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U.S. Military Space Programs: Status of Selected Programs

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Abstract. DOD and the intelligence community manage a broad array of space activities, including launch vehicle development, communications satellites, navigation satellites (the Global Positioning System - GPS), early warning satellites to alert the United States to foreign missile launches, weather satellites, reconnaissance satellites, and developing capabilities to protect U.S. satellite systems and to deny the use of space to adversaries (called "space control" or "counterspace systems"). The 1990-1991 Persian Gulf War is dubbed by some as the first "space war" because support from space displayed great improvement over what was available during the previous major conflict, Vietnam. These systems continue to play significant roles in U.S. military operations.

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U.S. Military Space: Status of Selected Programs

Updated June 4, 2007

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U.S. Military Space: Status of Selected Programs

Summary

The 1958 National Aeronautics and Space Act specified that military space activities be conducted by the Department of Defense (DOD). DOD and the intelligence community manage a broad array of space activities, including launch vehicle development, communications satellites, navigation satellites (the Global Positioning System — GPS), early warning satellites to alert the United States to foreign missile launches, weather satellites, reconnaissance satellites, and developing capabilities to protect U.S. satellite systems and to deny the use of space to adversaries (called "space control" or "counterspace systems"). The 1990-1991 Persian Gulf War is dubbed by some as the first "space war" because support from space displayed great improvement over what was available during the previous major conflict, Vietnam. These systems continue to play significant roles in U.S. military operations. How to organize DOD and the intelligence community to work effectively on space programs has been an issue for many years.

Tracking the DOD space budget is extremely difficult since space is not identified as a separate line item in the DOD budget. Additionally, DOD sometimes releases only partial information (omitting funding for classified programs) or will suddenly release without explanation new figures for prior years that are quite different from what was previously reported.

A breakdown by program acquisition costs for individual weapon systems in the DOD budget request for FY2008 is available online at [http://www.dod.mil/comptroller/defbudget/fy2008/fy2008_weabook.pdf]. The FY2007 authorization and appropriations bills contain the authority and funding for DOD space activities, but, as mentioned, do not specify figures for those activities. The House and Senate passed conference agreements on both the FY2007 national defense authorization bill, H.R. 5122, and the FY2007 defense appropriations bill, H.R. 5631. The President signed the appropriations bill into law, P.L. 109-289, (H.Rept. 109-504; S.Rept. 109-292; H.Rept. 109-676: in Congressional Record H6996-7309) on September 29, 2006, and he signed the authorization bill into law, P.L. 109-364, (H.Rept. 109-452; H.Rept. 109-702: in Congressional Record H8061-8540) on October 17, 2006. Specific figures for the programs included in this report are contained in those sections.

Contents

U.S. Military Space: Status of Selected Programs

Recent Congressional Activity

On April 19, 2007, the Senate Committee on Armed Services Subcommittee on Strategic Forces held open and closed hearings on military space programs in review of the defense authorization request for fiscal 2008 and the Future Years Defense Program.

Background

The 1958 National Aeronautics and Space Act specified that military space activities be conducted by the Department of Defense (DOD). The Undersecretary of the Air Force is DOD's executive agent for space. The intelligence community makes significant use of space-based intelligence collection capabilities. The National Reconnaissance Office (NRO), an agency within DOD, builds and operates intelligence-collection satellites and collects and processes the resulting data, which are provided to users such as the National Geospatial-Intelligence Agency (NGA) and the National Security Agency (NSA). NRO, NGA, and NSA are all under the oversight of the Director of National Intelligence (DNI).[1]

DOD and the intelligence community manage a broad array of space activities, including launch vehicle development, communications satellites, navigation satellites (the Global Positioning System — GPS),[2] early warning satellites to alert the United States to foreign missile launches, weather satellites, reconnaissance satellites, and developing capabilities to protect U.S. satellite systems and to deny the use of space to adversaries (called "space control" or "counterspace systems"). The 1990-1991 Persian Gulf War is dubbed by some as the first "space war" because support from space displayed great improvement over what was available during the previous major conflict, Vietnam. These systems continue to play significant roles in U.S. military operations.

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[1] See CRS Report RL32515, *Intelligence Community Reorganization: Potential Effects on DOD Intelligence Agencies*, by Richard A. Best, Jr., for more on the DNI and potential effects for DOD intelligence agencies, including NRO, NGA, and NSA.

[2] For additional information on GPS, see "The Future of the Global Positioning System," Defense Science Board, October 2005, online at [http://www.acq.osd.mil/dsb/reports/2005-10-GPS_Report_Final.pdf].

How to organize DOD and the intelligence community to work effectively on space programs has been an issue for many years. Congress established commissions to review the NRO in the FY2000 intelligence authorization act, P.L. 106-120; NGA (then called NIMA, the National Imagery and Mapping Agency) in the classified annex to the FY2000 DOD appropriations act, P.L. 106-79; and overall U.S. national security space management and organization in the FY2000 DOD authorization act, P.L. 106-65. The NRO, NGA/NIMA, and "Rumsfeld Space Commission" reports are discussed below.

Although U.S. military and civilian space programs are separated organizationally, the functions performed by satellites and the vehicles that launch them are not easily divided. Both sectors use communications, navigation, weather, and remote sensing/reconnaissance satellites, which may operate at different frequencies or have different capabilities, but have similar technology. The same launch vehicles can be used to launch any type of military, civilian, or commercial satellite. DOD uses some civilian satellites and vice versa.

After the Cold War, interest in space weapons to attack satellites (antisatellite, or ASAT, weapons) or ballistic missiles declined initially, but was rekindled beginning with the 104th Congress. Using satellites to attack ballistic missiles has been controversial since President Reagan's 1983 announcement of a Strategic Defense Initiative to study the viability of building a ballistic missile defense system to protect the United States and its allies. The Clinton Administration changed the name of the Strategic Defense Initiative Organization to the Ballistic Missile Defense Organization to reflect a new focus on theater missile defense in the wake of the Persian Gulf War, rather than national missile defense. The George W. Bush Administration changed the name to the Missile Defense Agency (MDA) to reflect its interest in broad missile defense goals.[3]

The concept of placing weapons in space, as part of a missile defense system or otherwise, remains controversial. A May 18, 2005, *New York Times* article reported that the new national space policy being developed by the Bush Administration would "move the United States closer to fielding offensive and defensive space weapons."[4] Then-White House Press Secretary Scott McClellan, responding to questions at a White House press briefing, stressed that the new policy, still being developed, does not represent a substantial shift in U.S. policy. The same day, Representative Kucinich introduced a bill (H.R. 2420) that would have banned weapons in space and the use of such weapons to damage or destroy objects in orbit. The House rejected (124-302) a Kucinich amendment to the Foreign Relations Authorization Act (H.R. 2601) on July 20, 2005, that was similar to his bill.

The issue of using weapons to destroy satellites has received renewed attention after the Chinese successfully destroyed a defunct weather satellite on January 11, 2007. Since the orbit of that satellite was approximately where the United States has

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[3] See CRS Report RL31111, *Missile Defense: The Current Debate*, coordinated by Steven A. Hildreth.

[4] Weiner, Tim, "Air Force Seeks Bush's Approval for Space Arms," *The New York Times*, May 18, 2005, p. 1.

many of its reconnaissance satellites, China's actions have caused a great deal of concern.[5]

DOD Space Budget

Space is not a line item in the DOD budget and DOD's annual budget justifications do not include a figure for "space activities"; therefore, DOD funding figures must be used cautiously. DOD sometimes releases only partial information or will release without explanation new figures for prior years that are quite different from what was previously reported.[6]

FY2008 Budget Request

A breakdown by program acquisition costs for individual weapon systems in the DOD budget request for FY2008 is available online at [http://www.dod.mil/comptroller/defbudget/fy2008/fy2008_weabook.pdf].

FY2007 Authorization and Appropriations

The FY2007 authorization and appropriations bills contain the authority and funding for DOD space activities, but, as mentioned, do not specify figures for those activities. The House and Senate passed conference agreements on both the FY2007 national defense authorization bill, H.R. 5122, and the FY2007 defense appropriations bill, H.R. 5631. The President signed the appropriations bill into law, P.L. 109-289,[7] on September 29, 2006, and he signed the authorization bill into law, P.L. 109-364,[8] on October 17, 2006.

Selected Military Space Program Issues

For many years, questions have arisen about whether DOD effectively manages its space activities, and several commissions and task forces have studied the issue. Congress created a commission in the FY2000 DOD authorization bill to make recommendations on the overall management of national security space programs. Chaired by Donald Rumsfeld, the commission released its report on January 11, 2001, shortly after Mr. Rumsfeld became Secretary of Defense. The "Rumsfeld

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[5] Liu, Melinda and John Barry, "Sat Wars?," Newsweek (Online Only), January 25, 2007, [http://www.msnbc.msn.com/id/16810197/site/newsweek/].

[6] Space spending by all federal government agencies, by year since FY1959, is provided in Appendix E of the annual Aeronautics and Space Report of the President, submitted to Congress by NASA. The most recent edition [http://history.nasa.gov/presrep2004.pdf] covers funding through FY2004.

[7] See H.Rept. 109-504; S.Rept. 109-292; Conf. Rep. 109-676 (in Congressional Record H6996-7309).

[8] See H.Rept. 109-452; Conf. Rep. 109-702 (in Congressional Record H8061-8540).

Space Commission" made sweeping recommendations for management of DOD and intelligence community space programs. According to two reports by the Government Accountability Office (GAO), DOD intended to implement 10 of the 13 organizational recommendations,[9] although no additional updates have been provided.

Several DOD space programs have experienced significant cost overruns and schedule delays, raising concerns about DOD's acquisition process for space systems. The Defense Science Board (DSB) and Air Force Scientific Advisory Board (AFSAB) commissioned a task force chaired by retired Lockheed Martin executive Tom Young to review DOD space program acquisition because of significant cost increases in several programs; its May 2003 report was publicly released in September 2003.[10] Four key findings of the report were that cost has replaced mission success as the primary driver in managing acquisition processes, creating excessive technical and schedule risk; the space acquisition system is strongly biased to produce unrealistically low cost estimates; government capabilities to lead and manage the acquisition process have seriously eroded; and there are long term concerns about the space industrial base. According to press reports, the task force produced an update in August 2004 that concluded that some of the space programs it criticized were making progress but still required close review, and that better coordination is needed between the military and intelligence agencies in setting requirements.[11]

On April 6, 2006, the Senate Committee on Armed Forces held a hearing on space acquisitions. At that hearing, Cristina T. Chaplain, GAO's Acting Director of Acquisition and Sourcing, testified that DOD's space acquisition programs continue to face substantial cost and schedule overruns. In some cases, according to Ms. Chaplain, cost growth has come close to or exceeded 100%, causing DOD to nearly double its investment with no corresponding increase in functionality. Additionally, many programs have experienced significant schedule delays — as much as six years — postponing delivery of promised capabilities to the warfighter.[12]

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[9] "Defense Space Activities: Status of Reorganization," GAO-02-772, June 2002, and "Defense Space Activities: Organizational Changes Initiated, but Further Management Actions Needed," GAO-03-379, April 2003.

[10] Report of the Defense Science Board/Air Force Scientific Advisory Board Joint Task Force on Acquisition of National Security Space Programs, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, May 2003, online at [http://www.acq.osd.mil/dsb/reports/space.pdf].

[11] See, for example, Merle, Renae, "Report Says Air Force's Space Programs Improved," *The Washington Post*, August 25, 2004, E02.

[12] Ms. Chaplain's full testimony is available online at [http://armed-services.senate.gov/e_witnesslist.cfm?id=1823]. Additional written comments submitted in response to specific questions from the committee are available online at [http://www.gao.gov/new.items/d06776r.pdf].

SBIRS-High

SBIRS-High is designed as a constellation of five satellites above the equator in geostationary orbit (GEO) plus sensors on two other satellites in highly-elliptical orbits (HEO). DOD still plans to launch the sensors on the two HEO satellites, but will procure, at most, three of the GEO satellites. The funds that would have been spent for the fourth and fifth GEO satellites reportedly will be used instead to design an alternative system using state-of-the-art technologies. Launch is scheduled for 2009.

SBIRS-High will eventually replace the DOD's Defense Support Program series of early warning satellites that alert the National Command Authority to foreign missile launches; however, the program[13] has encountered significant schedule delays and cost growth, breaching "Nunn-McCurdy" cost-growth limits several times.[14] The May 2003 report of the Defense Science Board and Air Force Scientific Advisory Board criticized early program management of SBIRS-High and took a cautious attitude concerning whether the restructured program would succeed.[15] An October 2003 GAO report[16] concluded the program remained at "substantial risk of cost and schedule increases." Even though test delays and technical difficulties have become commonplace within SBIRS-High, Congress has continued to acknowledge the program's importance, and has therefore maintained high levels of funding.

The President's FY2008 budget request of $1.07 billion represents a total increase of $400.9 million from FY2007, with $587 million reserved for RDT&E and $483 million for procurement. The proposal provides for the continued assembly, integration, and testing of the first two SBIRS geosynchronous (GEO) satellites as well as to the procurement of one SBIRS GEO satellite and two highly elliptical orbit (HEO) satellite payloads. First launch is expected in 2009.

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[13] An overview of this program is available online at [http://www.globalsecurity.org/space/library/report/1998/sbirs-brochure/part07.htm].

[14] 10 U.S.C § 2433, commonly referred to as the "Nunn-McCurdy" provisions, requires the Pentagon to justify continuation of a program whose costs have grown by 25% or cancel the project.

[15] Report of the Defense Science Board/Air Force Scientific Advisory Board Joint Task Force on Acquisition of National Security Space Programs, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, May 2003, online at [http://www.acq.osd.mil/dsb/reports/space.pdf].

[16] "Despite Restructuring, SBIRS High Program Remains at Risk of Cost and Schedule Overruns," GAO-04-48, October 2003.

Transformational Communications Satellite (TSAT)

The Transformational Communications Satellite[17] program is planned to be a follow-on to the Advanced Extremely High Frequency (AEHF) program,[18] which, in turn, is a follow-on to the current series of Milstar satellites. AEHF itself is controversial because of cost overruns and changing satellite and constellation specifications. TSAT is expected to "transform" DOD communications by providing vastly greater capacity than is available today by operating at much higher (optical) frequencies. If TSAT is delayed, some observers suggest that additional AEHF satellites may be needed.

In May 2006, GAO released a report outlining the ongoing issues and problems, in the development and deployment of the TSAT system.[19] Specifically, GAO stated that DOD was not meeting original cost, schedule, and performance goals established for the TSAT program. However, GAO noted that DOD is taking positive steps to lower risk in the TSAT program so it can enter the product development phase with greater chance of success.

The FY2007 appropriation for TSAT is $737.1 million, $130 million below the $867 million budget request. Congress also directed the Secretary of the Air Force to submit a report to the congressional defense committees explaining what actions the Air Force has taken to address the remaining concerns raised by the TSAT Program Review Group and the GAO, including (1) the need to significantly refine requirements so that program content can be matched to budget constraints, and how the Department plans to control requirements to prevent problems associated with 'requirements creep'; (2) the need to adequately staff the TSAT program office with experienced space acquisition professionals; (3) the status of refining key performance parameters so they provide specificity and validation metrics; and (4) the implications for other programs, such as Space Radar and Future Combat System, of a less capable initial block of TSAT satellites. This report was delivered February 15, 2007, as required.

For FY2008, the President has requested a budget for research and development of $963.6 million — an increase of nearly $234 million over FY2007 funding levels. The total appropriation of $729.9 million in 2007 was a net increase of 43% from FY2006. The first TSAT was planned to launch in late 2014, but the Air Force pushed that date to early 2016.

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[17] An overview of this program is available online at [http://www.globalsecurity.org/space/systems/tsat.htm].

[18] The first AEHF launch is scheduled for April 2008.

[19] Space Acquisitions: DOD Needs Additional Knowledge as it Embarks on a New Approach for Transformational Satellite Communications System, GAO, May 2006, available online at [http://www.gao.gov/new.items/d06537.pdf].

Space Radar

Space Radar[20] is planned to consist of a yet-to-be-determined number of satellites that would track mobile targets (as opposed to fixed targets) on the ground. As of January 2007, the Air Force had not yet decided on the final design of the satellites or the final architecture of the constellation. The House Appropriations Committee has sharply criticized the program for the past several years[21] due to ongoing cost overruns and missed R&D milestones.

Congress also directed the Secretary of Defense and the Director of National Intelligence (DNI) to submit a joint report to the congressional defense and intelligence committees describing (1) the respective roles and responsibilities of the intelligence community and the DOD with respect to the development of the Space Radar program, including an updated Memorandum of Agreement between the Secretary and the DNI; (2) the process by which the intelligence community and the DOD coordinate joint development efforts and requirements definition; and (3) the plans for achieving a cost-share agreement between the intelligence community and the Department for the development and acquisition of a Space Radar capability. Congress also asked for a commitment from the Secretary and the DNI that Space Radar would be a single system responsive to the requirements of each organization. This report was due March 1, 2007, but has not yet been submitted.

Beginning in FY2008, funding for the Space Based Radar will transfer to the Defense Reconnaissance Support Activities Program and funding amounts have been classified for the FY2008 budget request because of the program's integration into the National Intelligence Community. For FY2007, Congress appropriated $186.4 million for the Space Radar program, nearly twice the FY2006 budget of $98.3 million. The first satellite launch is scheduled for FY2016.

Additional information about Space Radar is available in the January 2007 Congressional Budget Office report, "Alternatives for Military Space Radar."[22] This report outlines four alternative system/constellation architectures that would meet the mission requirements of the Air Force.

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[20] An overview of this program is available online at [http://www.globalsecurity.org/space/systems/sr.htm].

[21] For example, in its 2004 report on the FY2005 DOD appropriations bill (H.Rept. 108-557), the committee noted that the estimated cost for a nine-satellite constellation was $34 billion, and the Air Force considers nine satellites to be less than half the number required. The committee expressed skepticism about the $34 billion estimate, as well.

[22] This report is available online at [http://www.cbo.gov/ftpdocs/76xx/doc7691/01-03-SpaceRadar.pdf].

Space Tracking and Surveillance System (STSS) (formerly SBIRS-Low)

The Space Tracking and Surveillance System (STSS, previously SBIRS-Low) is designed to support missile defense.[23] The goal of an operational STSS is to track missiles through all three phases; discriminate between warheads and decoys; transmit data to other systems that will be used to cue radars and provide intercept handovers; and provide data for intercept hit/kill assessments. Tracking missiles during the mid-course phase is more difficult than during boost, because the missile is no longer firing its engines and hence does not have a strong infrared (heat) signature, making it necessary to track a cold object against the cold background of space. Similarly, tracking warheads after they have been deployed, and discriminating between warheads and decoys, is a technically challenging task.

Cost estimates are problematic because there is no final system architecture and the schedule is in flux. In March 2005, GAO reported that DOD's estimate for the program between 2002 and 2011 is approximately $4.5 billion; a life cycle cost was not provided.[24]

For FY2008, the president requested a budget of $331 million for the STSS program, an increase from the FY2007 budget of $322 million. Launch information was not available.

[23] The STSS program has gone through several name changes, making it difficult to track. Management of this program was transferred from the Air Force back to the Ballistic Missile Defense Organization (BMDO), to emphasize that missile defense is its primary objective. BMDO is now the Missile Defense Agency (MDA). For more on missile defense, see CRS Report RL31111, *Missile Defense: The Current Debate*, by Steven A. Hildreth.

[24] GAO, Defense Acquisitions: Status of Ballistic Missile Defense Program in 2004, March 2006, GAO-05-243. In this report, GAO reported that DOD had estimated the life-cycle cost for STSS (then SBIRS-Low) through FY2022 at $11.8 billion. The House Appropriations Committee reported in late 2001 (H.Rept. 107-298, p. 250) that the program's life cycle cost had grown from $10 billion to over $23 billion.