Based Infrared System (SBIRS)
- **Space-Based IR Architecture – Dem/Val**
  - Improved Space Based TW/AA System
- **Space-Based IR Architecture – EMD**



(*)	Part of a Program	DISA	Defense Information Systems Agency	LDR	Low Data Rate
AFSCN	Air Force Satellite Control Network	EHF	Extremely High Frequency	MCM	Mine Countermeasures
C3	Command, Control, and Communications	EMD	Engineering and Manufacturing Development	MDR	Medium Data Rate
DAMA	Demand Assigned Multiple Access	EMUT	Enhanced Manpack UHF Terminal	NCMC	NORAD Cheyenne Mountain Complex

Space Program Structure

2003 has eight space functional areas

funds these Programs

SURVEILLANCE

Warning & Assessment Systems
- NCMC – TW/AA Systems
- TW/AA Interface Network
- Ballistic Missile Attack Assessment System
- Ballistic Missile Early Warning System (BMEWS)
- SLBM Radar Warning Systems
- Space Defense Interface Network
- NCMC – Space Defense Systems

Space Activities
- Defense Reconnaissance Support Activities
- Space Activities
- Spares – Space Activities

Other Surveillance Systems
- Nuclear Detonation (NUDET) Detection System
- Tactical Event System
- Navy Space Surveillance
- Spacetrack
  - Air Force Maui Optical Station (AMOS)

NAVIGATION

NAVSTAR Global Positioning System (GPS)
- **NAVSTAR GPS**
- **NAVSTAR GPS Block IIF**
- NAVSTAR GPS User Equipment

METEOROLOGY

- Defense Meteorological Satellite Program (DMSP)
- **National Polar-orbiting Operational Environmental Satellite System (NPOESS)**

LAUNCH

- **Titan Space Launch Vehicles**
- **Evolved Expendable Launch Vehicle (EELV)**
- Medium Launch Vehicles
- Upper Stage Space Vehicles
- Rocket Systems Launch Program (RSLP)
- Space Test Program
- Space Shuttle Operations

GROUND SUPPORT

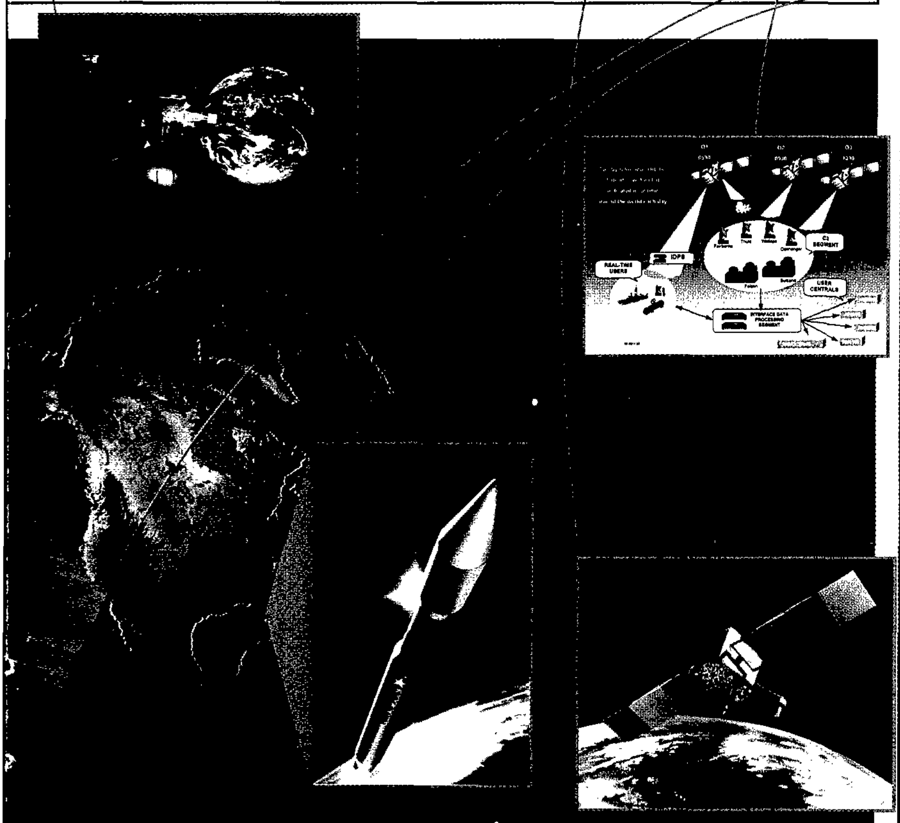
- *Launch Facilities*
  - Western Space Launch Facility
  - Eastern Space Launch Facility
- *Other Ground Support*
  - Satellite Control Network
    - AFSCN Operations
  - Navy Space Operations Center (NAVSOC)
  - Space Test Center / Range Consolidated Facilities
  - Kwajalein Missile Range

SUPPORTING RDT&E

- Advanced Spacecraft Technology
- Hypersonic Technology (HyTech) Program
- Space and Missile Rocket Propulsion
- MightySat
- Kinetic Energy Anti-Satellite (KE ASAT)
- *Other Supporting RDT&E*
  - Space Systems Environmental Interactions
  - Advanced Weapons Technology
  - Materials, Electronics and Computer Technologies
  - MCM, Mines, and Special Warfare
  - C3 Advanced Technology
  - Space and Electronic Warfare C3 Technology

GENERAL SUPPORT

- Operational Headquarters – Defensive
- Training – Defensive
- U.S. Space Command Activities
- Management Headquarters (U.S. Space Command)
- Space Warfare Center (SWC)
- Aerospace Rescue and Recovery
- DoD Space Architect
- Test and Evaluation (T&E) Support
- Undergraduate Space Training
- Naval Space Command
- Army Space Activities



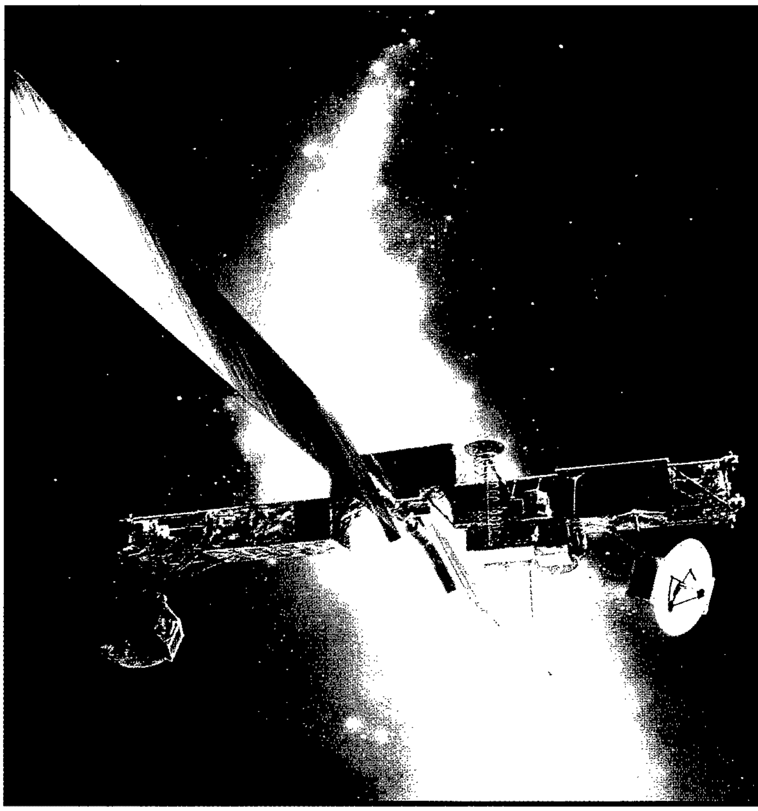
Seven space programs
are summarized in the following pages.
They represent just a few of the space systems
that will continue to revolutionize U.S. capabilities,
during peace and war, for the 21st Century

NORAD	North American Aerospace Defense Command	SLBM	Submarine-Launched Ballistic Missile
RDT&E	Research, Development, Test, and Evaluation	TW / AA	Tactical Warning / Attack Assessment
SATCOM	Satellite Communications	UHF	Ultra High Frequency
SHF	Super High Frequency		

Milstar I / II Satellites

Mission Description:

Milstar is the extremely high frequency (EHF) component of the DoD's Military Satellite Communications (MILSATCOM) program area and provides world-wide links to strategic and tactical warfighters. It is a joint-Service program to acquire satellites, their mission control segment, and Army, Navy and Air Force terminals to enable survivable, world-wide and secure communications in all levels of conflict. Milstar's dedicated EHF allows strategic users to be offloaded from DSCS satellites, thereby permitting greater tactical use of those SHF satellites.



System Characteristics

Constellation:
4 satellites on orbit

Orbit Altitude:
36,000 km (22,300 mi)

Satellite Mass:
≈4,536 kg (≈10,000 lb)

Power Plant:
Solar panels (5,000 w)

Dimensions:
Length: 15.5 m (51 ft)
Solar array: 42.3 m (116 ft)

EHF/SHF Services:
EHF: 44.5 GHz uplink
SHF: 20.7 GHz downlink

Connectivity:
24 hr/day, 65° S - 65° N
Two satellite cross links
(one in each direction, East and West)

Rate:
LDR: 75 – 2,400 bps
MDR: 4.8 kbps – 1.544 Mbps

Key Program Factors:

- The Milstar system provides key bandwidth and capacity improvements to meet the expanding communication connectivity and data transfer requirements of operational users, especially during the deployment, maneuver and engagement phases of military operations
- The capability to provide protected (anti-jam) and survivable (anti-scintillation) communication service is unique to a military system; there is no commercially available equivalent
- Operational survivability and reliability needs are met by a combination of satellite orbital altitude, and system-wide hardening, jam-resistance and security measures
- Acquisition Service and Category: Air Force, ACAT-1D
- All Milstar satellites will have 192 low-data-rate (LDR) channels; a medium-data-rate (MDR) payload supporting 32 channels will be added to satellite #3 before launch, and built into Milstar II satellites (#4, #5 and #6).

Providing Protected and Survivable Communications

Schedule Highlights

Milestone/Event: FY:	1997	1998	1999	00	01	02	03	04	05	06	07	08	09
• Milstar I IOC (Satellites #1 and #2)	X												
• Milstar II Satellite #3M Launch			X										
• Satellite #4, #5, #6 Launches				X	X	X							
• MDR Initial Op'l Test & Eval (IOT&E)				X									
• Milstar II IOC					X								
• Milstar FOC									X				

Funding Summary

Resource Category	Pgm Elem	FY95 & P	FY96	FY97	FY98	FY99	FY00 - 03
• RDT&E (AF)	0604479F	6,382.8	533.6	683.7	676.7	555.1	667.3
Totals:		6,382.8	533.6	683.7	676.7	555.1	667.3

Current Activities and Plans

FY96	FY97	FY98	FY99
• Milstar I: – #1 on orbit – Launched #2 – Phase II IOT&E • Milstar II: – MDR for #3 (#3M) – MDR, bus for #4 – LDR for #3M, #4 – LDR, MDR and bus for #5, #6	• Milstar I: – #1 and #2 on orbit – Phase II IOT&E • Milstar II: – MDR, bus, LDR for #4 – LDR, MDR and bus for #5, #6 – MDR on #3M, then satellite integration and test (I&T)	• Milstar I: – #1 and #2 on orbit – ECPs as needed • Milstar II: – Complete #3M I&T – LDR, MDR payload I&T of #5 – LDR, MDR payload manufacturing for #6 – Mission control system (MCS) software upgrade	• Milstar I: – #1 and #2 on orbit – ECPs as needed • Milstar II: – Launch, checkout and on-orbit testing of #3M – Complete I&T for #4 – Complete payload I&T for #5, start integration – Manufacturing for #6 – MCS software upgrade

Management

DoD	Service Staff	Major Command	Program Office
USD(A&T) Pentagon, DC	Air Force (SAF/AQS, AF/XOR, AF/SCM, AFPEO/Space), Pentagon, DC	AFSPC Peterson AFB, CO	AFMC/SMC Los Angeles AFB, CA

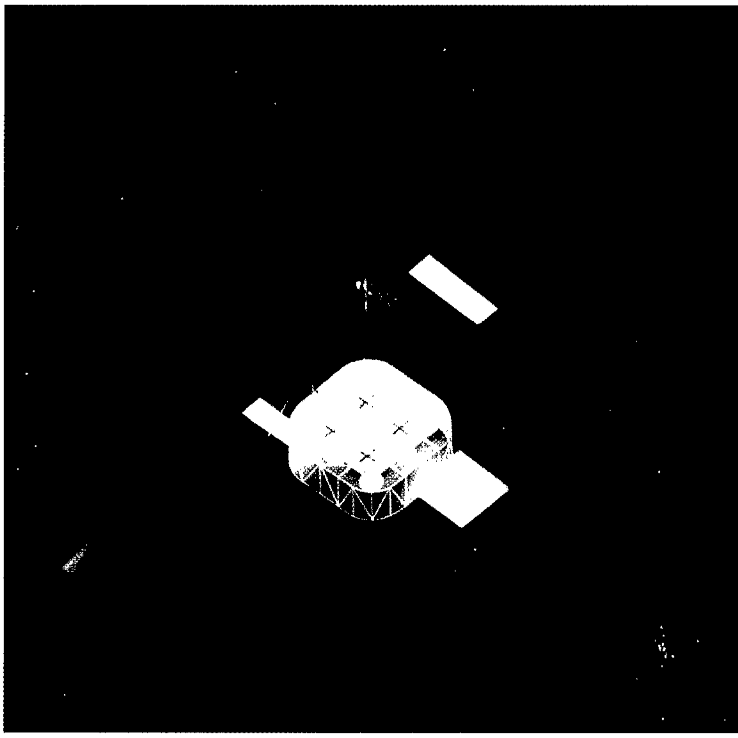
Major Contractors:

- Lockheed Martin, Sunnyvale, CA (prime); Hughes Space Systems, Los Angeles, CA; TRW Space and Missiles Group, Los Angeles, CA.

UHF Follow-On (UFO) Program

Mission Description:

UHF systems support tens of thousands of stationary and mobile users ashore and afloat. The UFO satellite system will replace the Fleet Satellite Communications (FLTSATCOM) and the Leased Satellites (LEASAT), which provide links between naval aircraft, ships, submarines and ground stations, and between strategic air headquarters and the National Command Authority (NCA) network. UFO will improve UHF protection against electronic threats and provide an interim Global Broadcast Service (GBS) capability via onboard GBS transmitters on satellites F8 – F10.



System Characteristics

Constellation:
8 satellites on orbit (+ 1 spare)

Orbit Altitude:
36,000 km (22,250 mi)

Satellite Mass:
1,542 kg (3,400 lb)

Power Plant:
Solar panels (2,400 w)

Dimensions:
Length (total): 18.6 m (60 ft)
Solar array width: 2.9 m (9.5 ft)

Communications Payloads:

UHF:	18 25-kHz	(F1-F10)
	21 5-kHz	(F1-F10)
EHF:	11 LDR	(F4-F6)
	20 LDR	(F7-F10)
GBS:	4 24-Mbps Ku-band	(F8-F10)

Mission Life: 10 yrs (mean)
Design Life: 14 yrs

Key Program Factors:

- Provides ship-to-shore, fleet broadcast and other priority UHF communications links for tactical users, low-intensity conflict (LIC), and special operations; maintains DoD's world-wide UHF communications capability; ensures interoperability with most existing UHF terminals; provides secure and jam-resistant telemetry, tracking and command (TT&C) functions; provides jam-resistant uplinks (fleet broadcast); electromagnetic pulse (EMP) -protected. Will support 10,000+ manpack, ship, airborne, and mobile and fixed ground UHF terminals
- Acquisition Service and Category: Navy, ACAT-1C
- Initial Operational Capabilities (IOCs): UHF in 1Q/FY 1994; EHF in 3Q/FY 1995
- Satellites F4 – F10 also carry a Milstar-compatible EHF package with enhanced anti-jam and command, broadcast and interconnectivity communication capabilities
- Network Control: Demand Assigned Multiple Access (DAMA) controllers will maximize use of 5- and 25-kHz channels to meet user needs.

Enabling Dominant Maneuver and Information Superiority

Schedule Highlights

Milestone/Event: FY:	1997	1998	1999	00	01	02	03	04	05	06	07	08	09
• UFO 6 Launched (22 Oct 95)													
• UFO 7 Launched (25 Jul 96)													
• UFO 8 Launch		X											
• UFO 9 Launch		X											
• UFO 10 Launch			X										
• UFO Full Operational Capability (FOC)			X	– –	– –	– –	– –	– –	– –	– –	– –	– –	– ►

Funding Summary

Resource Category	Pgm Elem	FY95 & P	FY96	FY97	FY98	FY99	FY00 - 03
• Procurement (WP, N)	0303109N	1,667.9	87.8	110.6			
• Procurement (WP, N)	0303109N		*	0.1	0.1	0.1	0.1
*Less than $0.05M **Totals:**		1,667.9	87.8	110.7	0.1	0.1	0.1

Current Activities and Plans

FY96	FY97	FY98	FY99
• UFO 6 launched (22 Oct 95) • UFO 7 launched (25 Jul 96) • Continue technical support for F8-F10 production	• Integrate GBS payload onto F8-F10 • GBS system test on F8 • Deliver F8	• GBS system test on F9-F10 • Deliver F9-F10 • GBS IOC 3Q/FY98	• FOC UHF/EHF payloads

Management

DoD	Service Staff	Major Command	Program Office
USD(A&T) Pentagon, DC	Navy (OPNAV-N63) Pentagon, DC	NAVSPACECOM Dahlgren, VA	PEO (SCS) / PMW-146 Arlington, VA

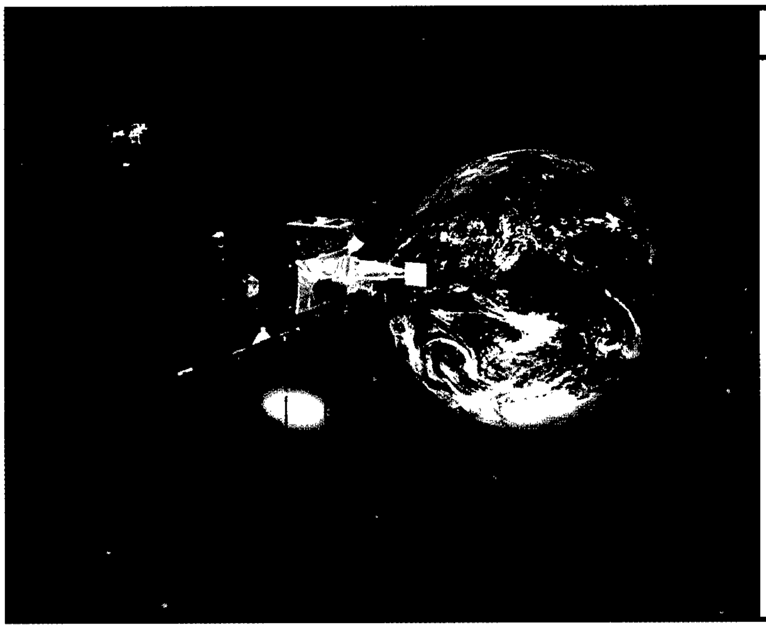
Major Contractors:

► Hughes Space and Communications Company, Los Angeles, CA.

Space-Based Infrared System (SBIRS) Program

Mission Description:

SBIRS will replace the Defense Support Program (DSP) as the U.S.'s primary initial warning system of a ballistic missile attack on the U.S., its deployed forces, or its allies. The SBIRS High component (with highly elliptical and geosynchronous orbiting satellites) and SBIRS Low component (with low-orbiting satellites) will provide global below- and above-the-horizon detection, tracking and discrimination of missiles in their boost, post-boost, midcourse and reentry phases of flight. An integrated, centralized ground station will serve all SBIRS space elements (as well as DSP satellites). SBIRS will provide the key advanced surveillance and warning capability needed to support both theater and national ballistic missile defenses (BMD) in the 21st century.



System Characteristics

Orbit Characteristics:
Geosynchronous orbits(GEO)
Highly elliptical orbits (HEO)
Low earth orbits (LEO)

Constellation:
GEO: 4 satellites on orbit (+ 1 spare)
HEO: 2 satellites
LEO: [TBD]

Launch System:
Compatibility with Medium Launch Vehicles (MLV) (contractual requirement)

Other Characteristics
[TBD]

Key Program Factors:

- SBIRS High is in the Engineering and Manufacturing Development (EMD) acquisition phase. After a two-contract pre-EMD competition, a single contractor was selected in November 1996
- SBIRS Low is in the Program Definition/Risk Reduction (PDRR) phase. Two Flight Demonstration System (FDS) satellites and a Low Altitude Demonstration System (LADS) satellite are to be launched in FY 1999. EMD is to begin in FY 2001
- Acquisition Service and Category: Air Force, ACAT-1D
- The SBIRS program is a lead program for acquisition streamlining. One document, the Single Acquisition and Management Plan (SAMP), has replaced the traditional acquisition documents
- Two additional activities are funded under SBIRS: Cobra Brass (under development by Sandia National Lab), and the Miniature Sensor Technology Integration (MSTI) program to provide phenomenology data for the full system. Additionally, these programs will provide insight into future Technical Intelligence (TI) and capabilities for Battlespace Characterization
- Per Congressional direction to accelerate SBIRS Low, DoD has funded an FY 2004 deployment.

Advanced Multi-Mission Space-Based Sensor System

Schedule Highlights

Milestone/Event: FY:	1997	1998	1999	00	01	02	03	04	05	06	07	08	09
• EMD Authority to Proceed (ATP)	X												
• SBIRS Low FDS Launch			X										
• SBIRS Low LADS Launch			X										
• Consolidated Ground IOC (Increment I)			X										
• First HEO Delivery					X								
• First GEO Launch						X							

Funding Summary

Resource Category	Pgm Elem	FY95 & P	FY96	FY97	FY98	FY99	FY00 - 03
• RDT&E (AF), SBIRS Low – Dem/Val	0603441F	≥115.4	249.4	237.5	222.4	126.5	188.9
• RDT&E (AF), SBIRS High & Low – EMD	0604441F	≥113.0	165.2	189.6	338.4	580.3	3,054.0
• Procurement (MP, F)	0305915F						554.0
• MilCon (AF)	0305915F			14.5	14.0		
• Operations (AF)	0305915F				14.8	18.1	75.2
Totals:		≥228.4	414.6	441.6	589.6	724.9	3,872.1

Current Activities and Plans

FY96	FY97	FY98	FY99
• SBIRS Low FDS development (satellites & ground) – Add Long Wave IR • Pre-EMD contracts (space and ground) • Technology projects • Low Altitude Demonstration System (LADS)	• SBIRS Low FDS development • LADS • Technologies • EMD contracts (space and ground segments) • Transfer PE 0603441F to PE 064441F	• SBIRS Low FDS development • LADS • Technologies • EMD activities (space and ground segments)	• SBIRS Low FDS development • LADS • Technologies • Targets • EMD activities (space and ground segments)

Management

DoD	Service Staff	Major Command	Program Office
USD(A&T) Pentagon, DC	Air Force (SAF/AQS, AFPEO/Space) Pentagon, DC	AFSPC Peterson AFB, CO	AFMC/SMC Los Angeles AFB, CA

Major Contractors:

- TRW, Redondo Beach, CA (SBIRS Low Dem/Val FDS); Boeing North America, Downey, CA (SBIRS LADS); Lockheed Martin/Loral/Aerojet team (SBIRS High EMD).

Global Positioning System (GPS): Space and Control Program

Mission Description:

The GPS is a space-based radio positioning, navigation and time data distribution system that provides precise location, speed and time to an unlimited number of military and civilian users. (User equipment sets, whether integrated aboard aircraft, ships and vehicles or handheld, derive positioning and timing information from satellite-transmitted data.) The program's space and ground control segments comprise Block IIR satellite acquisition and deployment, Block IIF acquisition, segment upgrades, and system-wide R&D to support deployment. Procurement of Block IIR and Block IIF satellites will sustain the GPS constellation via progressive replacement of current Block II and IIA satellites by increased-capability and longer-lasting versions, respectively.

System Characteristics

SPACE SEGMENT:

Constellation:
24 satellites in six orbital planes

Orbit Altitude:
20,200 km (10,900 nm) circular
55° inclination, 12-hr period

Communication:
Nav data tx: 2 L-band freqs
Control data rx: S-band link

	IIA	IIR	IIF
Mass:	844 kg (1,860 lb)	1,075 kg (2,370 lb)	2,136 kg (4,710 lb)
Power:	700 w	1,136 w	1,510 w
Span:	5.3 m (17.5 ft)	11.6 m (38 ft)	17.4 m (57 ft)
Life:	7.5 yrs	7.5 yrs	15 yrs

GROUND SEGMENT:

5 Monitor Stations (Hawaii, Kwajalein, Ascension Island, Diego Garcia, Colorado Springs)

4 Ground Antennas (Ascension, Kwajalein, Diego Garcia, Colorado)

1 Master Control Station (Falcon AFB, CO)

Key Program Factors:

- DoD's responsibility is to acquire, operate and maintain GPS for national security, civil and international use, to include maintaining Standard and Precise Positioning Services (SPS and PPS) and developing measures to retain military advantage without disrupting civil services
- The space and control segment acquisitions are key upgrades to the operational GPS system
- Acquisition Service and Category: Air Force, ACAT-1C
- Block II/IIA program: 28 satellites procured and launched. Block IIR program: 21 satellites procured; first spacecraft lost in unsuccessful Delta II launch of January 1997. Block IIF program: 33 satellites to be procured; first launch in late-2001
- GPS roles in Navigation Warfare: protection of location information for friendly forces; prevention of hostile use; and 33% improvement in sensor-to-shooter information accuracy.

Key to World-Wide Navigation and Situational Awareness

Schedule Highlights

Milestone/Event: FY:	1997	1998	1999	00	01	02	03	04	05	06	07	08	09
GPS Operational (Block II / IIA Satellites)	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	▶
• Block IIF System Design Review	X												
• First Block IIR Satellite Launch	X												
• Block IIF Final Design Review		X											
• Integrate Satellite / Control Contracts				X									
• First Block IIF Satellite Launch						X							

Funding Summary

Resource Category	Pgm Elem	FY95 & P	FY96	FY97	FY98	FY99	FY00 - 03
• RDT&E (AF), Space/Ground Segments	0305165F	1,277.3	25.3	40.4	26.7	21.6	40.0
• RDT&E (AF), Block IIF	0604480F	[N/A]	18.5	35.4	71.1	67.9	84.2
• Procurement (all), Space/Ground	0305165F	2,146.9	161.0	207.7	171.4	179.4	715.0
• Operations (AF), Space/Ground	0305165F	49.1	18.7	22.6	22.0	21.3	105.4
Totals:		3,473.3	223.5	306.1	291.2	290.2	944.6

Current Activities and Plans

	FY96	FY97 / FY98 / FY99
RDT&E	• Block IIF EMD system sustainment contract (satellite and ground system development, system integration)	
	• Block IIR and ground control software upgrade • Software for launch and on-orbit operations • Technical protection and prevention options	• Block IIF fully mission-capable ground control software upgrade • Simulator, upgrades, sustaining engineering, program management and support
	• Continue Operational Control Segment (OCS) contract for Consolidated Operator Support Environment (COSE), OCS Architectural Implementation, and Block IIR Full Functionality • Block IIR software	
Proc	• Procured 4 Block IIR satellites, with launch and integration (L&I) services • Started multi-year procurement (MYP) for long-lead (LL) items for Block IIF satellites, with L&I services	• Procure 3 Block IIR satellites annually, with L&I services • Continue MYP LL for 6 Block IIF satellites annually, and their L&I services
Ops	• Continuing ground support to on-orbit satellites, simulator and other training for GPS operations, and tri-Service ground and shipboard GPS support	

Management

DoD	Service Staff	Major Command	Program Office
USD(A&T) Pentagon, DC	Air Force (SAF/AQS) Pentagon, DC	AFSPC, Peterson AFB, CO ACC, Langley AFB, VA	AFMC/SMC Los Angeles AFB, CA

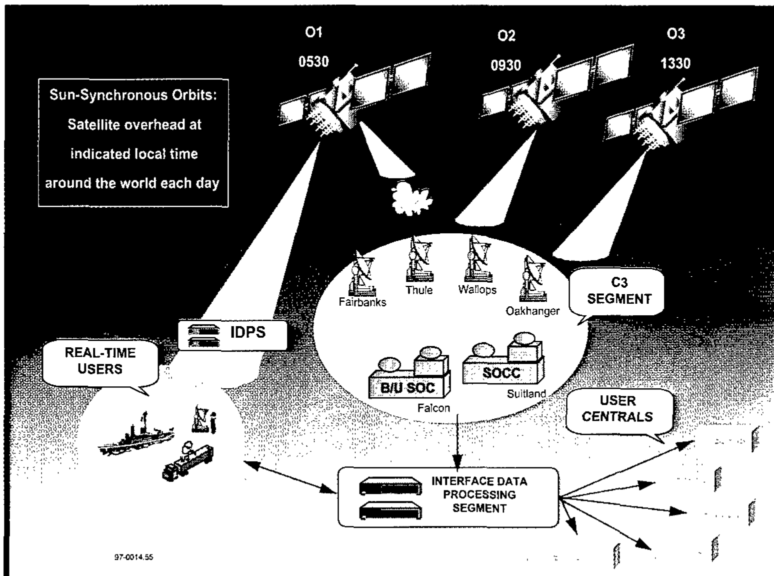
Major Contractors:

- Boeing North American, Seal Beach, CA (Block IIA); Lockheed Martin Missiles and Space, King of Prussia, PA (Block IIR); Lockheed Martin Federal Systems, Gaithersburg, MD; Boeing North America, Seal Beach, CA (Block IIF).

National Polar-orbiting Operational Environmental Satellite System (NPOESS)

Mission Description:

NPOESS is a tri-agency weather satellite program to provide timely, high-quality weather information as the nation's single source of global weather data. Per Presidential Decision Directive/National Science and Technology Council (NSTC)-2 (May 1994), the DoD, DOC and NASA are combining DoD's Defense Meteorological Satellite Program (DSMP) follow-on and DOC's Polar-orbiting Operational Environmental Satellite (POES) as NPOESS, which will both support military operations and help protect national resources. It will provide visible and infrared cloud cover imagery, and other meteorological, oceanographic and solar-geophysical information.



50 WS	50th Weather Squadron
AFGWC	Air Force Global Weather Central
FNMOC	Fleet Numerical meteorology and Oceanography Center
NAVOCEANO	Naval Oceanographic Office
NESDIS	National Environmental Satellite, Data and Information Service
SOC	Satellite Operations Center
SOCC	Satellite Operations Control Center

System Characteristics

Constellation:
3 satellites on orbit (min):
– 2 U.S., 1 European

Orbit Characteristics:
Sun-synchronous polar

Orbit Altitude:
833 km (450 nm)

Satellite Mass:
3,023 kg (6,665 lb) (notional)

Power Plant:
Flexible GaAs Solar Array

Payloads:
Multispectral visible/infrared, microwave, and space environmental

Tracking Stations:
Air Force Satellite Control Network (AFSCN) Automated Remote Tracking Stations (ARTS)
NOAA Command Data Acquisition (CDA) sites (at Wallops Island, VA, and Fairbanks, AK), and NESDIS (at Suitland, MD)

Key Program Factors:

- Presidentially directed program (Presidential Decision Directive [PDD]-2)
- Funding shared with DOC. DOC manages the program; NASA provides technology insertion
- Appropriations committee notification needed for any funding adjustments
- Acquisition Service and Category: Air Force, ACAT-1D
- Program to transition from Phase 0 to Phase I (Dem/Val) (Milestone I decision in March 1997)
- Program calls for five satellites with a first need date of 2007 to replace DOC's POES and DoD's DMSP (which is scheduled to be non-operational in late-2008)
- One of the satellites is projected to be European.

Advanced Environmental System for Global DoD and DOC Missions

Schedule Highlights

Milestone/Event: FY:	1997	1998	1999	00	01	02	03	04	05	06	07	08	09
• Milestone I	X												
• Phase I Contract Awards (Development)	X												
• Milestone II				X									
• Phase II Contract Awards (5 satellites)					X								
• First Satellite Need Date											X		
• Probable First Launch													X

Funding Summary

Resource Category	Pgm Elem	FY95 & P	FY96	FY97	FY98	FY99	FY00 - 03
• DoD / RDT&E (AF)	0603434F	7.4	17.4	27.7	51.5	113.2	933.1
• DOC*		16.0	10.5	27.7	51.5	112.6	939.1
Totals:		23.4	27.9	55.4	103.0	225.8	1,872.2

*DOC funding beyond FY98 is based on EXCOM-approved program; adjustments will be made after Milestone I

Current Activities and Plans

FY96	FY97	FY98	FY99
• Program Definition • Risk reduction • Technology development • Architecture studies (at Suitland, MD)	• Program Definition • Risk reduction • Technology development • Milestone I review • Critical sensor and algorithm development (multiple contractors)	• Program Definition • Risk reduction • Technology development • Critical sensor, algorithm development • Begin fabrication for risk-reduction flights	• Program Definition • Risk reduction • Technology development • Critical sensor development and fabrication for risk-reduction flights • Compete system definition

Management

DoD	Service Staff	Major Command	Program Office
USD(A&T) Pentagon, DC	Air Force (ASAF/Space, SAF/AQS) Pentagon, DC	AFSPC, Peterson AFB, CO ACC, Langley AFB, VA	AFMC/SMC Los Angeles AFB, CA

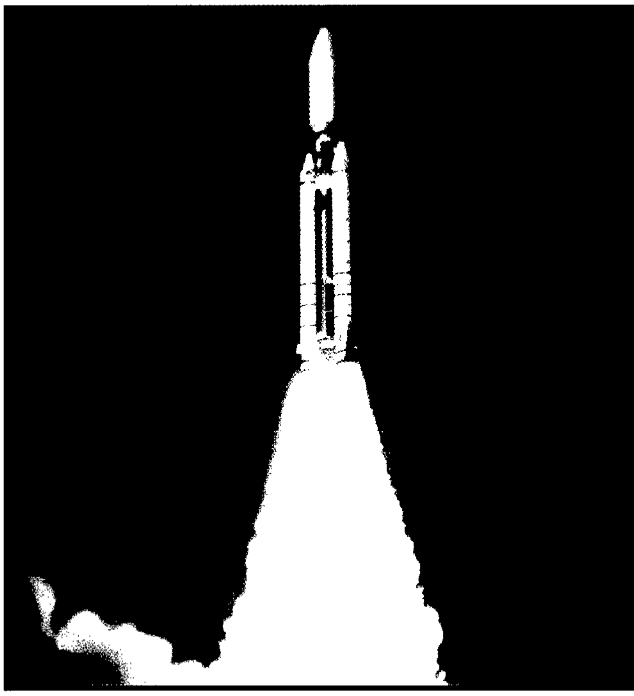
Major Contractor:

- Lockheed Martin, Sunnyvale, CA (formerly Martin-Marietta, Lockheed).

Titan Space Launch Vehicles Program

Mission Description:

National security requirements dictate a continuing, highly reliable means of placing critical DoD satellites into required orbits. The Titan IV system can launch the largest of these satellites into near-earth or geosynchronous orbits from either the east or west coast launch facilities. Titan IV has several configurations: No Upper Stage (NUS), Inertial Upper Stage (IUS), and Centaur; also the Titan IVB, with solid rocket motor upgrade (SRMU) and new avionics and ground support to meet reliability and increased performance requirements. The program is acquiring 41 Titan II and IV launch vehicles.



System Characteristics

Configurations: (Titan IVA & IVB)
NUS
IUS
Centaur

Thrust (at lift-off):
12,453 kilo-newtons (kN)
(2,800,000 lb)

Payloads:
National security
NASA missions

Reliability:
0.94 (demonstrated)

Facilities: (Space Launch Complex / SLC)
Vandenberg AFB, CA:
– Titan II - SLC-4W
Cape Canaveral Air Force Station, FL:
– Titan IV - SLC-4E
– Complex 40 & 41

Key Program Factors:

- Program provides continuing integration support to the payload community, as well as continuing engineering support to maintain system characterization and reliability
- Since 1994, the Titan IV program has also included funding for Titan II engineering costs, payload integration, and Government costs
- Acquisition Service and Category: Air Force, ACAT-1D
- A new acquisition strategy transitions from the current 41-vehicle development/ production and payload integration contracts to new contracts designed to improve cost accountability, correct contract discrepancies, and define the total effort to complete the program. This strategy combines Titan II and IV production, storage, launch pad maintenance and deactivation, launch operations, anomaly resolution, development and hardware requalification, payload integration and program studies to save costs by maximizing use of resources and eliminating duplication.

Launcher for the Nation's Highest-Priority Spacecraft

Schedule Highlights

Milestone/Event: FY:	1997	1998	1999	00	01	02	03	04	05	06	07	08	09
• Titan IVB SRMU IOC	X												
• Cassini Spacecraft (Probe to Saturn)		X											
• Titan II Launch Schedule	2	0	1	1	1	0	0	0	0				
• Titan IV Launch Schedule	4	4	2	4	3	3	1	0	1				

Funding Summary

Resource Category	Pgm Elem	FY95 & P	FY96	FY97	FY98	FY99	FY00 - 03
• RDT&E (AF)	0305144F	2,620	128.9	97.5	82.4	137.6	187.2
• Procurement	0305144F	3,734	407.2	432.2	555.3	585.3	1,310.1
• Operations (AF)	0305144F	687	74.2	73.8	79.0	76.2	331.4
Totals:		7,041	610.3	603.5	716.7	799.1	1,828.7

Current Activities and Plans

FY96	FY97	FY98	FY99
• Titan R&D programs • Integration for DSP and Milstar • Titan booster support • Production, final assembly and launch for Titan II and IV	• Titan R&D programs • Integration for DSP and Milstar • Titan booster support • Production, final assembly and launch for Titan II and IV	• Titan R&D programs • Integration for DSP and Milstar • Titan booster support • Production, final assembly and launch for Titan II and IV	• Titan R&D programs • Integration for DSP and Milstar • Titan booster support • Production, final assembly and launch for Titan II and IV

Management

DoD	Service Staff	Major Command	Program Office
USD(A&T) Pentagon, DC	Air Force (SAF/AQS, AFPEO/Space) Pentagon, DC	AFSPC Peterson AFB, CO	AFMC/SMC Los Angeles AFB, CA

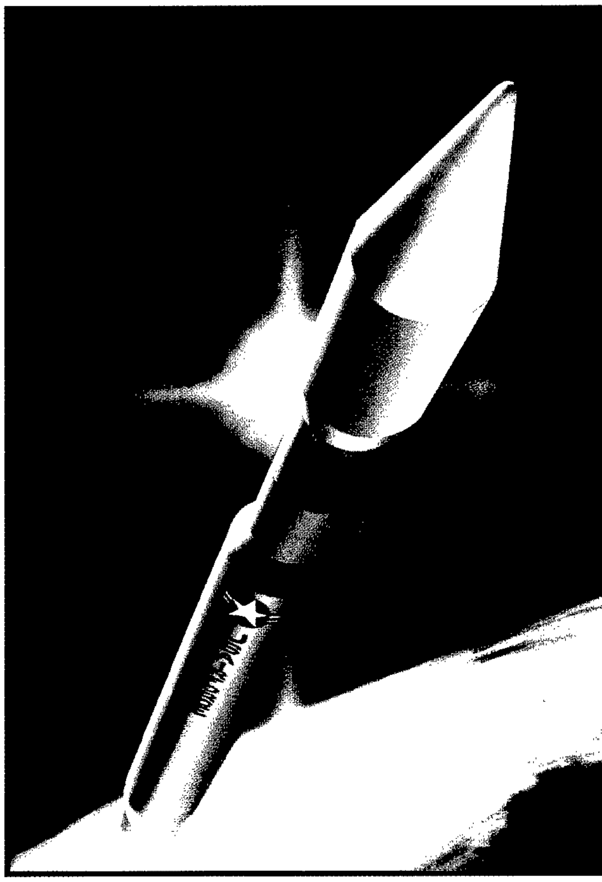
Major Contractors:

▶ Lockheed Martin Aerodynamics and Astronautics, Denver, CO (prime); Aerojet, Sacramento, CA (liquid rocket engine [LRE]); McDonnell Douglas, Huntington Beach, CA (payload fairing); Alliant TechSystems, Magna, UT (SRMU); United Technologies, San Jose, CA (SRM); Honeywell, Clearwater, FL (avionics).

Evolved Expendable Launch Vehicle (EELV) Program

Mission Description:

EELV is a space launch system development program to replace the current fleet of medium- to heavy-lift expendable vehicles (Titan II, Delta II, Atlas II, and Titan IV) with a more affordable family of vehicles. The new space launch vehicles must be able to meet the Government's combined spacelift needs (DoD, intelligence, and other missions) through at least 2020. The primary EELV configurations are the Medium-Lift Variant (MLV), required by FY 2002 to support satellite block changes and transitions, and the Heavy-Lift Variant (HLV), required by FY 2005 to assure continued access to space following Titan IV phaseout.



System Characteristics

Cost Performance:

Life-cycle cost savings ≥ 25%

Configurations:

MLV

HLV

Thrust:

[TBD]

Payloads:

Per National Mission Model 2002-2020

Reliability:

≥ 0.98 (Design)

Facilities:

Vandenberg AFB, CA

Cape Canaveral Air Force Station, FL

Key Program Factors:

- Program includes system design, key technology demonstrations, modifications to industrial capabilities and launch facilities, and demonstration launches of both MLVs and HLVs
- Acquisition concept reduces recurring costs at least 25% by emphasizing hardware and infrastructure commonality, and enhancing production, operations and support efficiencies via economies of scale
- Acquisition Service and Category: Air Force, ACAT-1D
- After a four-contract 15-month Low Cost Concept Validation (LCCV) phase, two contracts were awarded in December 1996 for a 17-month Pre-EMD phase. A seven-year single-contract EMD phase (value ≈ $1.4 billion) is planned for a June 1998 award
- Work continues to incorporate commercial requirements into the HLV.

Next-Generation Launcher for Affordable, Assured Access to Space

Schedule Highlights

Milestone/Event: FY:	1997	1998	1999	00	01	02	03	04	05	06	07	08	09
• Pre-EMD contracts awarded	X												
• EMD contracts award		X											
• MLV test launch					X								
• First MLV operational launch						X							
• HLV test launch							X						
• First HLV operational launch										X			

Funding Summary

Resource Category	Pgm Elem	FY95 & P	FY96	FY97	FY98	FY99	FY00 - 03
• RDT&E (AF), EELV Dem/Val	0603853F	40.0	36.9	42.3	63.3		
• RDT&E (AF), EELV EMD	0604853F				28.4	294.0	1,234.0
• RDT&E (AF), Integration	0305953F					3.4	10.2
• Production	0305953F						1,006.6
• Operations (AF)	0305953F						84.9
• Other Funding Sources			72.3	15.1	7.1		
Totals:		40.0	108.2	57.4	98.8	297.4	2,335.7

Current Activities and Plans

FY96	FY97	FY98	FY99
• Completed four Low Cost Concept Validation contracts (awarded in FY95) – Contracts for $30M each, 15 months • Prepared for down-selection to two Pre-EMD contractors	• Awarded two Pre-EMD contracts (Dec 96) – Contracts for $60M each, 17 months • Plan EMD Phase	• Complete Pre-EMD contracts (in May 98) • Award single EMD contract (in Jun 98) – Contract for $2.4B, through FY04 • Mods and construction at Cape Canaveral and Vandenberg AFB launch facilities	• Continue EMD work on EELV variants • Continue mods and construction at launch facilities

Management

DoD	Service Staff	Major Command	Program Office
USD(A&T) Pentagon, DC	Air Force (SAF/AQS, AFPEO/Space) Pentagon, DC	AFSPC Peterson AFB, CO	AFMC/SMC Los Angeles AFB, CA

Major Contractors:

- Lockheed Martin, Denver CO; McDonnell Douglas, Huntington Beach, CA.

DoD Space Architect and MILSATCOM

"The DoD Space Architect's ... office develops architectural recommendations to enhance the utility and affordability of current and future space systems."

Role and Responsibilities

The DoD Space Architect's main job is to develop space architectures across the range of DoD space mission areas, integrate requirements, and coordinate with Intelligence Community counterparts. As a joint technical agency, this office develops architectural recommendations to enhance the utility and affordability of current and future space systems. Its first major task has been to develop a future MILSATCOM architecture that encompasses core DoD capabilities, allied, civil and commercial functions, and a global broadcast capability.

Future MILSATCOM Architecture

General. The drive for advanced MILSATCOM is based on growing user need. With the relocation of likely conflict from the fixed battlefields of Western Europe to less-developed regions, and with the increasing information appetite of technologically advanced weapons, the reliance of our deployed forces on robust space-based communications has risen exponentially. From 1 gigabit per second (Gbps) in overall communications throughput capacity needed to meet information demands during Desert Storm, we may need a 10-Gbps capacity by 2010. Beyond technical performance needs, jointness of operations, consolidation of resources and trends in the marketplace generated guidance to:

- Accommodate all stakeholders' needs;
- Balance DoD-owned and commercial systems; and
- Consider international cooperation.

This two-phase activity is providing a road map for systems development and investment strategy. Phase I, Architecture Development, is now complete, and the work has transitioned to DUSD(S) for Phase II, Architecture Implementation. Phase I products are consistent with the Operational and Systems Architectures defined in the C4ISR Architecture Framework, and the technical features of prospective acquisitions (under Phase II) are expected to be consistent with the Framework's Technical Architectures.

Phase I. The Space Architect's objectives and goals for the future MILSATCOM are summarized in the table below.

DoD Space Architect Recommendations for the Future MILSATCOM Architecture

Objectives (2010 - 2025)	Transition Goals (Now - 2010)	Architecture Goals (2010 - 2025)
The right, assured, secure communications to the right user at the right time MILSATCOM services fully integrated with Defense Information Services Network for transparent, efficient and effective communications for the users Reduced communications footprint through improvements in terminals, radios, antennas, RF signatures, people, etc. MILSATCOM developed to be user-friendly and interoperable, so that warfighters can focus on their missions, not their communications	Maintain continuity of service (via satellite replenishment, operations management, or risk trade-offs) Within acceptable risk and funding limits, work to fulfill the "easier" MILSATCOM objectives Foster new warfighting visions via demonstrations and operational use Accelerate flexibility and system efficiency improvements to terminals Integrate MILSATCOM fully into the overall communications architecture; and Leverage international cooperation opportunities	Protected and Survivable Services: – To maintain freedom of action during operations Mobile Services: – Support Dominant Maneuver and Information Superiority for forces on the move High-Capacity Service: – To all echelons to support Precision Engagements Terminals: – Provide superior information services at all levels, with reduced infrastructure Related Infrastructure: – Reduce the communications "footprint"

The Architect's work went well beyond defining out-year MILSATCOM objectives and architectural and transition goals. For each communications service and supporting area, the study report includes both transition strategies and programmatic recommendations to help the DoD move toward the MILSATCOM Objective Architecture. These decision sequences are designed to replace legacy systems in time to avoid serious operational risk (pending adjustment for future facts and information), and to provide transition support to the Office of the DUSD(S) (ODUSD(S)) for Phase II during the next year and beyond.

Phase I Transition Strategies and Recommendations		
Service / Area	**Architectural Transition Strategy**	**Programmatic Recommendations for Road-Mapping**
Protected and Survivable Services	Continue to field a processed and cross-linked EHF system with improved capability	Sustain Milstar II through DFS-6; begin new EHF satellite development for launch in 2005. Sustain 24-hr EHF polar capability through 2010. Investigate potential for international cooperation
Mobile Services	Sustain UHF through transition. In 2003-05, decide on the objective architecture for netted mobile, hand-held, paging, and LDR broadcast	Fly more UHF spacecraft to ensure continuity. Meanwhile, examine future architecture alternatives (including enhanced military systems at lower altitudes, an improved GEO system, space-based UHF plus UAVs, and fully commercial services)
High-Capacity Service	Field a transponded, commercial-like X- and Ka-band system	Continue DSCS SLEP. Launch X/Ka-band transponded satellites for replenishment, or launch sooner for expansion and earlier Ka-based GBS capability. Investigate CRAF-like agreements for a military capability on commercial Ka-band satellites
Terminals	Assess designs, acquisition processes to facilitate transition to MILSATCOM objectives and the C4ISR architecture	Put higher data rate and protected services on mobile platforms. Reduce Service-unique inventories. Implement multi-band designs. Establish measurable goals to reduce O&S costs
Related Infrastructure	Integrate SATCOM systems with the DISN at all levels	Integrated DISN, SATCOM and GBS nodes. Standardize a broadcast module for distribution on protected EHF / MDR, Ka GBS, fiber, etc. Enable assessment of the communications architecture's capabilities vs. warfighter vision and developmental weapon system needs. Develop a user-focused communications network management and control system.

CRAF Civil Reserve Air Fleet
DFS Development Flight Satellite
DISN Defense Information Systems Network
DSCS Defense Satellite Communications System
EHF Extremely High Frequency
GBS Global Broadcast Service
GEO Geosynchronous Earth Orbit
LDR Low Data Rate
MDR Medium Data Rate
SLEP Service Life Extension Program
UAV Unmanned Aerial Vehicle
UHF Ultra High Frequency

Entering Phase II

Additional Space Architect contributions from Phase I will facilitate ODUSD(S) stewardship of Phase II. These include specific decision timetables, which evolved from "strawman" road maps, and several policy recommendations, which parallel some initiatives already underway.

As ODUSD(S) prepares to initiate and coordinate the transition effort, USSPACECOM is prioritizing the requirements to reflect cost-constrained user needs and industry is "rewriting the book" on commercial SATCOM. The U.S. commercial sector alone now has more than 2-1/2 times the number of satellites on orbit as the DoD, and industry is investing several times our SATCOM budget every year. Thus, our challenge will be how we are going to leverage the commercial market to meet our own collective needs and preserve militarily required capabilities. We want to apply that same kind of thinking to space and provide room for expanded capabilities and growth. If we can't do it in SATCOM, we won't be able to do it anywhere.

"... our challenge will be how we are going to leverage the commercial market to meet our own collective needs and preserve militarily required capabilities."

Space Planning for the Far Term

National Security Space Master Plan (NSSMP)

In the three fiscal years from 1994 through 1996, Congress indicated its continuing concerns over our basic management processes governing military and intelligence space programs. Accordingly, one of DoD's first major initiatives has been to get a comprehensive central and multi-agency planning process underway to guide our defense space activity for the long term. This process is being sparked by an NSSMP Task Force, whose guiding vision:

- ▶ Focuses on the warfighter;
- ▶ Features centralized planning and decentralized execution;
- ▶ Coordinates and integrates DoD and NRO activities; and
- ▶ Takes advantage of the growth in U.S. civil, commercial, and international space activities.

The task force reports to a Senior Steering Group (SSG), which makes recommendations to the JSMB.

SSG Membership

Co-Chairs	Flag-Level Representatives
Ass't DUSD(S) Dir, NRO Plans and Analysis (P&A)	Each Service (USA, USN, USAF, USMC) Joint Staff USSPACECOM National Imagery & Mapping Agency (NIMA) DoD Space Architect Defense Intelligence Agency (DIA) Central Intelligence Agency (CIA) National Aeronautics and Space Administration (NASA) National Security Agency (NSA) Community Management Staff (CMS)
Adjunct Members	
Dept of Energy Dept of Commerce Dept of Transportation Dept of Interior	

In the year since March 1996, our task force has defined and achieved multi-agency coordination for specific long-term planning objectives, also referred to Guidestars. These Guidestars derive from prior studies, vision documents, and current policy and strategy. Each is thus an integrated goal for high-level out-year planning by the defense and intelligence space communities; its multiple Attributes (qualities or characteristics) will be fully defined in the final Space Master Plan. The draft Guidestars, as reported out of the SSG, are listed below; they will be presented for JSMB review during the spring of 1997.

"Each [Guidestar] is thus an integrated goal for high-level out-year planning by the defense and intelligence space communities ..."

National Security Space Master Plan Proposed GUIDESTARS

Technical Superiority	Ensure U.S. dominance in national security space capabilities through revolutionary technological approaches in critical areas
Customer Focus	Develop a responsive customer-focused national security space and ground architecture that simplifies operations and use
Cooperation	Ensure U.S. civil and commercial capabilities are used to the maximum extent feasible for national security space activities. Consider the use of international capabilities where appropriate
Access	Provide assured, cost-effective, responsive access to space
Information Collection	Provide comprehensive and timely intelligence, surveillance and reconnaissance of Earth and Space through integrated use of space, airborne, land and sea assets
Information Handling	Ensure space systems are seamlessly integrated within a globally accessible information infrastructure
Sharing	Provide appropriate national security space services and information to the civil, commercial, scientific and international communities
Protection	Protect national security space systems to ensure mission execution
[TBD]	[Under development]
Dominant Workforce	Promote a trained, space-literate national security workforce able to fully utilize space capabilities for the full spectrum of national security operations

Our Space Master Plan is important because it will lay out a consolidated roadmap by which the national security space community can meet its long-term objectives in a systematic way. The Master Plan is also a vehicle by which DUSD(S), in conjunction with the DoD Space Architect and the other space communities, can coordinate and implement the policies and operational concepts that will be pursued into the 21st century. We don't expect to have all the answers as the future remains uncertain, but, as a "living document," it will keep us on a sensible path.

Other Planning Needs

Space Technology Planning. Guided by the NSSMP, emerging architectures and recent vision and technology documents, we will need to flesh out our investment planning with respect to key enabling technologies for space. For example, we will need to harmonize concepts emerging from the Air Force's *New World Vistas* forecast with those of other Services and agencies to ensure a coordinated approach to national security space priorities, from which specifically approved concepts may be implemented. Our approach will incorporate several factors in an effort to integrate and coordinate the technology efforts of the Services and Defense Agencies:

- We want to be sure we have identified the "right" technologies to support for the capabilities we need to achieve;
- We need to distinguish between those that will mature via normal market forces and those that will need specific funding to meet national security needs;
- We will want to coordinate who invests in what, to assure that critical technologies are funded adequately, but without unnecessary duplication or gaps; and
- We will want to identify those high-leverage technologies that are maturing, so that we can accelerate their application and demonstration in national security space contexts.

Continuation of Acquisition Reform. We need to support the Department's efforts to help the Services and other national security acquisition agencies integrate improvements to our systems acquisition process. Many steps have already been taken and many techniques applied, such as acquisition streamlining, reduced use of MILSPECs, and increased use of commercial procurement practices. However, defense space acquisition has some unique features and needs that require special attention if we are to pursue best commercial practices in an optimal way. For example, we need to ensure the right balance between commercial and military system features for operation in lethal as well as exploitative threat environments. Competitors could seek to exploit our space capabilities for economic advantage, while opponents — overt and covert — could seek lethal as well as exploitative counters to our space operations.

Thus, functional specifications for security and survivability may need to be more stringent than for commercial environments — or failure risks must be considered in the systems' operational concepts. Our space capabilities are a national advantage for the U.S., but they are perishable and need to be protected and renewed accordingly.

Resource/Funding Stability. At least as important as active threats is the threat posed by instability of funding during a given time frame. Here is where the Government as a whole needs to agree on space's role in the nation's well-being, the general capabilities required over time, and on the commitment needed to acquire these in a prudent way. "Surprises," especially in high-technology applications, can always beset the best-constructed program. These need to be taken in stride and alternatives planned. While such long-term funding stability — in the sense of adequate funding profiles for agreed programs — may require both commitment and patience, the penalties for instability are well-known from other defense arenas: they typically involve major cost increases and/or program cancellations or restructuring, with shortfalls in capabilities and collateral effects in other areas.

Sustaining an investment course may not be easy while the entire defense establishment continues to shrink, but keeping and improving our space capabilities is not a poker game, where money tossed into the pot is "lost" until somebody wins; rather, it is more like a mortgage — an investment on the installment plan — where "payments" need to be sustained until the desired item, whether house or satellite, has been procured and beneficially employed.

"Our Space Master Plan is important because it will lay out a consolidated roadmap by which the national security space community can meet its long-term objectives in a systematic way."

"Our space capabilities are a national advantage for the U.S., but they are perishable and need to be protected and renewed accordingly."

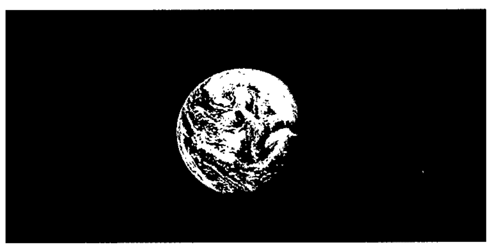
"Growth in out-year funding reflects development and procurement of next-generation ... space systems to meet national security and other policy-directed requirements."

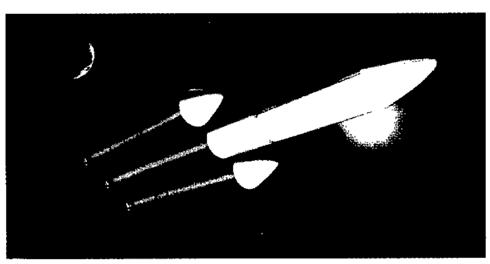
DoD Space Program Analysis

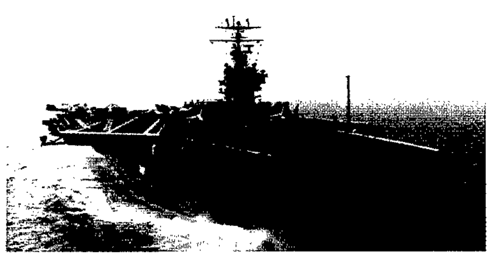
Funding and Modernization

Given adjustments in program funding due to the end of the Cold War and lessons learned from the Persian Gulf War, DoD space programs have been funded steadily during the past five years, despite reductions in the overall defense budget. Growth in out-year funding reflects development and procurement of next-generation communications, navigation, meteorological and launch systems to maintain and modernize U.S. space systems to meet national security and other policy-directed requirements.

Operation of our present national security space infrastructure and fielded systems uses about half our annual space budget. Clearly, both the national security community and the nation get value for this money. However, if even essential space capabilities are to remain affordable into the next century, we must do more than make them accepted as an operational "utility." We must also continue to reduce their costs — in both relative and absolute terms. Cost as an independent variable (CAIV) will become an increasing constraint on performance — unless we can modernize and operationalize our new space capabilities in ways that are as revolutionary as their capabilities.







Defining the Issues

DUSD(Space), as the DoD's agent for change, is grappling with many cost, operations and policy considerations. We are asking ourselves such questions as those below.

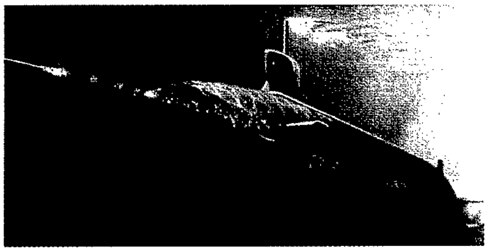
- **Why Space** — What we are doing today and what we expect for the future, whether there are better ways of doing things;
- **Launch** — How we get turnaround time and cost down, while continuing to assure both defense and commercial access to space;
- **Operational Efficiency** — Whether our space operations need to be continuous, or whether (given responsive launch) we can operate from the surface until on-orbit capabilities are needed;
- **Communications** — How to reduce barriers to quick and effective communications as a constraint on the warfighter;

"Operation of our present ... systems uses about half our annual space budget ..."

- **Interoperability** — How to assure space architectures that will optimize user performance in joint operations;

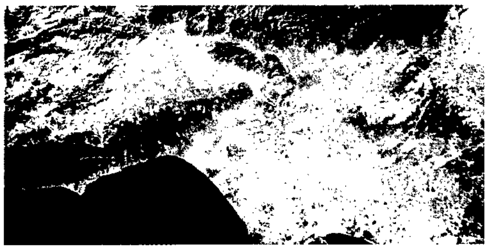
- **Payloads** — Whether and how to combine sensors to support multiple missions and users;

- **Acquisition** — How to procure commercial-off-the-shelf (COTS) items and via commercial best practices, while avoiding system vulnerabilities in hostile military environments;

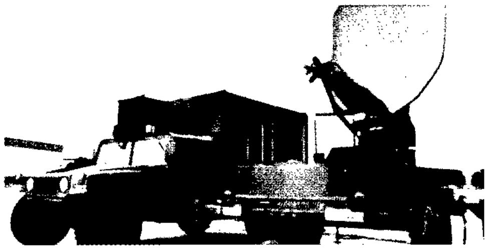


"Clearly, both the national security community and the nation get value for [their] money ... [but we] must also continue to reduce ... costs."

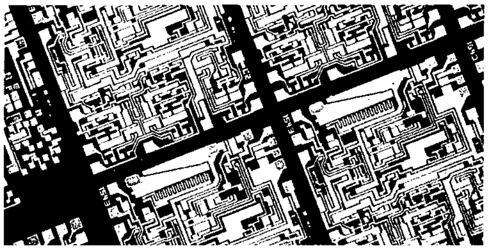
- **Cooperation and Sharing** — How to foster national and international space activities to meet common goals while continuing to preserve our competitive advantage and military independence;



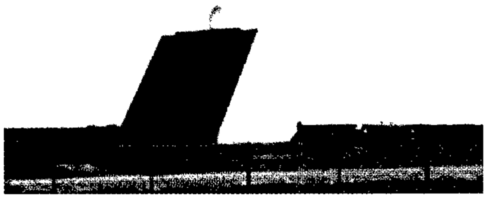
- **Ownership** — Whether to acquire equipment or procure services from others in light of national security needs;



- **Technology** — How best to guide S&T to enable future national security space capabilities; and



- **Space Control** — How best to protect our space capabilities against exploitation by or vulnerability to potential enemies.



"The Administration is defining its 'bridge' to the 21st Century, and the Quadrennial Defense Review is redefining some of our assumptions and projections."

The last question alone indicates that our challenge is to protect our assets and their effectiveness, to include preventing an adversary from using them against us, while continuing to adhere to current treaties, laws, and policies.

Developing the Analytic Framework

As we chart a course to the future, we seek first to structure an analytic framework to assure that we ask the right questions in the right context, and that we do not omit essential ingredients of the planning process.

While most specific program/budget actions take place within the DoD's contexts of the Planning, Programming and Budgeting System (PPBS) and acquisition program review processes, our longer-range planning requires us to adapt to "the permanence of change." The analysis needs to "touch all the bases" to ensure that all relevant factors are considered. It needs to be both open-ended and systemic. We are looking at a multi-dimensional matrix approach, in which each dimension has its own scale of considerations. We are just at the beginning of this process.

What makes the analytic approach even more challenging is that different members of the national security space community may have very different views of how such a matrix should be defined or scored. Further, the world is not standing still. The Administration is defining its "bridge" to the 21st Century, and the Quadrennial Defense Review is redefining some of our assumptions and projections.

Meanwhile, DoD is proceeding with essential activities to ensure that the future is soundly based on timely foundations. We need to assure continuity and perspective in our space decision-making and advocacy roles — to assure that "good" solutions are not held hostage to the promise of "better" approaches some time in the future.

"We need to assure continuity and perspective in our space decision-making and advocacy roles ..."

Summary of Space Challenges Today

Many space functions, processes and programs have been addressed in the preceding pages, to the extent that an overview document allows. Many occupy the full attention of dedicated experts across the space community as we look to a new century in which space products and services are increasingly integrated into our daily lives, as well as into the ways we manage crises and, if need be, wage war. The challenges are many, but the following areas will merit our special attention:

Four special challenges:

- Support to Warfighters

– Management

– Communications

- Launch

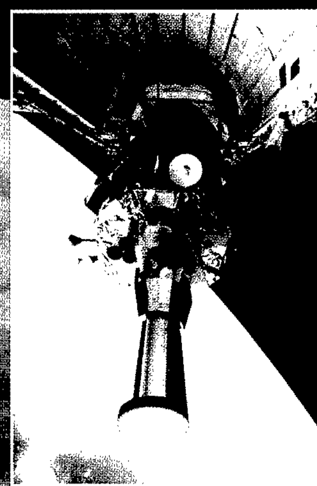
1. **Support to Warfighters,** namely —
   - Making sure that space programs are "consumer-oriented";
   - Fully educating the warfighters on uses and the utility of space;
   - Ensuring that information dominance is a reality; and
   - Enhancing coalition operations through international cooperation in space.

2. **Management,** specifically —
   - Continued improvements in efficiencies and economies; and
   - Continued integration of the defense and intelligence space programs.

3. **Communications,** with emphasis on —
   - Eliminating the movement of information as a constraint on the warfighter;
   - Transitioning our legacy MILSATCOM systems to the approved future architecture; and
   - Efficiently investing $50-60 billion over the next twenty years for modernization.

4. **Launch,** with emphasis on —
   - Drastically reducing the cost-per-pound of spacelift;
   - Reducing launch turnaround times from months to hours; and
   - Modernization and maintenance of the launch function's ground infrastructure.

If everybody across the space community plays a part, we will meet the national security objectives of our National Space Policy. The architectures that we seek to establish and implement will become easier to attain, and our long-range objectives will come within reach. If the next twenty-five years of progress in space match the last twenty-five years, we will have come a long way indeed.



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