V. Management of National Security Space Activities

A number of issues transcend organizational approaches and are important to the ability of the U.S. to achieve its objectives in space. These are issues that the national leadership, the Department of Defense and the Intelligence Community should address in the near term, irrespective of particular organizational arrangements that may be pursued. Resolution of them would both benefit and support organizational changes.

A. Interagency Coordination

1. Current Interagency Process

The current interagency process is inadequate for the volume and complexity of today's space issues. For the most part, the existing interagency process addresses space issues on an as needed basis. As issues in the space arena inevitably become more complex, this approach will become increasingly unsatisfactory. What may be needed is a standing interagency group to identify key national security space issues, to guide, as necessary, the revision of existing national space policy and to oversee implementation of that policy throughout the departments and agencies of the U.S. Government. The need for a standing interagency coordination process is made more urgent by the fact that there are a number of pending issues on space affairs in Congress, in domestic regulatory bodies and in international trade and arms control negotiating fora. To avoid unintended and deleterious effects on the space sectors, these issues must be addressed in a comprehensive fashion.

2. Pending Agenda

The domestic and international issues facing the U.S. demand a coherent policy approach and deliberate direction for their treatment. A sample of that agenda includes:

- Arms control issues that China, Russia, Greece and Pakistan have raised in the United Nations Committee on Peaceful Uses of Outer Space.

- World Trade Organization negotiations regarding market access for commercial satellite systems.

- Domestic allocation of spectrum for third generation wireless (scheduled to occur by July 1, 2001) and the potential authorization of commercial ultrawide band services (a pending Federal Communications Commission rulemaking proceeding), both of which may affect DoD use of spectrum for military operations, government use of commercial spectrum and commercial use of government spectrum.

- Claims of developing countries regarding equitable access to radio frequency spectrum and orbital locations.

- U.S. and international development of orbital debris and deorbiting policies.

- Domestic licensing issues involving commercial, civil and national security interests, such as remote sensing policies, export control and foreign ownership.

B. SecDef/DCI Relationship

No relationship within the executive branch touching on national security space is as important as the one between the Secretary of Defense and the Director of Central Intelligence.

> ***No relationship…touching on national security space is as important as the one between the Secretary of Defense and the Director of Central Intelligence.***

Together, the Secretary and the DCI control national security space capabilities. Neither can accomplish the tasks assigned without the support of the other. The Secretary's support is needed by the DCI to field and operate intelligence systems. The DCI provides much of the intelligence required by the Secretary to support the development of U.S. military capabilities and the conduct of military operations. The Secretary's interest in and support of intelligence is critical to the DCI. The higher the Secretary's level of interest, the closer the relationship with the DCI is likely to be as the two work to assure the development and fielding of systems and the conduct of operations essential to the nation's security.

Since the two positions were created in 1947, and especially since the NRO was created in 1960, the relationship between the two officials has varied. While the Secretary and the DCI have established processes through which to cooperate on routine national security issues, they have not given the national security space program their sustained, joint attention for nearly a decade. Nor have the urgent issues related to space control, information operations and the assessment of the threats the nation faces from space received the attention they deserve. Specifically, the U.S. must:

- Invest in advanced technologies.
- Exploit the commercial market to supply imagery to relieve the burden on national systems.
- Make revolutionary changes in the nation's intelligence collection systems.
- Develop space-based systems to meet pressing military requirements.

The Secretary and the DCI need to align their respective staff offices so that coordination on intelligence issues broadly, and space matters specifically, is easier and more direct between the two. There is no systemic organizational impediment to such alignment or to meeting the need for increased attention to critical issues. It is a matter of the priorities of the Secretary and the DCI and how they choose to delegate and oversee responsibilities for space-related concerns.

C. Acquiring and Operating Space Systems

The Department of Defense and the Intelligence Community acquire and operate most of the satellites used to support defense and intelligence missions. Within DoD, the Air Force is the Service that acquires most of the Department's satellites; the National Reconnaissance Office is the acquisition agent for the Intelligence Community's satellites. The two organizations have approached satellite acquisition and operations differently over time, although the processes have evolved in a similar fashion in recent years. Understanding the differences, however, is useful in evaluating alternatives to organizing and managing these functions in the future.

1. Budgeting

The DoD and NRO processes for assembling and approving budgets are similar. In DoD the Services identify the resources, including the funds, people and facilities, needed to support approved system requirements. The Services' space inputs are generated by their respective Space Commands, reviewed by Service Headquarters staffs, submitted by Service Secretaries, integrated and rationalized by the OSD staff through a structured process, and approved by the Secretary of Defense. In the NRO, the inputs are generated by its directorates; reviewed, integrated and rationalized by its staff; and submitted by the Director of the National Reconnaissance Office (DNRO) for DCI approval.

2. Satellite Acquisition

For acquisition, the DoD approval chain is from the program managers, to the Program Executive Officers, to the Component Acquisition Executive. In the NRO, the approval chain is from the program managers, to the directorate heads, to the Service Assistant Secretary for Acquisition and the DNRO. For major DoD programs, such as satellite systems, the Defense Acquisition Executive is the final decision authority. For all NRO programs, the DNRO is delegated the final decision authority, eliminating one layer of bureaucracy and the accompanying staff review.

Both the Air Force and the NRO acquire space systems under authorities from the Secretary of Defense (Figure 24). For some purposes unique to its mission, the NRO also operates under authorities derived from the Director of the Central Intelligence Agency, as provided for in the Central Intelligence Agency Act of 1949, as amended. The DoD acquisition process is described in Department of Defense Directive 5000.1 and applies to all major systems. In the early 1990s, the Deputy Secretary of Defense exempted the NRO from DoD Directive 5000.1 and directed the development of an equivalent process, known as Directive 7. Directive 7, in essence, tailored the basic principles in 5000.1 specifically for the acquisition of space systems, the NRO's only line of business, which resulted in a more streamlined process than that of the DoD. In the fall of 2000, however, DoD revised its 5000.1 directive to streamline the DoD acquisition process. It is now similar to the Directive 7 process.

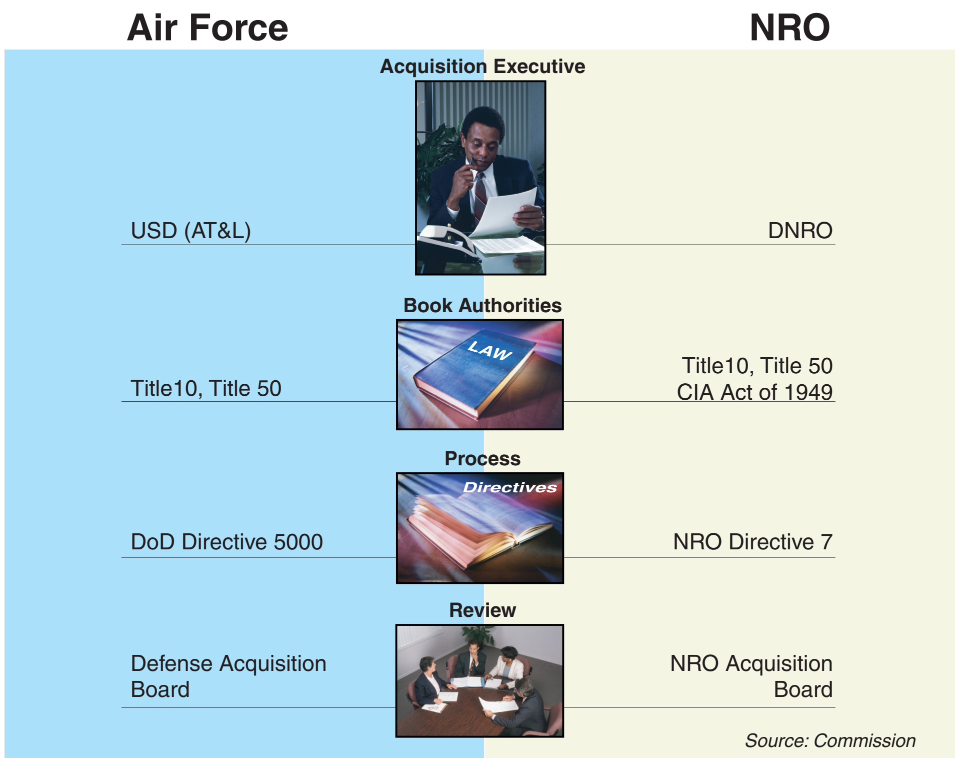


Figure: 24 Acquisition Oversight in the Air Force and the NRO

3. Satellite Operations

The use of NRO and Air Force satellites is sufficiently different that the approach to operations in the two organizations is also different in character. With the exception of station keeping and repositioning, operations of DoD satellites are characterized for the most part by constancy of operations. Operators monitor but do not interact with the satellites unless there is an anomaly. In contrast, NRO satellite operations are tasked frequently in response to constantly changing collection requirements. Operators intervene in real-time on a routine basis, often with each orbit of the satellite, to change the satellite configuration. These characteristics demand continuity of highly experienced, on-site technical experts who are extremely knowledgeable about the satellite design features. To support these requirements, NRO satellite operations rely on crews comprised of a government lead and a crew of contractor technical experts. However, DoD satellite operations rely less on contractor technical support at the ground stations.

Future DoD systems like the Space Based Infrared System will operate more like NRO systems. Therefore, the operational philosophies of the two organizations are likely to become more similar. Air Force acquisition and operations will have to be more closely linked to ensure the continuity and technical expertise needed in the ground stations.

4. Integrated Acquisition and Operations

While there are growing similarities between Air Force and NRO satellite acquisition and operations, how these functions are integrated within the two organizations is still quite different today. Satellites are relatively unique systems, purchased in small numbers and often one- or two-of-a-kind. As a result, a close relationship between the acquirers and operators can be beneficial throughout the life cycle of a space system.

The NRO's approach to acquisition and operations, referred to as "cradle-to-grave," more closely integrates the acquisition and operations functions within the organization. This approach creates a different relationship between the acquirers and operators than that of the Air Force, in which the acquisition and operations elements are in separate commands. In the NRO model, the individuals involved in acquiring the satellites are the same individuals who fly the satellites. Therefore, the experiences and understanding derived from operations can more directly influence satellite design; the reverse is also true. When the operators are on the technical design team, their capacity to resolve on-orbit anomalies during satellite operation is greater. This is not the case in the Air Force, where the operators have less direct influence in design. These differences amount, in essence, to different organizational cultures within NRO and Air Force space activities, an understanding of which is essential to determining whether and how the activities might be integrated over time.

D. Pursuing "Leap Ahead" Technologies

Technology has been a major driver of U.S. economic growth over the past five decades. Scientific discovery and technological innovation have been important elements of U.S. economic and military leadership, and have improved the quality of life in the United States. Technological superiority has aided the U.S. military in maintaining its worldwide commitments even as the size of its force has been reduced. As the spread of high technology weaponry on the world market continues, it will become increasingly difficult to stay ahead, particularly in space-related technologies. The Department of Defense needs to provide both resources and direction to ensure that advances in space technology continue.

1. Managing Science and Technology Programs

Declining budgets and programmatic instability have had a major impact on key technologies required by the defense and intelligence space sectors. For example, the U.S. has lost its preeminence in rocket propulsion technology. A review by the Defense Science and Technology Advisory Group in 1999 concluded that funding perturbations could potentially decimate one of the nation's priority propulsion initiatives. For example, the U.S. will rely on Russian RD-180 technology to power some of its core Evolved Extended Launch Vehicle (EELV) booster fleet. In addition to losing preeminence in space booster technology, the Air Force Scientific Advisory board declared in 1995 that "other countries have taken the lead in spacecraft propulsion, where U.S. technology is behind what has been accomplished in the former Soviet Union."

Certain core technologies rely on a narrow industrial base. The U.S. Government may need to sustain critical providers through innovative programs such as "centers of excellence." Radiation-hardened parts and atomic clocks are two examples of the larger problem of an eroding industrial base. In each of these cases, the business base is inadequate to sustain the companies that supply the components. In the case of radiation-hardened parts, market forecasts project a decline in the business base of 50 to 60 percent. The sole U.S. company that produces the atomic clock critical to the U.S. GPS system announced in 2000 that it plans to stop production because of insufficient market demand.

The Department needs to actively coordinate science and technology investments across the space technology community so as to better integrate and prioritize these efforts, many of which have application across all space sectors. The defense and intelligence sectors need to partner more closely with the civil sector. Some NASA research and development programs have national security applications. Investments in launch infrastructure and launch vehicles have clear applications across all sectors.

Many attempts have been made, but with limited success, to coordinate space technology planning, development and projects among the various space technology communities. In 1997, the Space Technology Alliance, an informal organization with membership that includes executive-level technical directors from NASA, DoD, the Intelligence Community and others, was established to coordinate the development of space technologies. This has done much to improve the level of interagency coordination, but even so, a number of priority national issues need attention at a higher level. Modernization of U.S. launch ranges and the development of a reusable launch vehicle, both of which are key drivers to reducing the cost of access to space for government and commercial purposes, are critical examples.

2. Space Technology Goals

The Department of Defense should focus its space technology investment strategy on:

- Reducing the cost of launch and space systems by emphasizing miniaturization and new ways of doing business (Figures 25).
- Developing new sensors that can detect and track smaller, moving and concealed targets under all environmental conditions.
- Promoting on-orbit data processing and artificial intelligence to reduce human operator costs and the burden of high data volume on the communications infrastructure.
- Developing advanced launcher and propulsion technology to reduce the cost of getting to and maneuvering on orbit.
- Developing on-orbit servicing equipment that can extend space system life expectancy and makes it possible to upgrade system capabilities on orbit.
- Developing advanced surveillance and defensive and offensive technologies needed for space control and information operations (Figures 26).
- Developing advanced command and control, guidance and pointing, power generation, materials and optics technologies needed for power projection from space.

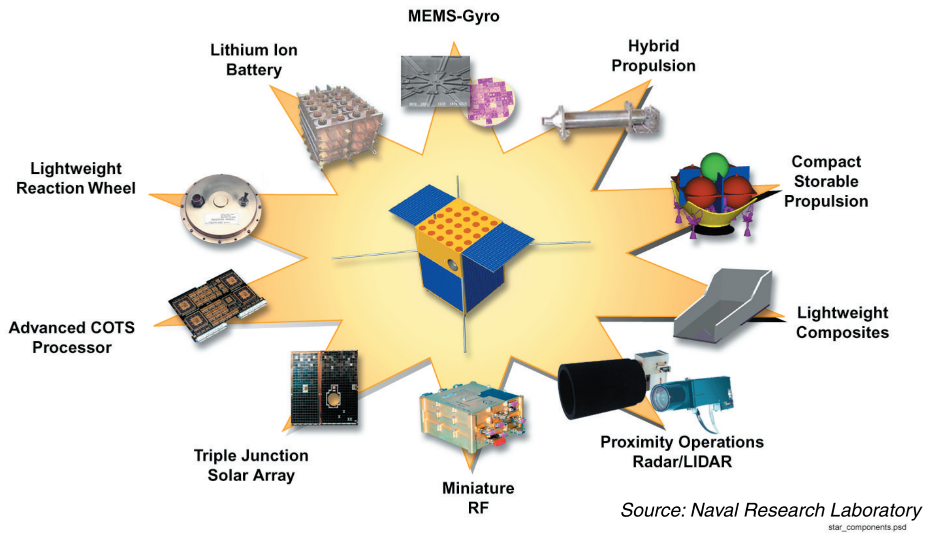
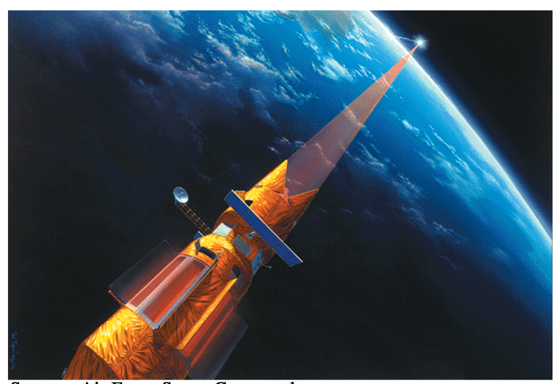


Figure 25: Examples of advanced space system technologies

In addition to establishing possible areas for investment, the Department, in cooperation with the space community, needs to ensure that an environment exists within which experimentation and innovation will flourish. Most successful science and technology programs are conducted in organizations well apart from the bureaucratic mainstream. It would serve the space community well to establish temporary joint interagency program offices to foster flexible, innovative and adaptable space technology research and development.

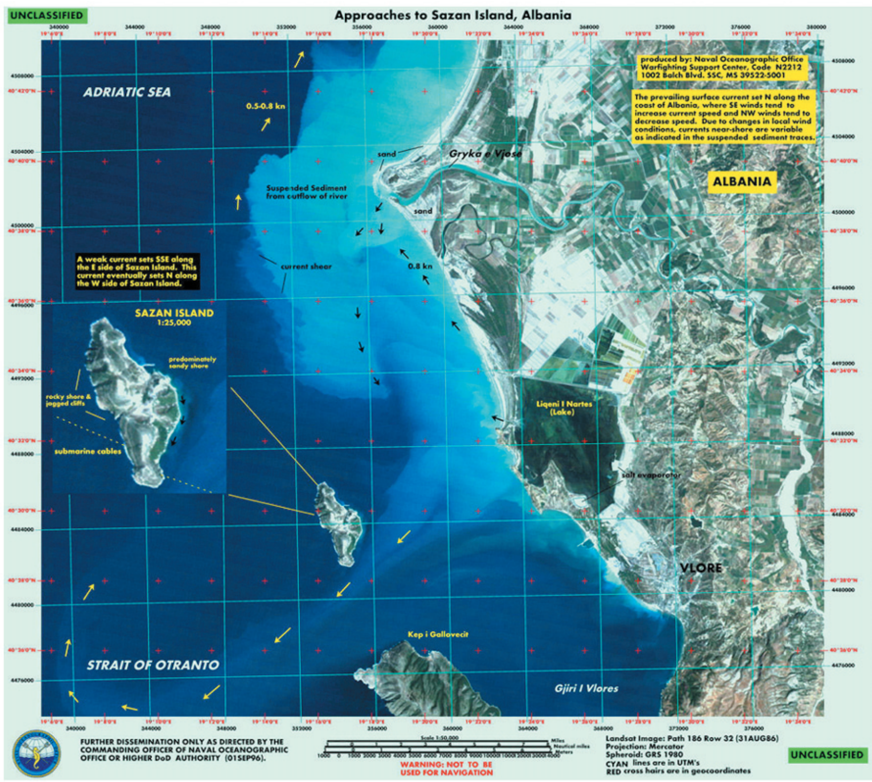


Source: Air Force Space Command

Figure 26: Artist rendering of the space based laser demonstration project, now in research and development.

E. Leveraging the Commercial and Civil Sectors

The commercial and civil space sectors provide satellite services and scientific and engineering resources useful for national security space. In the United States, investments from commercial space activities now exceed those of the U.S. Government by a factor of two. For decades, in conflict and in peacetime, the Department of Defense and the Intelligence Community have turned to the commercial industry to develop new technologies, design new systems and build hardware. They rely as well on industry to provide services, such as satellite communication and imagery services, when U.S. Government capabilities cannot meet requirements (Figure 27).



Source: Naval Oceanographic Office Warfighter Support Center, Stennis Space Center, Mississippi (Approveed for Public Release)

Figure 27: U.S. military forces use commercial imagery for "intelligence preparation of the battlefield"

Despite the importance of the U.S. commercial and civil space sectors to the successful completion of the national security mission, the U.S. Government has no comprehensive approach to incorporating those capabilities and services into its national security space architecture. Nor does it have well-defined policies to enhance the competitiveness of the commercial and civil industries. The U.S. Government, as a consumer, a regulator or an investor, is currently not a good partner to the national security space industry.

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1. Launch Facilities

Air Force launch facilities continue to support both government and commercial launches, even as the number of commercial launches from these facilities approaches half of the total. Privatizing the maintenance and operations of the launch infrastructure is a valid consideration as long as the U.S. Government retains control of certain core governmental functions, such as making critical safety decisions on destroying a rocket that has strayed off course. The commercial sector is gaining experience in space operations. Three states, New Mexico, Virginia and Alaska, are developing spaceports to handle commercial and government customers. In October 1996, NASA began the transfer of responsibility for day-to-day operations and management of the U.S. Space Shuttle fleet to United Space Alliance, a commercial space operations company, while retaining oversight of the Space Shuttle program. The Department of Transportation is responsible for issuing licenses to private companies to provide commercial space payload processing and launch services at the two government launch sites.

2. Export Control Policy

Except where exclusions are needed for national security purposes, U.S. Government policies should encourage the U.S. commercial space sector to earn as much of the international commercial space market as possible. U.S. industry, therefore, deserves timely responses from the U.S. Government in approval or denial of licenses. Unfortunately, the current process produces long delays in licensing approval. The Canadian government, for example, originally intended to award a contract to build Radarsat 2 to a U.S. company, but awarded it instead to an Italian company because of U.S. export control procedures and regulations. Industry reports many instances in which it took months to get permission to hold a meeting with a close U.S. ally, and in one case took weeks to get permission to make a phone call to a foreign entity. This sort of delay is damaging to U.S. industry in today's fast-paced, international markets. The U.S Government must develop and evolve new export control and licensing processes that will promote the commercial space industry, while being mindful of national security considerations.

3. Satellite Services

The U.S. Government and its allies have turned to the commercial sector for many satellite services and products and will continue to do so (Figure 28). Among the many examples of commercial products used by the U.S. Government are these:

- In 1991, the U.S. military procured commercial remote sensing imagery from a non-U.S. company during Desert Storm. Commercial satellite communications services were critical to U.S. Army missions.

Source: Air Force Space Warfare Center
Figure 28: The U.S. military uses commercial satellite communications to support its missions.

- In 1995, the U.S. Navy bought more than two million minutes of service on an intergovernmental satellite system constellation, and many Navy ships communicate through the system today.

- The U.S. Government has leveraged commercially-developed direct broadcast satellite technology for its Global Broadcast Service.

The Department of Defense and the Intelligence Community are not likely to own and operate enough on-orbit assets to meet their requirements. According to RAND Corporation, "in the near term, there are not enough military systems to satisfy projected communications demand and commercial systems will have to be used." The Department of Defense uses commercial services on a daily basis. However, it often procures these services on an ad hoc basis rather than integrating them into its space architecture planning process because of a concern over potential unavailability in a crisis situation. Furthermore, the Department builds capabilities that could perhaps be more economically provided by the commercial sector.

Besides satisfying DoD needs, greater use of commercial satellite systems also could facilitate more effective operations with U.S. allies by providing greater interoperability between some U.S. and non-U.S. military satellite systems. The U.S. Government should become a more reliable customer for commercial products and should plan to augment internal capabilities with commercial products and services in developing future space architectures. The Department of Defense should buy commercial services and products unless a unique requirement can be justified.

4. Multinational Space Alliances

Multinational alliances can increase U.S. space capabilities and reduce costs, as well as give the U.S. access to foreign investment, technology and expertise. Fostering these alliances can help maintain the U.S. position as a leader in the global space market. Civil multinational alliances provide opportunities for the United States to promote international cooperation and build support among other countries, especially emerging space-faring nations and developing countries, for U.S. positions on international policy or regulatory concerns.

F. Budgeting for Space

Currently, there is no DoD appropriation that identifies and aggregates funding for space programs. Space funding is a part of many appropriations spread across DoD and Intelligence Community budgets. Most of the funding for national security space is in the Air Force and National Reconnaissance Office budgets. The Army and Navy each fund space programs that are primarily in support of Service-unique requirements. The Army funds common user and Army-unique ground terminals, and the Navy funds the UHF Follow-On program, the Multi-User Objective System and Navy terminals. These multiple appropriations lead to several problems:

- When satellite programs are funded in one budget and terminals in another, the decentralized arrangement can result in program disconnects and duplication. It can result in lack of synchronization in the acquisition of satellites and their associated terminals.

- It can also be difficult for user requirements to be incorporated into the satellite system if the organization funding the system does not agree with and support those user requirements.

- Since the Air Force builds most DoD space systems, the Army and the Navy fund little research and development for space.

Of some concern is that, although the Army and the Navy represent DoD's largest users of space products and capabilities, their budget activities consistently fail to reflect the importance of space. Their rationale is that space technology programs should be funded by the Air Force. This dichotomy between the importance of space to the Army and the Navy versus the funding commitment these Services make needs to be addressed.

The current method of budgeting for national security space programs lacks the visibility and accountability essential to developing a coherent program. Alternative budget mechanisms, such as a major force program or space appropriation, would be useful in raising the visibility of the national security space program in the Department of Defense's budgeting process.

1. Major Force Program

A Major Force Program (MFP) is a tool to track program resources independent of Congressional appropriations. Currently, 11 such MFPs cover functional areas such as strategic programs, general-purpose forces, guard and reserve, and airlift. Each MFP is further broken into program elements that track dollars and people across the various appropriations assigned to a particular program, such as the F-22 aircraft, the DDG-51 destroyer and the UH-60 helicopter. While there are program elements dedicated to particular space programs, such as SBIRS or the EELV, there is no MFP for space and related programs, nor is there any comprehensive effort in DoD to identify all space and related ground elements.

All MFPs, except MFP 11, are managed decentrally. In the case of MFP 11 for special operations forces, the Congress directed that management control of those resources be exercised by the Commander in Chief, U.S. Special Operations Command.

2. Space Appropriation

An alternative approach is to consolidate space programs in specific Congressional appropriations. For example, there are such appropriations for Air Force aircraft, for Army military personnel and for Navy shipbuilding. No similar appropriation exists for space programs, even in the Air Force. While an appropriation effectively "fences" programs by Service or defense agency, it does not necessarily provide insight into the dynamics of the individual programs.

G. Exercises, Experiments and Wargames

The military uses a variety of tools to simulate warfighting environments in support of exercises, experiments and wargames. However, these tools have not been modernized to take into account the missions and tasks that space systems can perform. As a result, simulation tools cannot be used as effectively to understand the utility of space-based capabilities on warfare.

1. Exercises

Military exercises generally involve training with current capabilities. To the extent feasible, Service and joint exercises train forces for missions they may be called upon to perform during conflict. Incorporating actual space capabilities into exercises is difficult. Intelligence satellites can provide some products in real time, but because training objectives are usually scripted, synthetic intelligence products are often used. Because doing so would shorten their operational lives, satellites are rarely moved to accommodate the requirements of an exercise. Because of potential loss of control of the satellite, ground stations are not disabled. Nor are satellites such as GPS jammed, because to do so would interrupt their real world missions.

Space capabilities should be embedded in military exercises.

As a result, military commanders have had relatively little experience in learning to cope with the loss or temporary interruption of key space capabilities, such as GPS, satellite communications, remote sensing or missile warning information. Space capabilities should be embedded in military exercises. The 527th Space Aggressor Squadron, created in October 2000 by the Air Force, is the kind of capability that could be incorporated into exercises to demonstrate the impact of warfighting operations on hostile actions directed against space-based capabilities.

2. Experiments

Experiments are conducted primarily to evaluate prototypes or upgraded capabilities. Service battle labs and research organizations have conducted experiments involving space applications for years. These experiments have made possible new capabilities such as near real-time imagery transmitted to the cockpit, space-based tracking of friendly forces and dissemination of missile warning data. Most space experiments tend to be conducted by a single Service, despite the fact that space systems support joint missions. Experiments need to focus more on joint applications. A Space Applications Experimentation Cell at Joint Forces Command could provide the leadership needed to encourage more innovative experiments for this purpose.

3. Wargames

Wargames, unlike exercises and experiments, are devised to examine future concepts. These are particularly applicable to concepts relating to space, in which satellite constellations costing tens of billions of dollars can be simulated with a few keystrokes. The Services, OSD and NRO conduct wargames that address vital emerging national security space concepts and issues. These activities should be expanded to include greater participation of senior-level officials from the national security community. Standardizing the force structures and timeframes examined within the different wargames would be useful to enable comparisons of the lessons learned in various games. More should be done to ensure that NRO wargaming capabilities are included in Service, joint and combined wargames to foster greater collaboration on future space system concepts.

4. Models and Simulation

The Department of Defense uses models and simulation to help develop system requirements, test new system concepts, plan acquisition and conduct useful but less expensive training. Historically, DoD has measured the potential combat effectiveness of new systems by simulating their employment in mock combat. Because the value of communications, intelligence and space systems can be difficult to quantify, their contributions to warfighting are not accurately captured in current models and simulations. To support exercises, experiments and wargames, the Department must develop and employ modeling and simulation tools based on measures of merit and effectiveness that will quantify the effects of space-based capabilities.