Precision: the ability to deliver discriminating, tailored effects. Highly accurate space-based navigation and timing systems, integrated with airborne platforms, already have increased dramatically the effective delivery of munitions anywhere and anytime. The ability to coregister targeting information in a common coordinate system will yield even greater precision.

Three-Dimensional Maneuverability: the ability to threaten the enemy through the movement of forces in the aerospace continuum. From its inception, airpower has presented the dilemma of defending against forces that fly over or around surface defenses. Through maneuvering in the third dimension, aerospace forces bypass traditional tactical and operational barriers and even terrestrial notions of sovereignty to pursue strategic, operational, and tactical objectives (U.S. Air Force 2000, 6–7).

Space Commission Report (2001)

Congressional concern over the effective utilization of U.S. military space assets, coordination, military education and training, and operations prompted the creation of a Commission to Assess U.S. National Security Space Management in the fiscal year 2000 defense-spending bill passed in 1999. Congress directed this commission, which would be chaired by Donald Rumsfeld, to examine how military space assets could be exploited to support U.S. military operations, existing interagency coordination processes for national security space capabilities, relationships between intelligence and nonintelligence aspects of national security space programs, how professional military educational institutions address military space issues, and potential costs and benefits of establishing a separate military department and service dedicated to national security space missions or a creation of a comparable corps within the Air Force with such a dedicated mission (National Defense Authorization Act for Fiscal Year 2000, 106–65, 511, 814–815).

The commission issued its report in January 2001 at the end of the Clinton administration. Commission members determined that the increasing U.S. dependence on space and the vulnerabilities involved in this dependence require space's recognition as a top national security priority, that DOD and the intelligence community are not arranged or focused to meet 21st century national space needs, that the secretary of Defense and director of Central Intelligence (DCI) must have a close and effective partnership for the intelligence community and national command authority to work together to pursue national security objectives, that space will become a medium of human conflict and that the United States must develop superior space capabilities to deter and defend against hostile attacks, and that investment in science and technology resources is a prerequisite if the United States is to remain the world's preeminent space-faring nation (U.S. Commission to Assess United States National Security Space Management and Organization 2001, 99–100).

Specific recommendations made by commissioners focusing on congressional organization and management expectations outlined in the commission's charter include the following:

- Provide for national level guidance that establishes space activity as a fundamental national interest of the United States.
- Create a process to ensure that the national level policy guidance is carried out among and within the relevant agencies and departments.
- Create conditions that encourage the DOD to develop and deploy systems in space to deter attack on and, if deterrence should fail, to defend U.S. interests on earth and in space.
- Create conditions that encourage the intelligence community to develop revolutionary methods for collecting intelligence from space.
- Account for the increasingly important role played by the commercial and civil space sectors in the nation's domestic and global economic and national security affairs.
- Develop a military and civilian cadre of space professionals within the DOD, the intelligence community, and throughout government more generally.
- Provide an organizational and management structure that permits officials to be agile in addressing the opportunities, risks, and threats that inevitably will arise.
- Ensure that the DOD and the intelligence community are full participants in preparing government positions for international negotiations that may affect U.S. space activities (U.S. Commission to Assess United States National Security Space Management and Organization 2001, xxx; U.S. Congress, Senate Committee on Armed Services, Subcommittee on Strategic 2002).

DOD Directive 5101.2 DOD Executive Agent for Space (2003)

The 2001 space commission also expressed its reaffirmation of existing *DOD Directive 5160.32* that the Air Force should remain the executive agent for space. The issuance of an updated order covering this—*DOD Directive 5101.2*—on June 3, 2003 reinforced existing policy and incorporated the space commission's wishes. This document again designated the secretary of the Air Force as the DOD's executive agent for space with responsibility for planning and programming major DOD space-system programs and acquisitions. The directive went on to describe space forces as "the space and terrestrial systems, equipment, facilities, organizations, and personnel necessary to use, and, if directed control space for national security." It maintained space power constituted "the total strength of a nation's capabilities to conduct and influence activities to, in, through, and from the space medium to achieve its objectives." The directive also described space systems as

representing "All of the devices and organizations forming the space network. These consist of: spacecraft; mission package(s); ground stations; data links among spacecraft, ground stations, mission or user terminals, which may include initial reception, processing, and exploitation; launch systems; and directly related supporting infrastructure, including space surveillance and battle management/command, control, communications, and computers." (Spires 2004, 2:1215; *U.S. Department of Defense Directive 5101.2* 2003; 2–4).

Air Force Counterspace Operations Doctrine (2004)

A notable recent addition to the burgeoning literature of military produced space-policy documents is *Counterspace Operations: Air Force Doctrine Document 2–2.1* issued in August 2004. Issued in the aftermath of the conventional phase of 2003's Operation Iraqi Freedom, this document sought to further incorporate an aspect of space military operations into Air Force military doctrinal thought.

Chapters within this work seek to emphasize the general importance of counterspace operations, command and control of counterspace operations, space situation awareness including the relevant components of intelligence, surveillance, reconnaissance, environmental monitoring and command and control, characteristics of defensive and offensive counterspace operations, and planning and executing counterspace operations (U.S. Air Force, 2004, iii-iv).

Important foundational doctrinal hypotheses to Air Force counterspace operations include stressing that such operations are the means by which the Air Force achieves and maintains space superiority, that Air Force counterspace operations are intended to protect U.S. and allied military space capability while denying such capability to adversaries, and that the Air Force brings space expertise from a spectrum of military operations as a single service and in cooperation with other services through joint operations. Additional foundational doctrinal tenets include counterspace operations having offensive and defensive components depending on robust space situational awareness (SSA). Achieving SSA requires support from all levels of planners, decision makers, and operators representing terrestrial and space components. Defensive counterspace operations are required to preserve the U.S./allied ability to advantageously exploit space, offensive counterspace operations are required to prevent adversaries from exploiting space for their advantage, and counterspace operations must be conducted across war's tactical, operational, and strategic levels by all U.S. military forces (U.S. Air Force 2004, vii; Ziarnick 2004, 61–70).

This doctrinal document also stresses how hostile forces can conduct a wide spectrum of asymmetric attacks against U.S. space assets using various methods including:

- Ground system attack and sabotage using conventional and unconventional means against terrestrial nodes and supporting infrastructure.
- Radio frequency (RF) jamming equipment capable of interfering with space system links.

- Laser systems capable of temporarily or permanently degrading or destroying satellite subsystems, thus interfering with satellite mission performance.
- Electromagnetic pulse (EMP) weapons capable of degrading or destroying satellite and/or ground system electronics.
- Kinetic antisatellite (ASAT) weapons capable of destroying spacecraft or degrading their ability to perform missions.
- Information operations (IO) capabilities capable of corrupting space-based and terrestrial-based computer systems utilized to control satellite functions and to collect, process, and disseminate mission data (U.S. Air Force 2004, 4).

Air Force Doctrine 2–2.1 and the 2001 *Space Operations: Air Force Doctrine Document 2–2* (U.S. Air Force 2001) represent a growing emphasis on integrating military space into Air Force and military operational doctrine.

They conclude this review of six decades worth of military space policy documents representing multiple U.S. armed services with Air Force publications constituting the preponderance of U.S. military space policy doctrinal theory and policy statements. These documents demonstrate that determining the Air Force's and the U.S. military's proper operational military space policy mission and strategy remains an elusive concept and one which is still struggling to achieve resolution. This struggle will likely continue due to a variety of political and other constraints. Some of these constraints can be understood further by looking at presidential space policy directives and national space policy documents produced by the president under the organizational auspices of institutions such as the NSC.

Presidential Space Policy Directives/National Space Policy Documents

The most important U.S. Government space policy documents, whose scope covers both civilian and military aspects of space, are publications issued by the president through the Executive Office of the President (Dickenson 2005, 135–172), agencies such as the NSC (U.S. Department of State, Office of the Historian 1997; Zegart 1999; Best 2001), and the Office of Science and Technology Policy (OSTP) (Mann 2000, Herken 2000).

Although the OSTP serves as the president's primary science and technology advisor (U.S. National Archives and Records Administration 2006, 96), most military space policy documents issued by presidential administrations from Eisenhower to George W. Bush are issued by the NSC.

NSC documents setting forth the foreign and national security policies of individual presidential administrations have been produced by NSC staff and by DOD and State Department personnel. While some of these publications may be published in the *Federal Register,* the sensitive nature of this work can result in them remaining classified for decades. Upon declassification, these works can be found in presidential libraries, may be

available on presidential library websites, and may be published by commercial publishers. These publications can go under a variety of names such as NSC Policy Papers during the Eisenhower administration, National Security Study Memoranda (NSSM) and National Security Decision Memoranda (NSDM) during the Nixon and Ford administrations, Presidential Review Directives and Presidential Decision Directives (PDDs) during the Clinton administration, and National Security Presidential Directives (NSPDs) during the George W. Bush administration. The number of these documents issued during individual presidential administrations varies with nearly 250 NSSMs issued during the Nixon-Ford administrations and at least 318 NSDMs issued during this same time period (Relyea 2005, 8–12; Dwyer 2002, 410–19).

The remainder of this chapter presents excerpts from selected presidential military space policy documents from the Eisenhower administration to the present. These documents cover military and diplomatic aspects of national security space policy. The authority of some may be enduring, while others may last for brief periods of time before being rescinded by subsequent presidential actions or policies. Brief contextual overviews are provided on the circumstances and events prompting the issuance of these documents.

Eisenhower Administration (1953–1961)

The emergence of space as a factor in U.S. national security policy, exemplified by the 1957 Soviet Sputnik satellite launch and the emergence of ICBMs as military weapons, are key contextual backdrops to Eisenhower administration space policy. One of the earliest U.S. Government national security space policy documents was *NSC 5520* "U.S. Scientific Satellite Programs" issued by the Eisenhower administration in 1955. This document observed that U.S. scientific programs should be motivated by the desire to preserve the United States' freedom of action in space and that no actions should take place in space research or international diplomatic negotiations that would restrict the United States' ability to engage in space research without the consent of other nations. This latter point became a crucial tenet of U.S. space policy (Lambakis 2001, 213). Eisenhower administration space policy documents reflected a tension between promoting peaceful uses of outer space while simultaneously seeking not to place restrictions on the United States' ability to use space for military or other purposes (Hall 1995, 58–72).

NSC 5520 went on to observe that establishing small scientific satellites could produce substantial benefit, that the first nation to launch a satellite would receive considerable international prestige, that the JSC believed a military intelligence application would benefit from constructing a large surveillance satellite, that a small satellite program could be developed from existing DOD missile programs, and that missile defense research would gain from experiences acquired in finding and tracking satellites (U.S. National Security Council 2006(a), 8–15).

The Soviet Union's October 4, 1957 launch of a Sputnik satellite produced drastic changes in U.S. policies toward space and its potential military implications (McDougall

Sputnik I, the first artificial satellite to successfully orbit the Earth, was launched by the Soviet Union on October 4, 1957. *(Bettmann/Corbis)*

1997, 141–194). August 18, 1958 saw the release of *NSC 5814* "Preliminary U.S. Policy on Outer Space," which sought to list multiple civilian and military uses of space along with relevant legal implications while also establishing outlines for international cooperation in space. In its efforts to retain optimal legal and political flexibility for the United States, *NSC 5814* advised against delineating a boundary between air and space to allow for liberal legal interpretation of what constituted "peaceful uses" of outer space (Lambakis 2001, 215–216).

This document also sought to list the numerous existing and potential military uses of outer space including ballistic missiles and missile defense systems, military reconnaissance, weather observation satellites, military communication satellites, electronic countermeasures or jamming satellites, navigation aids, manned defensive outer space vehicles, bombardment satellites, and manned lunar stations. It decided to not include missile and missile defense systems into U.S. space policy to avoid confusion about what was or was not a space vehicle. Particular emphasis was placed on the potential military intelligence value of reconnaissance satellites as this passage demonstrates:

> 20. Reconnaissance satellites are of critical importance to U.S. national security. Those now planned are designed: (a) to gather military intelligence data, weather

> data, and information on the economic potential of the Sino-Soviet Bloc; and (b) to detect the launching of a missile or air attack upon the United States or its allies. Reconnaissance satellites would also have a high potential use as a means of implementing the "open skies" proposal or policing a system of international armaments control (U.S. National Security Council 2006(a), iii, 30–31; Lambakis 218).

The next major Eisenhower administration space policy document was *NSC 5918/1* "U.S. Policy on Outer Space" issued in early 1960 and intended to supersede *NSC 5814/1.* This document acknowledged the space technology's civilian, military, and political implications and warned that the United States must take energetic steps to combat the perception that the United States had fallen behind the Soviet Union in space technology. It also recommended a 60% increase in NASA's budget and said the United States should emphasize space projects with demonstrable results such as manned spaceflight (McDougall 1997, 205).

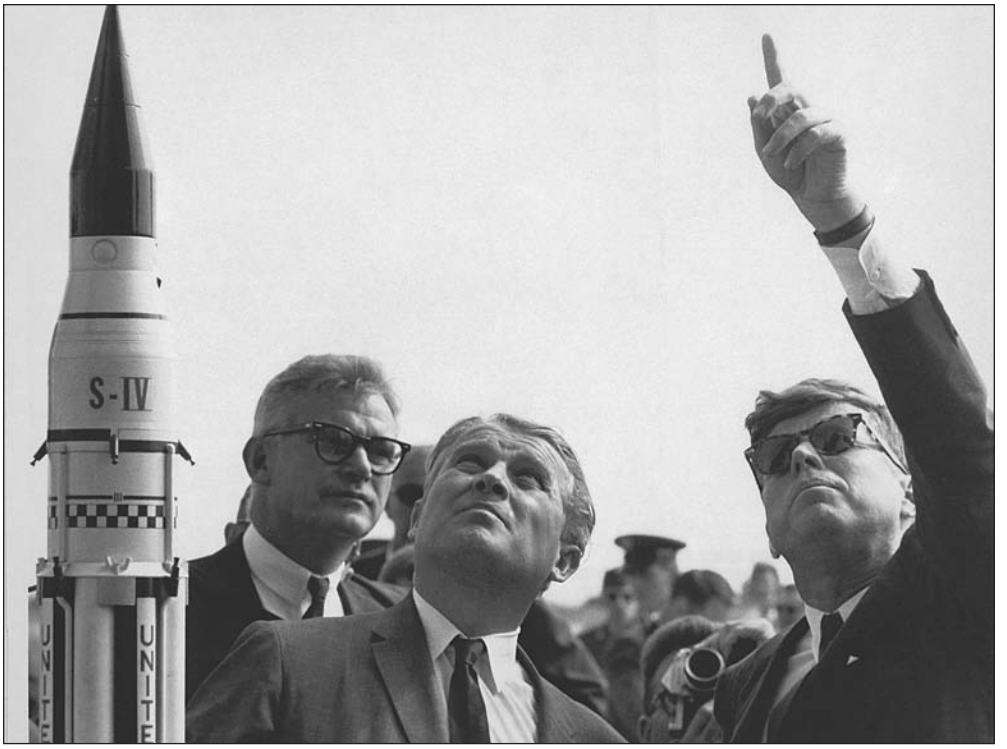
NSC 5918/1 went on to acknowledge that space represented "a new and imposing challenge," that recent Soviet space successes had caused them to experience substantial and long-term prestige enhancement, and created an image of communist nations as a superior military power (U.S. National Security Council 2006(a), 58–59). An appropriate U.S. response to these developments, according to *NSC 5918/1,* would involve the following actions:

> 31. Carry out energetically a program for the exploration and use of outer space by the U.S., based upon sound scientific and technological progress, designed: (a) to achieve that enhancement of scientific knowledge, military strength, economic capabilities, and political position which may be derived through the advantageous application of space technology and through appropriate international cooperation in related matters, and (b) to achieve and demonstrate an over-all U.S. superiority in outer space without necessarily requiring United States supremacy in every space of space activities (U.S. National Security Council 2006(a), 67).

Kennedy Administration (1961–1963)

The Kennedy administration began with the president not having a particular space policy on the agenda but accepting the view that space would play a particularly important role in promoting national prestige and security. Soon after his administration began, Kennedy sought to commit the United States to a manned landing on the moon by the end of the decade, which he proposed in a May 25, 1961 address to a joint session of Congress and which represents the defining moment of his space policy pronouncements (U.S. Congress 1961, 8877–8882; McDougall 1997, 302–306).

His abbreviated administration also saw Kennedy take other policy actions that increased U.S. military activity in space and sought to expand international cooperation to



Dr. Wernher von Braun explains the Saturn Launch System to President John F. Kennedy. NASA Deputy Administrator Robert Seamans is to the left of von Braun. *(NASA)*

promote peaceful uses of outer space (Kay 1998, 573–586; Elliott, 1992). *National Security Action Memorandum (NSAM) 129* issued on February 23, 1962 sought to promote U.S.–Soviet cooperation in space exploration. In this document, Kennedy stressed his strong support for United Nations (UN) space science programs and directed National Security Advisor McGeorge Bundy (1919–1996) to work with NASA, the special assistant to the president for science and technology, and the State Department to develop concrete proposals and recommendations as ways for opening pertinent discussions with the Soviets (U.S. National Security Council 2006(a), 93).

May 26, 1962 saw the issuance of *NSAM 156,* which mentioned U.S. participation in various international negotiations on disarmament and peaceful uses of outer space. This document acknowledged that such negotiations could be lengthy and present the problem of what constitutes legitimate uses of outer space and whether space reconnaissance falls into this category. *NSAM 156* went to express this concern as follows:

> In view of the great national security importance of our satellite reconnaissance programs, I think it is desirable that we carefully review these negotiations with a view to formulating a position which avoids the dangers of restricting ourselves,

> compromising highly classified programs, or providing assistance of significant military value to the Soviet Union and which at the same time permits us to continue to work for disarmament and international cooperation in space (U.S. National Security Council 2006(a), 95).

The year 1962 also saw the United States' desire to implement a satellite reconnaissance program, which is now known as Project Corona, even though there was concern that such a program would be controversial in some sectors of international opinion, and information about this program would have to be kept secret to maintain its prospects for operational success. The document *NSC Action 2454* "Space Policy and Intelligence Requirements" issued on July 10, 1962 recommended a U.S. satellite reconnaissance policy promoting the free and peaceful use of space, restricted the amount of publicly releasable information about U.S. reconnaissance activity, and proposed further international discussion of a possible agreement to prohibit satellites from carrying weapons of mass destruction (U.S. National Security Council 2006(a), iv).

U.S. diplomatic sensitivity to the implications of its reconnaissance satellite program is reflected by acknowledging Japan's reluctance to cooperate with NASA in establishing U.S. tracking facilities due to the suspicion that this could involve military activities, mentioning that groups in Zanzibar and Nigeria have argued that U.S. tracking stations in their countries were inconsistent with a nonaligned foreign policy, and recognizing that there is partial evidence that a Sino–Soviet campaign attributing sinister motive to U.S. satellite programs might receive sympathetic reactions from anti-U.S. elements and others concerned about increasing international tension (U.S. National Security Council 2006(a), 102).

This concern to demonstrate that U.S. space programs were of pacific intent was expressed in *NSAM 183* issued on August 27, 1962. This document reflected Kennedy's desire that such intentions be assertively voiced and defended at upcoming sessions of the UN General Assembly and Outer Space Committee. The document also directed the State Department to consult with DOD, the CIA, NASA, the Atomic Energy Commission, the Arms Control and Disarmament Agency, and the presidential science advisor to develop positions demonstrating that the United States intends to keep free from aggressive use and is interested in cooperating to promote space's peaceful scientific and technological purposes. *NSAM 183* also directed these agencies to demonstrate that distinguishing between peaceful and aggressive uses of space is not the same as distinctions between military and civilian uses, to build and maintain support for space reconnaissance's legality and propriety, to clarify that U.S. nuclear tests nor other space experiments were undertaken without proper scientific responsibility but as a response to previous Soviet tests, to explain that U.S. military space programs are defensive, and to stress that U.S. communication satellite policies conform to relevant international agreements (U.S. National Security Council 2006(a), 107).

Kennedy's own personal interest in promoting peaceful uses of outer space was reflected in *NSAM 192* issued on October 2, 1962. This document served as a follow up to *NSAM*

156 and *NSC Action 2454* and expressed his desire to be informed before the United States presented an initiative to the UN General Assembly or other international forum on proposals to ban weapons of mass destruction in outer space (U.S. National Security Council 2006(a), 111).

July 25, 1963 saw the Kennedy administration's final major space policy accomplishment with the signature of the Test Ban Treaty prohibiting nuclear weapons tests or other nuclear explosions underwater, in the atmosphere, or in outer space. The U.S. Senate ratified the treaty on September 24, 1963, and it entered into force on October 10 (U.S. Department of State, Bureau of Verification, Compliance, and Implementation, n.d., 1–5).

Johnson Administration (1963–1969)

The Vietnam War and its controversies served as the principal national security event of the Johnson administration. This did not prevent the United States from continuing to pursue some important space policy initiatives such as the growth and success of the Gemini and Apollo manned spaceflight programs (Rumerman 1998), declaring in 1964 that the United States was openly pursuing an ASAT capability to defeat Soviet bomb-carrying satellites like the fractional orbital bombardment system (Lambakis 2001, 223), and enhanced international cooperation in peaceful uses of outer space culminating in the 1967 OST (U.S. Department of State, Bureau of Verification, Compliance, and Implementation, n.d., 1–2).

Other noteworthy Johnson administration NSC national security space policy documents include *NSAM 285, NSAM 338,* and *NSAM 354. NSAM 285* "Cooperation with the USSR on Outer Space Matters" was issued on March 3, 1964. This memorandum sought to maintain a previously existing effort, begun with *NSAM 271* of November 12, 1963, to look for possible avenues to pursue peaceful space exploration with the Soviets and to monitor Soviet responses to U.S. space policy initiatives made at the UN (U.S. National Security Council 2006(a), 121).

NSAM 338 was written in response to the growing importance of the 1962 Communications Satellite Act, which lead to U.S. participation in the International Telecommunications Satellite Organization (INTELSAT) and saw satellite technology become increasingly important in facilitating global telecommunications. This September 15, 1965 document directed the Special Assistant to the President for Telecommunications to monitor U.S. policy assisting foreign communication satellite capability development and informing the president of any pertinent changes that may require his attention (U.S. National Security Council 2006(a), v-vi, 123).

NSAM 354 reflected the U.S. desire to cooperate with allied countries' space programs. This July 29, 1966 directive saw the United States encourage development of the European Launcher Development Organization (ELDO) (the predecessor the European Space Agency) and express the United States' willingness to cooperate with ELDO if it desired such cooperation. Johnson also directed DOD, NASA, and the State Department to take

Astronaut Edward White becomes the first American man to walk in space during the Gemini IV mission on June 9, 1965. *(NASA)*

the necessary actions to facilitate such cooperation (*National Security Space Project Presidential Decision: NSC Documents* 2006, vi, 125).

Nixon Administration (1969–1974)

The Nixon administration, responding to the sociopolitical strain and economic costs produced by the Vietnam War and "Great Society" social programs, decided the country was unable to afford large investments in manned space projects. This directional change was reflected in his March 7, 1970 speech announcing that U.S. space exploration would

place greater emphasis on unmanned vehicles and a limited continuation of the Apollo program. In January 1972 Nixon announced the beginning of the partially reusable STS, which became known as the space shuttle. The early 1970s saw significant international arms control agreements with the Soviet Union such as the Strategic Arms Limitation Talks (SALT I) and the ABM treaty of 1972, which limited nuclear missile growth, implicitly recognized the value of space-based reconnaissance by including a vague prohibition against interfering with either side's "National Technical Means" capabilities, banned the deployment of space-based ABM components, and drastically limited ABM deployment (Lambakis 2001; 224; Hoff 1997, 92–132; U.S. Arms Control and Disarmament Agency 1996, 110–114).

The Nixon administration made some military space developments such as deploying longer lasting military satellites such as the KH-9 in 1971, which reduced space launch demand while also producing navigation, communications, and meteorological satellite enhancements (Lambakis 2001, 224). *National Security Decision Memorandum (NSDM) 72* issued on July 17, 1970 ordered an interagency group to review policy aspects and establish procedures for the United States to exchange technical data with foreign governments and agencies wanting to enter into cooperative space programs with the United States. This document also directed preparation of procedures for future European cooperation in U.S. space programs while taking measures to protect U.S. national interests (U.S. National Security Council 2006(a), 129).

Ford Administration (1974–1977)

The Ford administration saw Soviet military space advances emerge and engage the attention of U.S. policymakers. U.S. concern was manifested by Soviet ASAT advances and by a growing realization of the United States' increasing dependence on space assets for national security, with communications being a particular area of concern. Further demonstration of this vulnerability was provided by a Defense Science Board assessment, which maintained that ground segments of U.S. space systems were vulnerable in wartime. Lackadaisical Air Force and DOD interest in space defense prompted Ford to issue a number of NSDMs to address these concerns (Lambakis 2001, 225).

NSDM 333 issued on July 7, 1976 sought to deal with the vulnerability of U.S. military satellites and directed the Air Force to use money to make progress in space surveillance and space defense (Stares 1985, 153–156, 168–170). Although only some of this document has been declassified as of late 2006, its content demonstrates the importance of these concerns to administration policymakers. Document highlights include stressing the need to make improvements to enhance the technical survivability of U.S. space assets, the need for providing clear, reliable, and timely warning of attacks against U.S. satellites, and the critical importance of providing positive verification of interference with critical military and intelligence satellite capabilities (U.S. National Security Council 2006(b), 5).

Illustration of an ASAT (antisatellite) missile after being launched from an F-15. U.S. concerns over Soviet ASAT programs lead the Ford Administration to authorize U.S. development of comparable ASAT capabilities. *(U.S. Department of Defense)*

This directive eventually resulted in establishing a System Program Office and SAMSO within the Air Force. Both Nixon and Ford contributed to the gradual termination of the United States' nuclear ASAT program initiated during the 1960s. However, an early 1977 Ford administration document *NSDM 345* resulted in directing DOD to develop a miniature homing-vehicle ASAT weapon launched by an F-15 jet fighter to counter Soviet ocean reconnaissance capabilities and study possible arms control options (Stares 1985, 171; Lambakis 2001; 225).

NSDM 345 U.S. Anti-Satellite Capability was issued on January 18, 1977 and directed the secretary of Defense to acquire a non-nuclear ASAT capability, mentioned that this interceptor be capable of destroying low altitude satellites and nullifying 6–10 Soviet military satellites within a week, be able to electronically nullify critical Soviet military satellites at all altitudes, that such U.S. electronic satellite capability should be classified with compartmented security procedures used to protect its existence and operating characteristics, and that the director of the Arms Control and Disarmament Agency work with the secretaries of State and Defense and DCI to develop relevant diplomatic and military policies concerning ASAT systems, specifying the acts that would constitute interference with such systems (U.S. National Security Council 2006(a), 143–145).

Carter Administration (1977–1981)

The Carter administration produced a number of documents covering various aspects of U.S. civilian and military space policy. Although concerned with promoting expanded international arms control with the Soviet Union, it continued Ford administration policies detailed in *NSDM 345* for developing an ASAT weapons system in the belief that such a system could be used in arms control negotiations with the Soviets (Stares 1985, 180–182).

Carter directed his NSC Policy Review Committee, whose membership consisted of major national security policymakers and cabinet officials such as the secretaries of Agriculture, Commerce, and Interior, to conduct a thorough review of U.S. space policies, which produced the first comprehensive national space policy review since the Eisenhower administration. This group received its marching orders in *Presidential Review Memorandum (PRM) 23* issued on March 28, 1977. *PRM 23* charged this group to determine space's relative importance for U.S. civil, military, and national intelligence programs; establish current ground rules for balancing and controlling interactions between civil, military, and national intelligence sectors to achieve interrelated national security, political, economic, and arms control goals; make recommendations on necessary space policy practices the

Jimmy Carter and Leonid Brezhnev sign the second Strategic Arms Limitation Treaty (SALT II) treaty on June 18, 1979, in Vienna. The treaty was the culmination of a second round of talks between the U.S. and Soviet Union seeking to curtail further development of nuclear arms. This treaty would not be ratified by the U.S. Senate due to the intense opposition to it caused, in part, by the Soviet invasion of Afghanistan later that year. *(Jimmy Carter Presidential Library)*

U.S. needed to change or modify; and recommend how to address recommendations and directives contained in previous NSC space policy documents (U.S. National Security Council 2006(a), 147–148).

Presidential Directive (PD) 25 issued on December 14, 1977 designated the White House OSTP director to review experiments capable of affecting the environment. This document also required presidential approval for space launches of nuclear systems through the OSTP (*National Security Space Project Presidential Decisions: NSC Documents* 2006, 153).

The most important Carter administration space policy document was the National Space Policy document contained in *PD 37* issued May 11, 1978. Culminating the work initiated with issuance of *PRM 23* a year earlier, this document formally acknowledged a U.S. military space program, reaffirmed the importance of free access to space, ordered satellite reconnaissance for intelligence operations to remain classified, and stressed a national commitment to operate global remote-sensing operations to support national objectives. *PD 37* also mentioned that the United States should continue using space to defend itself, deter attack, and promote arms control agreements while also providing preliminary encouragement to domestic commercial exploitation of space assets to enhance national economic and technological growth. It also depicted space as an arena for enhancing land, sea, and air power and continued preexisting ASAT research and development programs although it did not outline a plan for integrating space weapons into national military strategy (Lambakis 2001, 226).

Additional *PD 37* contents stress that space systems are national property and have the right of passage through and operations in space without interference, that the United States will pursue space activities supporting its right of self-defense, that it will maintain a national intelligence space program, pursue space activities to increase scientific knowledge, develop useful civil space technology applications, maintain national leadership in space, and conduct international cooperative space-related activities that benefit the United States scientifically, politically, economically, and/or militarily (*National Security Space Project Presidential Decisions* 2006, 152).

Important *PD 37* intelligence and military components demonstrating the crisis contingency planning involved in national security policymaking include the United States having a space program to acquire information and data for formulating and executing foreign and military policies; supporting planning for and conducting military operations; providing warning to support crisis management and monitor treaties; protecting sensitive information; and supporting military operational requirements (*National Security Presidential Documents: NSC Documents Supplement: Newly Declassified Excerpts,* 2006, 7).

The next major Carter administration space policy directive was *PD 42* issued on October 10, 1978. This document's focus was on assigning a committee to review the possible release of selected photoreconnaissance imagery and ordering a review of separate DOD and NASA space shuttle activities for ways of achieving enhanced budgetary efficiency. Other directive provisions mentioned that U.S. space policy would be focused on what can most effectively be accomplished in space rather than on individual large-scale engineering initiatives, continuing the LANDSAT satellite development program, examining

the potential for an integrated remote sensing system, achieving enhanced budgetary efficiencies in civilian and military meteorological satellite programs, possible combination of civilian and military oceanographic satellite programs, and ways of improving shuttle data link command and encryption between agencies such as the CIA, DOD, and NASA (U.S. National Security Council 2006(a), vii, 163–169; Mack 1990).

An additional noteworthy Carter administration space policy document dealt with the growing importance of remote sensing satellite capabilities in civilian and military operations. *PD 54* issued on November 16, 1979 enforced previously existing policies enumerated in *PD 37* and *PD 42* while defining three categories for remote sensing use. These categories were land, weather, and ocean programs. Overall directions of these programs involved separate classified activities having no civilian equivalents, joint or coordinated civil/military activities whose objectives could be achieved without jeopardizing national security, and integrating civil operational activities under civil agency management with coordination and regulation by an interagency board. In this latter instance, there would be no joint management and overall system convergence between classified space intelligence activities. *PD 54* also continued to separate DOD and Commerce Department polar-orbiting meteorological satellite programs (U.S. National Security Council 2006(a), vii, 171–173).

Reagan Administration (1981–1989)

The Reagan administration would see many significant and controversial changes in the direction of U.S. military space policy. The most important of these was SDI, which is described in greater detail in the Chapter 2. In August 1981 Reagan directed Dr. Victor H. Reis (born approximately 1935–), the assistant director of the OSTP, to conduct a national space policy review. This review was conducted by an interagency panel from various civilian and military agencies. Issues it was tasked with examining included: launch vehicle needs; whether existing space policy was sufficient to meet civil and military space program requirements; shuttle organizational responsibilities and capabilities; and potential space policy legislation (Stares 1985, 217).

In August 1981 the Reagan administration rejected a Soviet offer to discuss a space weapon treaty submitted to the UN General Assembly because of flaws administration policymakers saw in the treaty. The Reagan administration unveiled its strategic force modernization program to Congress during October and November 1981, which saw Secretary of Defense Casper Weinberger assert that the United States would continue pursuing an operational satellite system and stressed the need for the United States to have survivable early warning communication and attack assessment systems in the event of a nuclear war (Stares 1985; 217; U.S. Congress, Senate Armed Services Committee, Subcommittee on Strategic and Theater Forces 1982; U.S. Congress, Senate Committee on Foreign Relations 1981, 8–14).

Reagan administration NSC Documents were called *National Security Decision Directives (NSDD)* and the first military space policy oriented *NSDD* was issued November 13,

1981. *NSDD 8* designated the space shuttle as the primary space launch system for civil and military government missions. It went on to describe the shuttle as a national program requiring sustained commitment, that DOD would work with NASA to ensure that the shuttle was useful for defense missions, that national security missions would be integrated into shuttle launch schedules, and that launch priority will be given to national security missions (U.S. National Security Council 2006(a), 181).

The Reis review culminated in the July 4, 1982 issuance of a new U.S. national space policy statement *NSDD 42,* which superseded applicable Carter presidential directives and *NSDD 8. NSDD 42* declared the basic goals of U.S. space policy to be strengthening U.S. security; maintaining U.S. space leadership; obtaining economic and scientific benefits through space exploitation; expanding U.S. private sector investment and participation in civil space and space-related activities; promoting international cooperative activities if they are in the national interest; and cooperating with other nations in maintaining freedom of space (*National Security Space Policy Presidential Decisions: NSC Documents* 2006, 183).

Specific national security program objectives in *NSDD 42* included the following declarations:

> The United States will conduct those activities in space that are necessary to national defense. The military space program will support such functions as command and control, communications, navigation, environmental monitoring, warning, tactical intelligence, targeting, ocean and battlefield surveillance application (including an aggressive research and development program which supports these functions). In addition, military space programs shall contribute to the satisfaction of national intelligence requirements (U.S. National Security Council 2006(b), 8).

NSDD 42 also stressed that the United States would develop and deploy an operational ASAT system as soon as practical; that it would develop and maintain an integrated attack warning, notification, verification, and contingency reaction capability to effectively detect and react to threats to its space systems; that it would conduct research and planning and be prepared to develop and deploy space weapon systems to counter hostile space activities if conditions warranted; and that support of military operational requirements was a critical space intelligence mission (U.S. National Security Council 2006(b), 8–9).

Reagan's nationally televised March 23, 1983 address on ballistic missile defense marked the formal beginning of SDI and the controversy that the program produced. The authorizing program document for this was *NSDD 85* issued on March 25, 1983. A key excerpt from this document is this passage:

> I direct the development of an intensive effort to define a long-term research and development program aimed at an ultimate goal of eliminating the threat posed by nuclear ballistic missiles. These actions will be carried out in a manner consis-

> tent with our obligations under the ABM Treaty and recognizing the need for close consultations with our allies. . . I further direct a study be completed on a priority basis to asses the roles that ballistic missile defense could play in future security strategy of the United States and our allies. . . (U.S. National Security Council 2006(a), 205).

May 16, 1983 saw the issuance of *NSDD 94 Commercialization of Space Launch Vehicles.* This document saw the United States encourage the development of a commercial expendable space launch industry to the extent that these operations were consistent with existing laws, regulations, and national security interests. The shuttle remained the primary U.S. Government launch system, and promoting the growth and international economic competitiveness of the U.S. space launch industry served as primary objectives of this document (U.S. National Security Council 2006(a), 207–214; Launius and Jenkins 2002; Scarborough 1991).

January 6, 1984 saw the issuance of *NSDD 119* concerning formal policy guidance for SDI. DOD was given formal program management responsibility and a key program emphasis was on technologies involving non-nuclear kill concepts. SDI program research concepts were to emphasize strategic defense concepts using nuclear devices as a hedge against Soviet attempts to escape ABM Treaty restrictions (U.S. National Security Council 2006(a), 216).

Additional provisions of *NSDD 119* were that the United States would begin a comprehensive program for developing and demonstrating critical technological concepts associated with ballistic missile defense; coordinating this program with other strategic defense programs and incorporating active and passive defense concepts; providing the option of a limited non-nuclear ballistic missile defense if a Soviet ABM breakout occurred; and the DCI increasing U.S. efforts to assess Soviet ballistic missile defense developments on an annual basis (U.S. National Security Council 2006(b), 10).

Opposition to SDI was particularly strong among congressional Democrats during this period. Many of these individuals sought to insert provisions restricting U.S. ASAT activities into appropriations bills, which achieved limited success. Congress did succeed in passing an amendment withholding procurement funds for ASAT weapons unless the president certified that the administration was actively exploring the possibility of negotiating with the Soviets and that the proposed ASAT tests were necessary. A March 31, 1984 administration report on this topic reviewed ASAT national security requirements and arms control possibilities. This document stressed that administration policy was to look for credible ASAT arms control opportunities but expressed acute skepticism about such negotiations with the Soviets because of concerns about verifying such agreements and about continuing Soviet ASAT programs (Lambakis 2001, 228–229; President of the United States 1984, 7–16).

NSDD 144 was the National Space Strategy issued on August 15, 1984. This document sought to establish national security space principles and develop corresponding

Space Shuttle Atlantis takes flight on its STS-27 mission on December 2, 1988. It was a classified Department of Defense mission. *(NASA)*

implementation guidelines with emphasis on civilian, commercial, and military aspects of space policy. Categories stressed in this document's coverage of national security space programs included maintaining assured access to space with emphasis on a supplemental launch system besides the space shuttle if the necessity for such a system arose; pursuing a long-term survivability program for national security space assets; stemming the flow of advanced space technology to the Soviet Union; studying possible space arms control options; insuring that DOD space and space-related programs support SDI, and maintaining a strong national security space technology program capable of supporting development of essential improvements and emerging capabilities (U.S. National Security Council 2006(a), 221–227).

NSDD 164, the National Security Space Launch Strategy, was issued on February 25, 1985. It sought to define DOD and NASA roles in maintaining the operational use of STSs. Additional directive provisions included telling the Air Force to purchase 10 ELVs and launching approximately 2 of them per year between 1988–1992, committing DOD to at least one-third of STS flights for the next 10 years; and directing DOD and NASA to conduct a joint study on developing a next generation STS to include manned and unmanned systems capable of meeting users requirements (U.S. National Security Council 2006(a), 229).

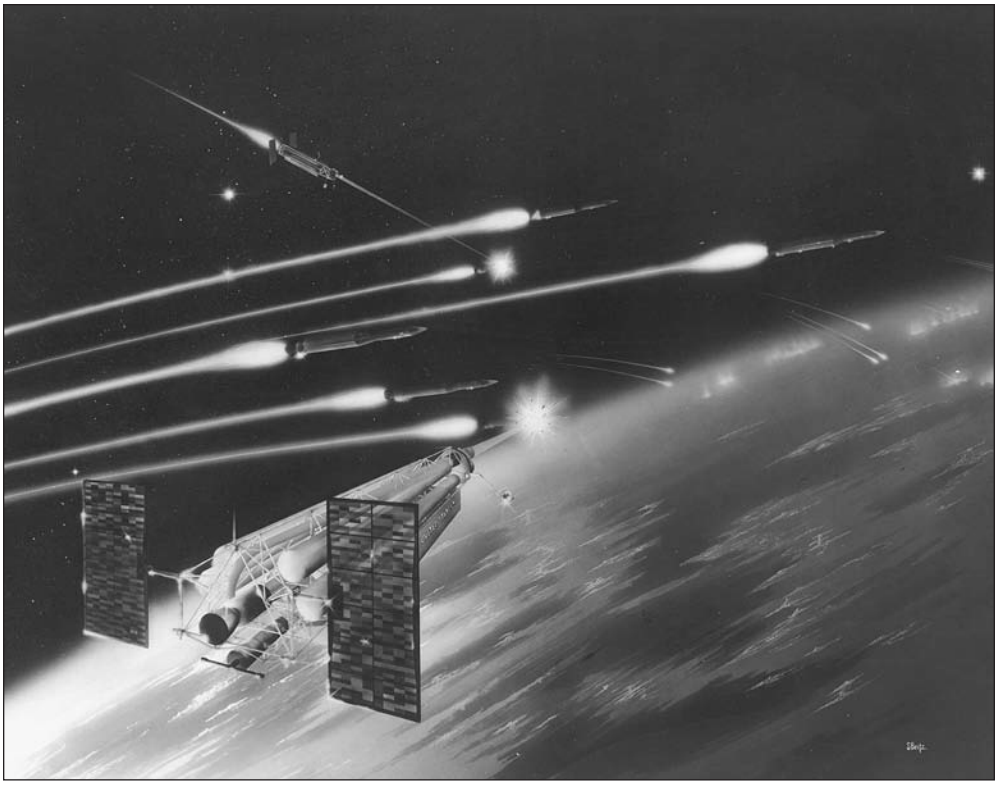
Another significant Reagan administration NSC space policy document was *NSDD 172* issued on May 30, 1985. This document involved methods and information to be used in making public presentations on SDI. Examples of factors to be presented in making

the public case for SDI included stressing the changing nuclear strategic context between the United States and Soviet Union, emphasizing improvements in Soviet offensive and defensive weapons systems, ongoing Soviet research and development in advanced defense systems, Soviet noncompliance with existing arms control agreements such as the ABM Treaty, Soviet actions degrading the U.S. ability to verify their compliance with arms control agreements such as encrypting technical data emitted by their missiles during flight testing, and assessing the views of Soviet and allied countries about SDI (*National Security Space Policy Presidential Decisions: NSC Documents* 2006, 231–238).

The changing nature of nuclear deterrence from offensive forces to defensive forces and its potential implications for U.S.–Soviet strategic stability was a key point stressed in *NSDD 172.* This document stressed that long-term dependence on offensive nuclear forces may not serve as a stable deterrence basis and that continuing Soviet investment in offensive and defensive nuclear force capabilities could destroy nuclear deterrence's theoretical and empirical foundation. In response to this, it was essential for the United States to explore future options for ensuring deterrence and strategic stability in a way to counteract the destabilizing growth of Soviet offensive forces and transfer Soviet defense practices toward more stabilizing and mutually beneficial results, which *NSDD 172* contended could best be accomplished through SDI (U.S. National Security Council 2006(a), 235).

Additional *NSDD 172* talking points included outlining the aim of SDI as maintaining U.S.–Soviet strategic balance and ensuring stable deterrence instead of seeking superiority; that the United States would continue adhering to the ABM Treaty; the absence of preconceived ideas about what defensive options SDI research may generate; that it is premature to speculate on whether ground or space-based defensive systems would be recommended by SDI research; that this research is focused on defensive options for destroying attacking ballistic missiles before they reach their targets; that SDI is designed to enhance the security of U.S. allies; that consultation would occur with U.S. allies and the Soviets on possible missile defense system deployment; that SDI does not change the U.S. commitment to deterring war; that offensive nuclear forces and the potential of nuclear retaliation remain key deterrence elements; and eliminating nuclear weapons was an ultimate long-term U.S. goal, but that this required numerous changes in existing conventional and nuclear force quality, arms control, and confidence-building measures to occur (*National Security Space Project Presidential Decision: NSC Documents* 2006, 238–244; Rivkin, Jr. 1987).

The next major Reagan national security space policy directive was *NSDD 195* issued on October 30, 1985. This document was issued in preparation for U.S.–Soviet nuclear and space arms control negotiations in Geneva and directed SDI to adhere to ABM Treaty requirements while also proposing an "open laboratories initiative" with the Soviets as a vehicle for exploring research in strategic defense programs. Another significant space policy aspect of this directive was that the United States should propose and seek a Soviet commitment for exploring how a cooperative transition to more reliance on defenses should be achieved (U.S. National Security Council 2006(a), 251; Payne 1989).



Artist's concept of a space-based particle beam weapon attacking enemy missiles, 1986. *(U.S. Department of Energy)*

NSDD 164 was superseded by a subsequent space launch strategy directive issued on December 27, 1986. *NSDD 254,* issued in the aftermath of the January 28, 1986 shuttle Challenger tragedy, described launch policies for civil, commercial, and military missions. It announced that U.S. national space launch capability would consist of a mix of the space shuttle and ELVs. The directive went on to specify that this mix would be defined as being most capable of supporting the respective needs of these three launch types. National security launches were to use both the shuttle and ELVs and DOD was directed to acquire additional ELVs to maintain a balanced launch capability and provide access to space while maintaining east and west coast launch sites for these ELVs (U.S. National Security Council 2006(a), 253; Courter et al. 1994; U.S. Congress, House Committee on Science and Technology, Subcommittee on Space Science and Applications 1987; U.S. Congress, Office of Technology Assessment 1988).

Concern over a growing Soviet ASAT program caused the Reagan administration to begin efforts to remove congressional restrictions on testing ASAT capability in space. This concern resulted in the February 6, 1987 issuance of *NSDD 258* in which DOD and the Air Force requested funding to conduct relevant research and development efforts in

this area and that further study of long-range U.S. ASAT requirements should continue (U.S. National Security Council 2006(a), 255–256).

A final noteworthy Reagan administration space policy document was *NSDD 293* on national space policy issued January 5, 1988. This document reaffirmed that the United States was committed to peacefully exploring and using outer space and that peaceful purposes allowed for military and intelligence-related activities in pursuit of national security and other goals, that the United States would pursue these military and intelligence activities to support its inherent self-defense rights and defense commitments to allies, that the United States rejected the claims of other nations to sovereignty over space or celestial bodies, that there can be limits on the fundamental right of sovereign nations to acquire data from space, and that the United States considers other national space systems to have the right to pass through and conduct space operations without interference (U.S. National Security Council 2006(b), 13–14).

This document went on to outline four basic DOD space mission areas including space support, force enhancement, space control, and force application. Space support guidelines stressed that military and intelligence space sectors could use manned and unmanned launch systems as determined by specific DOD or intelligence mission requirements. Force enhancement guidelines stressed that DOD would work with the intelligence community to develop, operate, and maintain space systems and develop appropriate plans and structures for meeting the operational requirements of land, sea, and air forces through all conflict levels. Space control guidelines stressed that DOD would develop, operate, and maintain enduring space systems to ensure freedom of action in space and deny such mobility to adversaries, that the United States would develop and deploy a comprehensive ASAT capability including both kinetic and directed energy weapons, and that DOD space programs would explore developing a space assets survivability enhancement program emphasizing long-term planning for future requirements. Where force application was concerned, this document proclaimed that DOD would, consistent with treaty requirements, conduct research, development, and planning to be prepared to acquire and deploy space weapons systems if national security conditions required them (U.S. National Security Council 2006(b), 15–16).

Projecting force from space was a particularly significant new facet of U.S. military space policy asserted in this document. This statement also reflected a belief in many governmental sectors that space was comparable to air, land, and sea war-fighting environments and that space combat operations should be pursued to defend national interests and enhance national security. *NSDD 293* culminated a period of significant growth in U.S. military space policy during the Reagan presidency. This administration saw AFSPACOM established in 1982 to consolidate space activities and link space-related research and development with operational space users. Army and Navy space commands were also created during this time and USSPACECOM was established in 1985 as a unified multiservice space command. Additional Reagan administration developments in military space policy included establishing a Space Technology Center at New Mexico's Kirtland Air

Force Base; forming a DOD Space Operations Committee, elevating NORAD's commander in chief to a four-star position and broadening that position's space responsibilities; creating a separate Air Force Space Division and establishing a deputy commander for Space Operations; constructing a consolidated Space Operations Center; creating a Directorate for Space Operations in the Office of the Deputy Chief of Staff/Plans and Operations in Air Force headquarters; establishing SDIO; and establishing a space operations course at the Air Force Institute of Technology (Lambakis 2001, 229–230).

George H.W. Bush Administration (1989–1993)

The beginning of the George H. W. Bush administration in 1989 saw some modification but overall continuity with Reagan administration military space policy directives. Although the first Bush administration's primary national security policy objectives would focus on the collapse of the Soviet bloc ending the Cold War and Operation Desert Storm, this administration still issued some significant documents reflecting the growing importance of space assets in military strategy and domestic and international economic activity.

George H.W. Bush administration NSC documents on space were called National Space Policy Directives (NSPDs). *NSPD 1,* also known as National Security Directive (NSD) 30, was issued on November 2, 1989. It essentially reaffirmed Reagan administration military space policy objectives while also emphasizing that U.S. space policy required continued American preeminence in space activities essential for achieving national security, scientific, technical, economic, and foreign policy objectives. It also called for supporting command and control, communications, navigation, environmental monitoring, warning, surveillance, and force application programs supporting national security program functions (U.S. National Security Council 2006(a), 262, 265).

The growing importance of commercial space launches in meeting military satellite requirements was reflected in *NSPD 2/NSD 46* issued on September 5, 1990. This directive gave United Boosters Inc. a license to participate in launches from Cape York, Australia if the Soviet Union agreed to provide international commercial market launch services only from Cape York for 10 years; if the Soviet Union and Australia observe Missile Technology Control Regime requirements; and if U.S. regulations on technology transfer to the Soviet Union are upheld. This document also allowed for additional participation in such launches by the European Space Agency and Australia if these aforementioned conditions were met (U.S. National Security Council 1990, 1–2).

NSPD 4 the National Space Launch Strategy was unveiled on July 10, 1991. This document declared that the National Space Launch Strategy had four components. These included ensuring that current space launch assets were satisfactory to meet government manned and unmanned space launch needs; developing a new unmanned but human usable space launch system to improve U.S. launch capability at lower costs and with enhanced responsiveness and mission performance; sustaining a strong space launch tech-

LANDSAT satellite orbits above the earth. This satellite system has civilian and military applications in areas such as remote sensing and detecting climate change. *(NASA)*

nology program to produce cost effective improvements in existing launch systems and developing advanced space launch capabilities for a new launch system, and actively considering commercial space launch needs and incorporating them into decision on improving launch facilities and vehicles (U.S. National Security Council 2006(a), 291; Bulloch 1994).

NSPD 5 dealt with LANDSAT remote sensing strategy and was issued on February 5, 1992. This directive ordered the preservation of LANDSAT satellites and acknowledged benefits of their use including their national security relevance. Policy goals contained in this directive declared that U.S. Government LANDSAT will have the following characteristics:

> (a) Provide data which are sufficiently consistent in terms of acquisition geometry, coverage characteristics, and spectral characteristics with previous Landsat data to allow comparisons for change detection and characterization;
>
> (b) Make Landsat data available to meet the needs of national security, global change research, and other federal users; and,
>
> (c) Promote and not preclude private sector commercial opportunities in landsat-type remote sensing (U.S. National Security Council 2006(a), 298; Rawles 1989).

Additional *NSPD 5* stipulations include the government encouraging development of advanced remote sensing technologies in hope of reducing their cost and increasing performance quality to meet future government remote sensing needs; limiting federal regulations affecting private sector remote sensing activities to those affecting national security, foreign policy, and public safety; and maintaining an archive within the United States of existing and future LANDSAT data (U.S. National Security Council 2006(a), 299).

Bush also continued Reagan goals of using space combat systems to improve national security as demonstrated by moving SDI away from providing a comprehensive national

ballistic missile defense shield and toward a program capable of providing the U.S. homeland, troops, and allies with limited protection against ballistic missile strikes (Lambakis 2001, 231).

Clinton Administration (1993–2001)

The Clinton administration saw continuation of the growth of the U.S. remote sensing industry, which began in the 1980s when Congress passed the 1984 Land Remote Sensing Commercialization Act removing many governmental restrictions on U.S. commercial satellites spatial resolution (Land Remote Sensing Commercialization Act, 98–451). Subsequent years saw foreign imagery suppliers dominate this market, which led Congress to pass the Land Remote Sensing Policy Act in 1992. This statute transferred governmental LANDSAT program management from the Commerce Department to DOD and NASA, acknowledged that full LANDSAT commercialization was not feasible in the foreseeable future and should not serve as a near-term national remote sensing policy goal, maintained that it was in the United States' long-term interest to maintain a permanent and comprehensive governmental archive of global LANDSAT and other remote sensing data, and declared that the private sector should be exclusively responsible for developing the remote sensing market and providing commercial value-added remote sensing services (Lambakis 2001; 231; Land Remote Sensing Policy Act, 102–555).

Consequently, the Clinton years would see significant growth in the commercial remote sensing imaging industry based on the belief that nurturing this industry would produce national security enhancements by promoting regional stability (Levy and Chodakewitz 1990; Monmonier 2002). The Clinton administration gave the Commerce Department jurisdiction over satellite exports in 1996, which Congress reversed in 1998 following fallout over revelations that U.S. companies had transferred sensitive satellite information to China (U.S. Congress, Senate Commerce on Commerce, Science, and Transportation 1999; Lambakis 2001, 232–233).

A number of NSC policy documents dealing with space were issued during the Clinton administration. These PDDs covered a variety of topics, with remote sensing applications being a particularly common characteristic of these documents. *PDD 23* was issued on March 10, 1994 and allowed for the release of remote sensing satellite images and associated technologies to the public under government regulation while seeking to secure national security information. A rationale behind this document was the belief that it would enable U.S. firms to compete more aggressively in the international remote sensing market, whose size was expected to increase from $400 million to $2 billion by the end of the century and in the space-based imagery sector, whose global market was estimated at being $15 billion by 2000 (U.S. National Security Council 2006(a), 311–312).

Decisions on limiting foreign access to commercial imagery due to possible national security concerns had to be made by the secretary of Commerce in consultation with the secretary of Defense and secretary of State, as necessary. Disagreements between these

Although the ruins of Troy have been explored for 130 years, archaeologists have only excavated 10% of the site. To help them, NASA scientists are exploring new ways of using remote sensing data. This image shows the original site of Troy and the surrounding area. Taken by the Advanced Land Imager (ALI) aboard the EO-1 satellite, the full-size image has a resolution of 10 meters. These and other sensors may help find the boundaries of a harbor near Trojan-war era Troy that has since filled with sediment, trace the route of a Roman aqueduct that carried water to the city 2,000 years ago, locate an ancient cemetery, and map the outer walls. (NASA)

cabinet officials could be appealed to the president. This document also stated that sensitive technology transfers could only be done according to a government-by-government agreement (*National Security Presidential Decisions: NSC Documents* 2006, 311–312).

The next pertinent Clinton space policy directive, issued in concert with the National Science and Technology Council (NSTC), was *PDD/NSTC 2* issued on May 5, 1994. This document combined civilian and military polar-orbiting satellites and directed that DOD, the Commerce Department, and NASA achieve this by October 1, 1994. A goal of this consolidation was reducing the cost of acquiring and operating polar-orbiting environmental satellites while satisfying civil and national security requirements. This reduced the number of these satellites from four to three, and satellite orbits were evenly spaced throughout the day to provide adequate data refreshing capability. *PDD/NSTC 2* also gave the United States the ability to deny critical environmental data to adversaries during a crisis or war to ensure that U.S. and allied military forces have exclusive access to this data (U.S. National Security Council 2006(a), 315, 319–320; U.S. Congress, House Committee on Science, Space, and Technology, Subcommittee on Space, 1994).

May 10, 1994 also saw the issuance of *PDD/NSTC 3* covering LANDSAT remote sensing strategy. This document stressed the importance of LANDSAT data to the military

and the need for maintaining this data's continuity. It stressed that the U.S. Government should provide unenhanced data that was consistent in acquisition geometry, coverage characteristics, and spectral characteristics with previous LANDSAT data to permit quantitative comparisons allowing for change detection and characterization; making government-owned LANDSAT data available at the cost of users requests; and promoting and not excluding private sector commercial opportunities in LANDSAT-type remote sensing (*National Security Space Policy Presidential Decisions: NSC Documents* 2006, 323–324; Thomas 1999).

August 5, 1994 saw the Clinton administration issue its National Space Transportation Policy in *PDD/NSTC 4.* This document stressed that the U.S. space program was critical to achieving national security, scientific, technological, commercial, and foreign policy goals and that it was essential for the United States to have affordable, assured, and reliable access to space. DOD was named as the leading agency for developing ELVs and related technologies, NASA was designated the lead agency for improving the space shuttle and future generation reusable space systems, and the Commerce and Transportation Departments were charged with promoting domestic commercial space launch activities (Lambakis 2001, 232; U.S. General Accounting Office 1994; U.S. Congress, House Committee on Science, Space and Technology, Subcommittee on Space 1995).

Key national security space transportation aspects of this directive were that ELV improvements needed to be implemented in cooperation with the intelligence community, NASA, and the Commerce and Transportation departments while recognizing commercial space launch needs; DOD working with NASA could use the space shuttle for national security needs; and protecting space transportation assets used for national security missions will occur depending on their planned use in crisis situations and threats. This directive also allowed the United States to use foreign components, technologies, and certain launch services if such use is consistent with U.S. national security, foreign policy, and commercial space policy (*National Security Space Policy Presidential Decisions: NSC Documents* 2006, 329–330, 336).

PDD/NSTC 6 covering U.S. GPS policy was issued on March 29, 1996. This policy document defined the roles of agencies such as DOD and the State and Transportation Departments in administering U.S. GPS policy. DOD was authorized to continue as GPS's primary operator and maintenance agency and *PDD/NSTC 6* stressed that these agencies were to administer U.S. GPS resources to protect national interests and military use while also promoting civil, commercial, and scientific applications (*National Security Space Policy Presidential Decisions: NSC Documents* 2006, 309, 311; Black 1999; Pace et. al. 1995).

DOD was also charged with maintaining a Precise Positioning Service for use by the military and other authorized users; cooperate with the intelligence community and other appropriate departments and agencies to assess GPS national security implications; and develop measures to prevent hostile use of GPS while ensuring that the United States retains a military advantage without unnecessarily disrupting or degrading civilian GPS use. State Department GPS responsibilities include cooperation with appropriate depart-

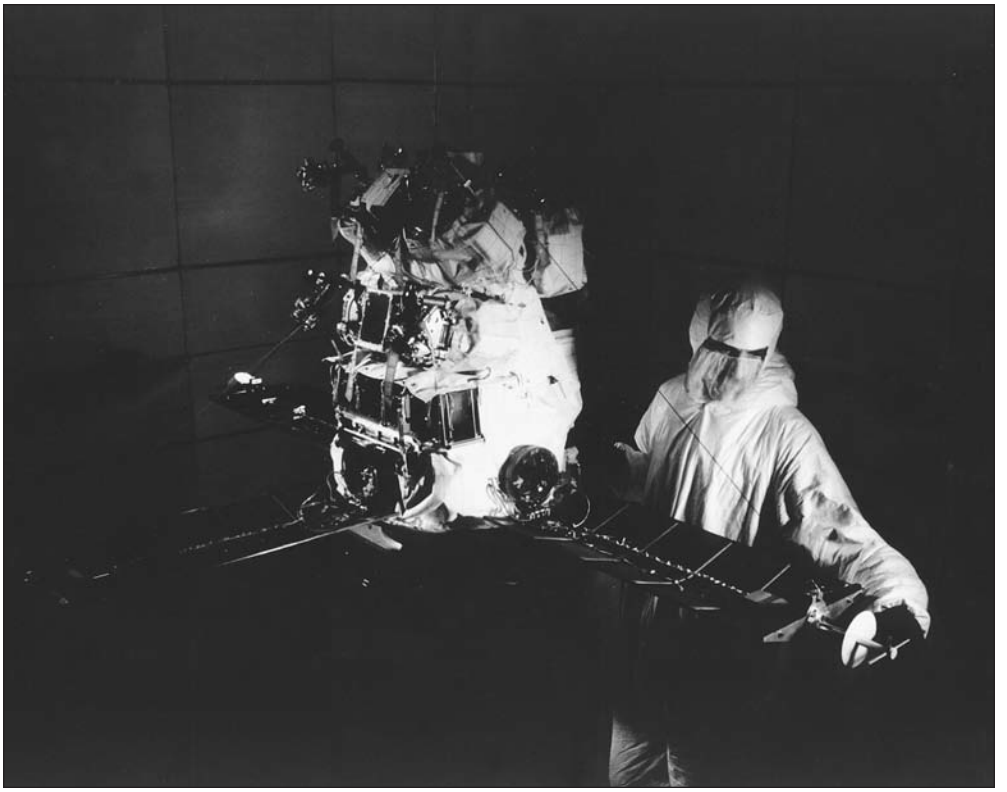
ments and agencies; consulting with foreign governments and international government organizations on GPS issues and guidelines; coordinating interagency reviews of instructions to U.S. delegations to bilateral and multilateral GPS conferences; and coordinating reviews of international agreements on GPS issues. Transportation Department GPS responsibilities include serving as the lead U.S. agency for federal civil GPS matters; developing and implementing federal GPS augmentation for transportation applications; and cooperating with DOD and the State and Commerce Departments to provide leadership in promoting commercial applications of GPS technologies and of U.S. Government GPS augmentations as domestic and international transportation standards (*National Security Space Policy Presidential Decisions: NSC Documents* 2006, 347–348).

The last significant Clinton administration space policy document was its national space policy issued on September 19, 1996. *PDD 49* sought to promote peaceful uses of space without excluding military or intelligence uses. It went on to address national security, defense, and intelligence space guidelines while acknowledging the need to minimize space debris. This document stressed the importance of space assets in enhancing U.S. military operations, monitoring and responding to strategic military threats, and monitoring international arms control and nonproliferation agreements. It also directed the secretary of Defense and DCI to closely coordinate defense and space intelligence activities and integrate their supporting architectures as much as possible (U.S. National Security Council 2006(a), xi, 352).

PDD 49 made the following declaration about DOD space sector guidelines:

> (c) DoD, as launch agent for both the defense and intelligence sectors, will maintain the capability to evolve and support those STSs, infrastructure, and support activities necessary to meet national security requirements. DoD will be the lead agency for improvement and evolution of the current ELV fleet, including appropriate technology development (U.S. National Security Council 2006(a), 353).

It also established a number of important intelligence space sector guidelines including ensuring that the DCI provide timely intelligence information to support various defense and foreign policy missions; that the DCI continue developing and applying advanced technologies for responding to a changing threat environment; that the nature, attributable collected information, and operational details of space intelligence activities remain classified; and that strict procedures are to be maintained to ensure that public discussion of satellite reconnaissance by executive branch personnel and contractors follows DCI guidance. In addition, *PDD 49* announced that the United States conduct satellite reconnaissance for peaceful purposes such as intelligence collection and monitoring arms control agreements; that this satellite reconnaissance include near real-time capability and be used to provide defense-related information for mapping, charting, and geodetic data that is provided to authorized federal agencies; that this data can be used to collect environmental data on natural or human-caused disasters; that the United States



Scientist at Los Alamos National Laboratory with the Alexis satellite array, developed to detect nuclear weapons tests worldwide. The satellite was launched in 1993. Tracking nuclear proliferation by satellite surveillance remains a crucial U.S. intelligence and national security objective. *(U.S. Department of Energy)*

conduct overhead signals, measurement, and signature intelligence; and that the Energy Department has the ability to support space missions that may require using nuclear power (U.S. National Security Council 2006(a), 352–356, 362).

A recent assessment of Clinton administration space policy asserts that it was a low priority in their national security policymaking as evidenced by the president's limited rhetoric on military space matters. Military space budgets were low and flat, and no progress was made on centralizing space policymaking and unifying military space objectives. Clinton ended the National Space Council begun under President Bush replacing it with the NSTC, whose mandate covered all science and technology issues, consequently diluting its ability to influence military space policy. There was no fixed organizational space structure within DOD. A deputy undersecretary of Defense for Space Policy briefly existed, but Secretary of Defense William Cohen (1940–) dissolved this position in 1997 and integrated it into the Command, Control, Communications, and Intelligence section of DOD's bureaucracy (Lambakis 2001, 234).

George W. Bush Administration (2001–2008)

The George W. Bush administration's foreign and national security policies have been irrevocably defined by the September 11, 2001 Al Qaeda terrorist attacks against the United States and the subsequent and controversial military interventions in Afghanistan and Iraq. The priority of responding to these attacks has occupied the preponderance of Bush administration national security policymaking. It has not kept this administration from engaging in efforts and promoting policies to strengthen the quality of U.S. military and intelligence space assets and to keep national security space policy in the minds of the domestic and international national security communities.

A significant indication of Bush administration military space policy was demonstrated by its December 13, 2001 announcement that it would withdraw from the ABM Treaty with the former Soviet Union effective in July 2002. The ABM Treaty had received significant criticism for the restrictions it placed on the United States' ability to construct ballistic missile defenses, whose need was becoming increasingly obvious as indicated by post–Cold War developments such as Iraqi use of Scud missiles during Operation Desert Storm, North Korea's 1998 flight testing of a ballistic missile over Japan and into the Pacific Ocean, and concerns documented in the 1998 Rumsfeld Commission report on ballistic missile defense. The Bush administration noted these concerns in explaining its reasons for withdrawing while pledging to continue working with Russia and other countries to combat weapons of mass destruction and their delivery components (U.S. Department of State 2001, 1–2; Ruse 2002; Bohlen 2003).

George W. Bush administration NSC policy documents are called National Security Presidential Directives (NSPDs). The first significant military space policy directive issued by this administration was *NSPD 23* issued on December 16, 2002, and it established national ballistic missile defense policy. Referring to the new security threats facing the United States since the 2001 terrorist attacks, this document directed the secretary of Defense to begin fielding an introductory suite of missile defense capabilities in 2004 and 2005. The missile defense system was to consist of ground and sea-based interceptors, additional Patriot missile defense units, and space-based sensors (U.S. National Security Council 2006(a), 365).

This document stated its desire to adhere to the National Missile Defense Act of 1999, which declared that U.S. policy was to deploy a national missile defense system capable of defending the United States against ballistic missile defense attack as soon as technologically feasible (National Missile Defense Act of 1999, 106–38). It then went on to describe the changing world strategic environment that requires ballistic missile defense.

Attributes of this evolving global strategic environment include the fact that hostile states that can sponsor terrorism are spending significant resources to develop ballistic missiles capable of hitting the United States with warheads that may carry biological, chemical, and nuclear weapons; the absence of effective U.S. and allied defenses against this threat makes it attractive to adversaries; Cold War era strategic logic does not apply to

these new threats because the leaders of these emerging nations and forces are more risk-prone than leaders of the former Soviet Union and see WMD as weapons of choice instead of last resort; and that it is necessary for the United States to make progress in developing offensive and defensive infrastructures and capabilities to deal with these new threats (Federation of American Scientists n.d., 1–2).

NSPD 23 also sought to eliminate what it saw as artificial distinctions between national and theater missile defenses by vowing to develop and deploy defenses capable of defending the United States and its deployed forces along with friends and allies. This missile defense system now includes U.S. locations such as Fort Greely, Alaska and other domestic and international locations; includes ground, sea, and space-based components; and seeks the involvement of international allies such as NATO countries (Federation of American Scientists n.d., 3–5; U.S. Missile Defense Agency 2005).

NSPD 27, issued on April 25, 2003, addressed the continuing importance of remote sensing in its civilian and national security implications. Remote sensing space systems was defined in this document as covering technology, components, products, data, services, spacecraft, mission packages, ground stations, data links, and relevant command and control facilities. *NSPD 27* goals were providing guidance for licensing and operating U.S. commercial remote sensing space systems, U.S. Government use of commercial remote sensing space assets, foreign access to U.S. commercial remote sensing space capabilities, and government defense, foreign policy, and intelligence relationships with U.S. commercial remote sensing space capabilities (Federation of American Scientists 2003, 1).

According to this document, U.S. remote sensing policy is focused on advancing and protecting U.S. national security interests by maintaining U.S. leadership in remote sensing space activities and sustaining and developing the domestic remote sensing industry. *NSPD 27* maintained the United States would achieve this by making maximum practical use of U.S. commercial remote sensing capabilities for filling military, intelligence, foreign policy, homeland security, and civilian users' imagery and geospatial needs; focusing U.S. Government remote sensing systems on meeting needs that cannot be met by commercial providers for economic, national security, or foreign policy concerns; developing a long-term sustainable relationship between the federal government and domestic remote sensing industry, providing a timely and responsive regulatory framework for licensing operations and exports of commercial remote sensing systems; and enabling U.S. industry to be competitive in providing remote sensing space capabilities for foreign governments and commercial users if measures are taken to protect U.S. national security and foreign policy (Federation of American Scientists 2003, 1–2).

This document also established the National Imagery and Mapping agency (now National Geospatial Intelligence Agency) as the government agency responsible for acquiring and disseminating commercial remote sensing products and services for national security requirements and, in consultation with the secretary of State, for foreign policy requirements. It also specified that exports of sensitive or advanced information systems, technolo-

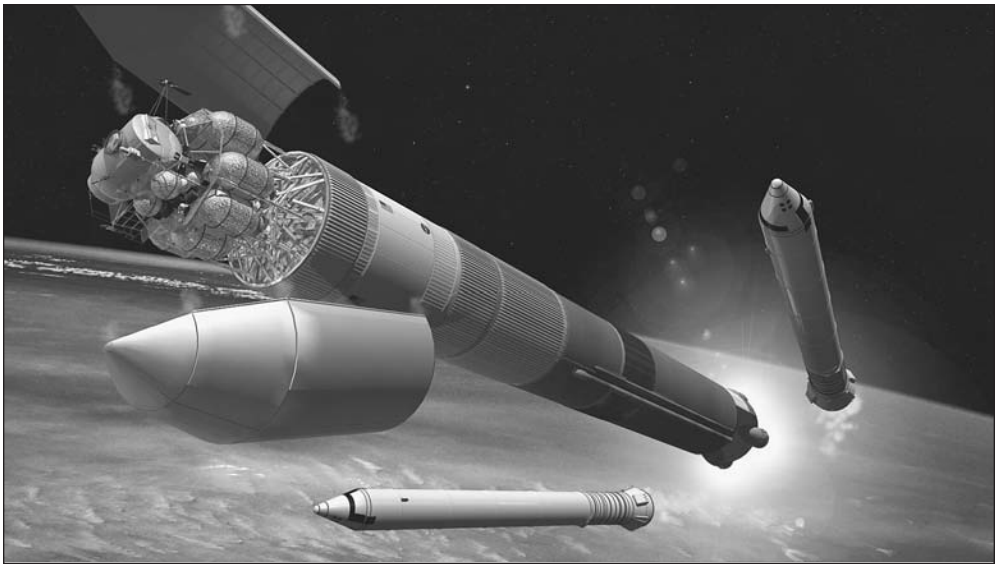


Illustration of the Ares V launch vehicle being developed to return astronauts to the moon by 2020. Ares V will use five RS-68 liquid oxygen/liquid hydrogen engines mounted below a larger version of the space shuttle's external tank, and two five-segment solid propellant rocket boosters for the first stage. *(NASA)*

gies, and components would be approved rarely and on a case-by-case basis in a consultative process involving the Secretaries of State and Defense and the DCI (Federation of American Scientists 2003, 4–6; Williamson and Baker 2004).

U.S. Space Transportation Policy was addressed in *NSPD 40* signed on December 21, 2004. This policy was introduced as a partial response to the January 14, 2004 U.S. Space Exploration Policy, which expressed its desire for human return to the moon by 2020 in preparation for additional human exploration of Mars and elsewhere. A focus of this document was achieving major transformation in U.S. space transportation capabilities and infrastructure by using the entrepreneurship and innovation of the U.S. private sector. *NSPD 40* articulated the importance of the United States being able to achieve rapid and dependable access to space by stressing the following steps the government would take to achieve such access, including making sure U.S. space transportation could provide reliable and affordable access to, transport through, and return from space; be capable of providing operationally responsive access to and use of space; developing space transportation capabilities facilitating human space exploration beyond low earth orbit; sustaining a focused technology development program from next-generation space transportation capacity to dramatically improve the reliability, responsiveness, and access cost of such transport; encouraging and facilitating the U.S. commercial space transportation industry for national security and civil transportation objectives; and sustaining and

promoting the U.S. space transportation industrial base, infrastructure, and workforce to meet U.S. Government national security and civilian requirements (Federation of American Scientists 2005, 1–3; U.S. Congressional Budget Office, 2006).

This document also directed that the secretary of Defense and NASA administrator were responsible for assuring access to space, that DOD would be the national security sector launch agent responsible for developing and maintaining appropriate services and infrastructure for this activity, that the Evolved Expendable Launch Vehicle (EELV) program will be the keystone for space access for medium and large national and homeland security payloads, and that by 2010 DOD, the intelligence community, and NASA will evaluate EELV's long-term requirements, funding, management responsibilities, and infrastructure (U.S. Department of Defense, Office of the Assistant Secretary of Defense (Public Affairs) 2005, 1–7; Federation of American Scientists 2005, 3–4).

The most recent incarnation of U.S. national space policy documents as espoused by presidential administrations was issued on August 31, 2006. This document had not been assigned an *NSPD* number as of late November 2006. It restates a number of preexisting U.S. space policy goals, including stressing the U.S. commitment to peaceful exploration of space, rejecting other national or international claims to sovereignty over space or celestial bodies, and the importance of free and unimpeded right of passage in and through space. Additional U.S. space policy tenets asserted in this document are that the United States considers its space assets and ground supporting links to be vital national interests, that it will preserve its rights, capabilities, and freedom of action in space while dissuading and deterring others from restricting those rights or developing the ability to restrict those rights; that it will oppose new legal regimes or other restrictions seeking to prohibit or limit U.S. access to or use of space; that it will oppose arms control agreements or restrictions designed to limit its ability to use space for research, operations, and testing conductive to U.S. national interests; and that the United States wants to encourage a growing and entrepreneurial commercial space sector (U.S. Office of Science and Technology Policy 2006, 1–2).

This document went on to stress the significant and increasing dependence of U.S. national security on space assets. It reaffirmed how space capabilities supported the president and other senior executive branch policymakers in conducting foreign policy, homeland security, and national security responsibilities (U.S. Office of Science and Technology Policy 2006, 3). An additional noteworthy section of this document recognizes the creation of the position of Director of National Intelligence (DNI) to coordinate national intelligence activities as a result of the Intelligence Reform and Terrorism Prevention Act of 2004 (Intelligence Reform and Terrorism Prevention Act of 2004, 108–458).

National space policy goals prescribed for the DNI include establishing intelligence community objectives, intelligence requirements, and guidance for timely and effective collection, analysis, and dissemination; ensuring that this intelligence and data support defense policies including indication and warning, crisis management, and treaty compli-

ance verification; providing intelligence collection and analysis of space-related capabilities to augment SSA; providing a strong foreign space intelligence and analysis collection capability for national and homeland security needs; and establishing and implementing policies and procedures to protect space intelligence collection and operational activities and declassify this information when it no longer needs to be protected (U.S. Office of Science and Technology Policy 2006, 4–5).

During June 2007, the Bush administration announced that it was working with Poland and the Czech Republic to set up ballistic missile defense systems in those countries. This was opposed by Russian president Vladimir Putin (1952–), who suggested Azerbaijan as a better location for this system. Discussion on this topic will influence U.S.–Russian relations for the foreseeable future (Hadley 2007).

These Bush administration military space policy priorities are likely to continue in the administration's final two years. Secretary of Defense Robert M. Gates (1943–), responding to advance questions submitted during his confirmation hearings, stated that he supported long-standing national policy on national rights of free passage to and through space, the right to protect the United States and its military from hostile space attacks, and his support for ongoing plans to develop and deploy ballistic missiles defenses (U.S. Congress, Senate Committee on Armed Services 2006(a), 48).

Conclusion

U.S. military space policy has come a long way during its six-decade history from von Karman's *Toward New Horizons* and Project Rand's *Preliminary Design of an Experimental World-Circling Spaceship* to today's accomplishments and challenges. Space has become an increasingly important factor in U.S. military policy and strategy and in national and international economic activity. The following statement by United States Strategic Command commander general James Cartwright (1949–) on March 16, 2005 before a Senate Armed Services Committee subcommittee graphically describes how crucial space has become to multiple aspects of contemporary life:

> The importance of the space mission to our national security cannot be overstated. The US economy, our quality of life, and our nation's defense are all linked to our freedom of action in space. For example, satellites are at the heart of routine financial activities such as the simple automatic teller machine operations or complicated international currency and stockmarket transactions. The telecommunications industry is heavily vested in space. Commercial airliners, container ships, trains, trucks, police, fire departments and ambulances have also become highly dependent upon space-based GPSs to enhance their ability to safely deliver people, goods and services. The fact is, our dependency on space increases every day—a fact not lost on our adversaries. This growing national dependence on space-based and

> space-enabled capabilities establishes a true imperative to protect our space assets and our ability to operate freely in, and from, space (U.S. Congress, Senate Committee on Armed Services, Subcommittee on Strategic Forces, 2006(b), 88).

U.S. willingness to assertively defend its interests in space and opposing international restrictions on space activities has resulted in the United States being willing to stand against international opinion on some space policy issues. The 1967 OST still has a wide range of support within the international community. Formulaic UN General Assembly resolutions opposing what they see as an "arms race in outer space" are passed on a regular basis in that organization's debates. Both the United States and Israel were the only countries voting against this resolution on December 8, 2005 on the basis of their concerns that it would restrict their freedom of action in space (United Nations General Assembly 2005, 22–23).

This assertive defense of U.S. military space policy interests is set against a background of increasing concern about the nature of China's space program. U.S. policymakers have grown concerned that this program has military aspirations that may come to threaten U.S. military space interests and assets. The 2006 edition of DOD's annual report on Chi-

Chinese soldier stands guard near the China National Space Administration's *Shenzhou VI* space vehicle. The ship launched in October 2005, carrying two astronauts—China's second manned mission into space. *(AP/Wide World Photos)*

nese military power maintains that China continues pursuing an offensive ASAT system; that it can currently destroy or disable satellites by launching a ballistic missile or space-launched vehicle armed with a nuclear weapon; that it is improving its SSA, which will allow it to track and identify most satellites; that it continues to improve its space-based command, control, intelligence, surveillance, and targeting capabilities; and that it wants to acquire radio frequency weapons to defeat technologically advanced military forces (U.S. Department of Defense 2006, 31–35).

China's increasing economic affluence is also prompting it to become more assertive in international political and economic circles (Saunders 2006). This assertiveness has also made it more important to understand how China views space as a potential vehicle for asserting military power and promoting what it sees as vital national interests while recognizing that there are divergent views on emerging Chinese military strategy and policy (McCabe 2003; Murray and Antonellis 2003; Descisciolo 2005, 49–64).

Debate over the nature and intent of China's military power will occupy academics and policymakers for the foreseeable future. Chinese actions are important ways of determining their intent. Two incidents during the fall of 2006 and one in January 2007 caused concern about China's potential ability to negatively affect U.S. space assets. News reports revealed that China fired high-powered lasers at U.S. satellites flying over its territory in what can be seen as attempts to blind these craft. Such efforts could damage the effectiveness and operational ability of U.S. reconnaissance satellites and radar satellites. U.S. military officials are taking these incidents seriously enough to test ground-based lasers against their own spacecraft to determine their usefulness and develop space architectures strong enough to resist such attacks (Muradian 2006, 1–3).

Another incident of concern reflects China's increasing interest in waging information warfare, which can affect space-based assets given their heavy dependence on computer networks. During November 2006, Chinese hackers successfully penetrated and shut down the U.S. Naval War College computer network, forcing authorities to shut down that institution's email and official computer network including the website and prompting an investigation by the FBI and Naval Criminal Investigative Service (Gertz 2006; Thomas 2004).

On January 11, 2007, China destroyed a Feng Yun 1C polar-orbit weather satellite orbiting at an altitude of 865 kilometers (537 miles) from the earth using an ASAT system launched from its Xichang Space Center in Sichuan province. This test prompted protests from the United States, Japan, Australia, India, Canada, and other countries that have expressed displeasure with Chinese contentions that the test's intent was peaceful. U.S. military and defense policymakers have expressed concern over the test because it reveals major gaps in U.S. intelligence knowledge about Chinese weapons capabilities that could destroy or disable U.S. satellites responsible for handling nearly 90% of U.S. military communications. These officials are also concerned that the test shows that China's military warfighting and weapons capabilities are not a decade behind the United States as preexisting intelligence estimates maintained (British Broadcasting Corporation 2007; Gertz 2007).

Concern over Chinese military space capabilities and policies was also expressed during January 2007 in a report prepared for the government's U.S.-China Economic and Security Review Commission. This report reviews Chinese military literature and notes the publications of books in 2001, 2002, and 2005 by Chinese military officers that advocate various military-explicit uses of space. Examples of such uses include: developing ASAT weapons using land-based and satellite platforms; using space weapons to defeat the United States in a war over Taiwan; developing space weapons using an internally intense posture while maintaining a low profile international posture to maintain China's "good image"; developing an orbital network of concealed space strike weapons that would be used in a "crisis" or "emergency" without warning to deter and defeat the United States by jamming and attacking satellite ground stations; the necessity for China to formulate emergency crisis or response plans for space war preparation; and stating that surprise space attacks can have a huge psychological impact on opposing policymakers (Pillsbury 2007, 3, 10–12).

Although the U.S. military has made significant progress in developing its military and intelligence space capabilities, it still faces numerous problems in achieving the full potential of these capabilities. The military has been unable to achieve agreement on the best use of its space assets in military operations, and it has also had problems determining if there should be a separate military service dedicated to conducting space operations.

Proponents of a separate military service believe the time has come to create such a military branch (Gayl 2004), while opponents of this believe the Air Force has not developed enough space power theory and doctrine to drive a military effort in space (Moorehead 2004).

U.S. scientific, political, and military communities have achieved enough success to make space assets an essential component of U.S. national security architecture. Although there are significant budgetary, diplomatic, military doctrinal, organizational management, political, and technological challenges that remain to be effectively resolved, the United States will likely be able to create and sustain a primarily space-based military force during the first half of the 21st century. It is also possible that China, Russia, the European Union, and Japan may create comparable space-based military capabilities during this time period.

This debate will continue in the United States and other national militaries, U.S. political and governing circles, the domestic and international scholarly security studies community, and in international political forums such as the UN Office for Outer Space Affairs. The published literature in this field described in this book reveals strong arguments from proponents and opponents of a human military presence in space. Space's increasing importance in domestic and international economic activity, the importance of space to the United States, China, Russia, and other countries for military intelligence and surveillance, the emerging ballistic missile threat of Shabab and Taepo-dong missiles from rogue regimes such as Iran and North Korea, and global military history trends in-

dicating expansion of military theaters from land, to sea, and air are inexorably expanding to include space despite naive utopian protestations from some participants in this debate. It will be imperative for 21st century national security policymakers to work to ensure that there are orderly and effective security architectures and internationally recognized procedures for ensuring free access to and movement through space, and that no totalitarian regimes or terrorist groups are able to impede the ability of countries or organizations to use space for disrupting commercial activities, intelligence, or national and homeland security operations. Achieving such freedom of space may require the United States to take unilateral or multilateral action to defend such access even if this may prove highly unpopular in certain sectors of world opinion. Space has become so important to domestic and international economic, intelligence, and security activity that the world cannot afford to surrender control of space to regimes or terrorist organizations opposed to market economics, the rule of law, and political pluralism.

References and Further Reading

Air University. Center for Strategy and Technology. 1994(a). "Professional Military Education (PME) in 2020." [Online article or information; retrieved 11/16/06.] http://csat.au.af.mil/2020/papers/app-1.pdf.

Air University. Center for Strategy and Technology. 1994(b). "SPACECAST 2020: Into the Future." [Online article or information; retrieved 11/16/06]. http://csat.au.af.mil/2020/monographs/exec-sum.pdf.

Anderson, F. W. 1981. *Orders of Magnitude: A History of NACA and NASA, 1915–1980.* Washington, D.C.: National Aeronautics and Space Administration.

Arnold, D. C. 2002. *Supporting New Horizons: The Evolution of the Military Satellite Command and Control System, 1944–1969.* Ph.D. diss. Auburn, AL: Auburn University.

Arnold, D. C. 2005. *Spying From Space: Constructing America's Satellite Command and Control Systems.* College Station, TX: Texas A&M University Press.

Barry, J. L. and D. L. Herriges. 2000. "Aerospace Integration, Not Separation." *Aerospace Power Journal* 14 (2): 42–47.

Baucom, D. R. 1992. *The Origins of SDI: 1944–1983.* Lawrence, KS: University Press of Kansas.

Bermudez, J. S., Jr. 1998. "North Koreans Test Two-Stage IRBM (Intermediate Range Ballistic Missile) Over Japan." *Jane's Defence Weekly* 30 (10): 26.

Berry, N. 2001. "Existing Legal Constraints on Space Weaponry." *Defense Frontier* 30 (2): 5–6.

Best, R. A., Jr. 2001. *The National Security Council: An Organizational Assessment.* Huntington, NY: Novinka Books.

Black, J. T. 1999. "Commercial Satellites: Future Threats or Allies?" *Naval War College Review* 52 (1): 99–114.

Bohlen, A. 2003. "The Rise and Fall of Arms Control." *Survival,* 45 (3): 7–34.

Boone, W. F. 1970. *NASA's Office of Defense Affairs: The First Five Years: December 1, 1962–January 1968.* Washington, D.C.: NASA History Office. [Online article or information; retrieved 10/31/06.] http://history.nasa.gov/HHR-32/HHR-32.htm.

Bowen, G. S. 2005. "Safeguard: North Dakota's Front Line in the Cold War." *Quest* 12 (1): 42–51.

British Broadcasting Corporation News. 2007. "Concern Over China's Missile Test," 1–3: January 19, 2007. [Online article or information; retrieved 1/23/07.] http://news.bbc.co.uk/2/hi/asia-pacific/6276543.stm.

Bulloch, C. 1994. "Commercial Launchers: What Military Boost?" *Interavia* 49 (July): 44–47.

Carns, M. P.C. 1995. "Spacecast 2020: A Commentary." *Airpower Journal* 9 (2): 4–7.

Chow, B. G. 1993. *Emerging National Space Launch Programs: Economics and Safeguards.* Santa Monica, CA: Rand Corporation.

Chun, C. K. S. 2002. *Aerospace Power in the Twenty-First Century: A Basic Primer.* Maxwell Air Force Base, AL: Air University Press.

Clarke, A. C. 1945. "Extra-Terrestrial Relays: Can Rocket Stations Give World-Wide Radio Coverage?" *Wireless World Radio and Electronics* 51 (10): 305–308.

Collins, M. J. 2002. *Cold War Laboratory: RAND, the Air Force, and the American State, 1945–1950.* Washington, D.C.: Smithsonian Institution Press.

Courter, J. 1994. "Military Space Policy: The Criticial Importance of New Launch Technology." *Strategic Review,* 22 (3)(Summer): 14-23.

Cunningham, J. 1994. "Third World Missile Proliferation Poses New Threats." *Journal of Social, Political, and Economic Studies* 19 (Summer): 131–148.

Daso, D. A. 1999. "New World Vistas: Looking Toward the Future, Learning From the Past." *Airpower Journal* 13 (4): 67–76.

Daso, D. A. 2000. *Hap Arnold and the Evolution of American Airpower.* Washington, D.C.: Smithsonian Institution Press.

Day, D. A., J. M. Logsdon, and B. Latell, eds. 1998. *Eye in the Sky: The Story of the Corona Spy Satellites.* Washington, D.C.: Smithsonian Institution Press.

Descisciolo, D. 2005. "China's Space Development and Nuclear Strategy." In *China's Nuclear Force Modernization,* 49–64. edited by L. Goldstein and A. S. Erickson. Newport, RI: Naval War College Press.

Dickenson, M. J. 2005. "The Executive Office of the President: The Paradox of Politicization." In *The Executive Branch,* edited by J. D. Aberbach and M. A. Peterson, 135–172. New York: Oxford University Press.

Dwyer, C. M. 2002. "The U.S. Presidency and National Security Directives: An Overview." *Journal of Government Information* 29 (6): 410–419.

Elliott, D. W. 1992. *Finding an Appropriate Commitment: Space Policy Development Under Eisenhower and Kennedy, 1954–1963.* Ph.D. diss. George Washington University, Washington, D.C.

Erickson, M. 2005. *Into the Unknown Together: The DOD, NASA, and Early Spaceflight.* Maxwell Air Force Base, AL: Air University Press.

Federation of American Scientists. 2003. *U.S. Commercial Remote Sensing Policy Fact Sheet,* 1–2, 4–5. [Online article or information; retrieved 11/29/06.] www.fas.org/irp/offdocs/remsens.html.

Federation of American Scientists. n.d. *National Security Presidential Directive/NSPD-23: National Policy on Ballistic Missile Defense,* 1–5. [Online article or information; retrieved 11/29/06.] www.fas.org/irp/offdocs/nspd/nspd–23.htm.

Federation of American Scientists. n.d. *U.S. Space Transportation Policy Fact Sheet,* 1–4. [Online article or information; retrieved 11/29/06.] www.fas.org/irp/offdocs/nspd/nspd–40.pdf.

Federation of American Scientists. Intelligence Resource Program. n.d. *Presidential Directives and Executive Orders.* [Online article or information; retrieved 10/18/06.] www.fas.org/irp/offdocs/direct.html.

Futrell, R. F. 1989. *Volume II: Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force 1961–1984.* Maxwell Air Force Base, AL: Air University Press.

Gayl, F. J. 2004. "Time for a Military Space Service." *U.S. Naval Institute Proceedings* 130 (7): 43–48.

Gertz, B. 2006. "Chinese Hackers Prompt Navy College Site Closure." *Washington Times,* November 30, 1–2. [Online article or information; retrieved 11/30/06.] www.washtimes.com/functions/print.php?StoryID=20061130–103049–5042r.

Gertz, B. 2007. "Officials Fear War in Space by China." *Washington Times,* January 24, 1–2. [Online article or information; retrieved 1/24/07.] www.washtimes.com/national/20070124–121536–8225r.htm.

Goodman, G. W., Jr. 2000. "Aerospace Force: US Air Force Sees its Future and Modernizes Itself to Get There." *Armed Forces Journal International* 138 (2): 48–58.

Gorn, M. H. 1992. *The Universal Man: Theodore von Karman's Life in Aeronautics.* Washington, D.C.: Smithsonian Institution Press.

Gorn, M. H., ed. 1994. *Prophecy Fulfilled: "Toward New Horizons" and Its Legacy.* Washington, D.C.: Air Force History and Museums Program.

Grier, Peter. 1996. "New World Vistas." *Air Force Magazine* 79 (3): 20–25.

Hadley, Stephen. 2007. "Press Gaggle by National Security Advisor Steve Hadley to the Travel Pool." June 7, 2007. [Online article or information; retrieved 6/11/07.] www.whitehouse.gov/news/releases/2007/06/print/20070607–4.html.

Hall, R. C. 1995. "The Eisenhower Administration and the Cold War: Framing American Astronautics to Serve National Security." *Prologue* 27 (1): 58–72.

Heppenheimer, T.A. 2002. *History of the Space Shuttle.* Washington, D.C.: Smithsonian Institution Press.

Herken, G. 2000. *Cardinal Choices: Presidential Science Advising from the Atomic Bomb to SDI.* Stanford, CA: Stanford University Press.

Hoff, J. 1997. "The Presidency, Congress, and the Deceleration of the U.S. Space Program." In *Spaceflight and the Myth of Presidential Leadership,* edited by R. D. Launius and H. E. McCurdy, 92–132. Urbana, IL: University of Illinois Press.

Intelligence Reform and Terrorism Prevention Act of 2004, Public Law 108–458, U.S. Statutes at Large 118 (2004), 3637–3872.

Jenkins, D. R. 1996. *The History of Developing the National Space Transportation System: The Beginning Through STS-75.* 2nd ed. Indian Harbour Beach, FL: D.R. Jenkins.

Jennings, F. W. 1990. "Doctrinal Conflict Over the Word Aerospace." *Airpower Journal* 4 (3): 46–59.

Johnson, D. J. 1993. *Space Launch Policies and Systems: A Presentation to SPACECAST 2020.* Santa Monica, CA: Rand Corporation.

Kay, W.D. 1998. "John F. Kennedy and the Two Faces of the U.S. Space Program, 1961–1963." *Presidential Studies Quarterly* 28 (3): 573–586.

Lambakis, S. 2001. *On the Edge of Earth: The Future of American Space Power.* Lexington, KY: University Press of Kentucky.

Lambeth, B. S. 2004. "A Short History of Military Space." *Air Force Magazine* 87 (12): 60–64.

Land Remote Sensing Commercialization Act, 1984. Public Law 98–451, U.S. Statutes at Large 98, 451–467.

Land Remote Sensing Policy Act, 1992. Public Law 102–555, U.S. Statutes at Large 106, 4163–4180.

Launius, R. D. 1994. *NASA: A History of the U.S. Civil Space Program.* Malabar, FL: Krieger Pub. Company.

Launius, R.D. and D.R. Jenkins, eds. 2002. *To Reach the High Frontier: A History of U.S. Launch Vehicles.* Lexington, KY: University Press of Kentucky.

Levy, L. J. and S. B. Chodakewitz. 1990. "The Commercialization of Satellite Imagery: Implications for Cross-Border Conflict." *Space Policy* 6 (August): 209–220.

Locher, J. 2002. *Victory on the Potomac: The Goldwater-Nichols Act Unifies the Pentagon.* College Station, TX: Texas A&M University Press.

Logsdon, J. 1992. *Legislative Origins of the National Aeronautics and Space Act of 1958: Proceedings of an Oral History Workshop Conducted April 3, 1992.* Washington, D.C.: NASA History Office.

Lonnquest, J. C. 1996. *The Face of Atlas: General Bernard Schriever and the Development of the Atlas Intercontinental Ballistic Missile, 1953–1960.* Ph.D. diss. Duke University, Durham, NC.

McCabe, T. R. 2003. "The Chinese Air Force and Air and Space Power." *Air and Space Power Journal* 17 (3): 73–83.

McDougall, W. A. 1997. *The Heavens and the Earth: A Political History of the Space Age.* Baltimore, MD: Johns Hopkins University Press.

Mack, P. E. 1990. *Viewing the Earth: The Social Construction of the Landsat Satellite System.* Cambridge, MA: MIT Press.

Mann, A. K. 2000. *For Better or for Worse: The Marriage of Science and Government in the United States.* New York: Columbia University Press.

Martinez, L. F. 1998. "Satellite Communications and the Internet: Implications for the Outer Space Treaty." *Space Policy* 14 (May): 83–88.

Monmonier, M. 2002. *Spying With Maps: Surveillance Technologies and the Future of Privacy.* Chicago: University of Chicago Press.

Moorehead, R. D. 2004. "Will We Need a Space Force?" *Military Review* 84 (4): 50–53.

Muradian, V. 2006. "China Attempted to Blind U.S. Satellites With Laser." *Defense News.com,* 1–3. [Online article or information; retrieved 11/30/06.] www.defensenews.com/story.php?F=2121111&C-america.

Murray, W. S., III and R. Antonellis. 2003. "China's Space Program: The Dragon Eyes the Moon (and Us)." *Orbis* 47 (4): 645–652.

National Aeronautics and Space Act of 1958, Public Law 85–568, U.S. Statutes at Large 72 (1958): 426.

National Defense Authorization Act for Fiscal Year 1997, Public Law 104–201, U.S. Statutes at Large 110 (1997), 2421, 2711–2714.

National Defense Authorization Act for Fiscal Year 2000, Public Law 106–65, U.S. Statutes at Large 113 (2000), 511, 814–815.

National Missile Defense Act of 1999, Public Law 106–38, U.S. Statutes at Large 113 (1999), 205.

Neufeld, J. 2005. *Bernard A. Schriever: Challenging the Unknown.* Washington, D.C.: Office of Air Force History.

Neufeld, M. J. 1996. *The Rocket and the Reich: Peenemunde and the Coming of the Ballistic Missile Era.* Cambridge, MA: Harvard University Press.

Neufeld, M. J. 2005. "The End of the Army Space Program: Interservice Rivalry and the Transfer of the Von Braun Group to NASA, 1958–1959." *Journal of Military History* 69 (3): 737–757.

Nolan, J. E. 1991. *Trappings of Power: Ballistic Missiles in the Third World.* Washington, D.C.: Brookings Institution.

Pace, S., G.P. Frost, I. Lachow, D.R. Frelinger, D. Fossum, D.K. Wassem, and M. Pinto et al. 1995. *The Global Positioning System: Assessing National Priorities.* Santa Monica, CA: Rand Corporation.

Parrington, A. J. 1989. "U.S. Space Doctrine: Time for a Change?" *Airpower Journal* 3 (3): 50–61.

Payne, K. 1989. "ICBMs, Arms Control, and the SDI." *Comparative Strategy* 8 (1): 55–71.

Pedlow, G. W. and D. E. Welzenbach. 1998. *The CIA and the U-2 Program, 1954–1974.* Washington, D.C.: Central Intelligency Agency, Center for the Study of Intelligence.

Pillsbury, M. 2007. *An Assessment of China's Anti-Satellite and Space Warfare Programs, Policies and Doctrines.* Washington, D.C.: U.S.-China Economic and Security Review Commission. [Online article or information; retrieved 2/6/07.] www.uscc.gov/researchpapers/2007/FINAL_REPORT_1–19–2007_REVISED_BY_MPP.pdf.

Piotrowski, J. L. 1987. "U.S. Space Command—Meeting National Security Needs in the Fourth Dimension." *Defense* (November-December): 43–47.

Portree, D. S. F. 1998. *NASA's Origins and the Dawn of the Space Age.* Washington, D.C.: NASA History Division, Office of Policy and Plans. [Online article or information; retrieved 10/30/06.] www.hq.nasa.gov/office/pao/History/monograph10/nasabrth.html.

Posey, R. 1998. "A Sudden Loss of Altitude." *Air and Space Smithsonian* 13 (2): 74–81.

Power, J. W. 1990. "Space Control in the Post–Cold War Era." *Airpower Journal* 4 (4): 24–33.

President of the United States. 1984. *U.S. Policy on ASAT Arms Control.* House Document 98–197. Washington, D.C.: U.S. Government Printing Office.

Project Rand. 1946. *Preliminary Design of an Experimental World-Circling Spaceship.* Santa Monica, CA: Douglas Aircraft Company. [Online article or information; retrieved 10/20/06.] www.rand.org/pubs/special_memoranda/2006/SM11827part1.pdf.

Rawles, J. W. 1989. "Commercial Imaging Comes Down to Earth." *Defense Electronics* 21 (April): 46–50.

Relyea, H. F. 2005. *Presidential Directives: Background and Overview.* Washington, D.C.: Library of Congress, Congressional Research Service.

Richelson, J. T. 1999. *America's Space Sentinels: DSP Satellites and National Security.* Lawrence, KS: University Press of Kansas.

Rip, M. R. and J. M. Hasik. 2002. *The Precision Revolution: GPS and the Future of Aerial Warfare.* Annapolis, MD: Naval Institute Press.

Rivkin, D. B., Jr. 1987. "SDI: Strategic Reality of Never-Never Land?" *Strategic Review* 15 (3): 43–54.

Rumerman, J. A. 1998. *Human Space Flight: A Record of Achievement, 1961–1998.* Washington, D.C.: NASA History Division. [Online article or information; retrieved 11/22/06.] http://purl.access.gpo.gov/GPO/LPS49039.

Ruse, M. A. 2002. "Reflections on the 1972 Antiballistic Missile Treaty and National Missile Defense." *Aerospace Power Journal* 16 (1): 69–76.

Saunders, P. C. 2006. *China's Global Activism: Strategy, Drivers, and Tools.* Washington, D.C.: National Defense University, Institute for National Strategic Studies. [Online article or information; retrieved 11/30/06.] www.ndu.edu/inss/Occasional_Papers/OCP4.pdf.

Scarborough, J. 1991. "The Privatization of Expendable Launch Vehicles: Reconciliation of Conflicting Policy Objectives." *Policy Studies Review* 10 (2–3): 12–30.

Schneider, M. B. 1971. "Safeguards, Sufficiency, and SALT." *Military Review* 51 (5): 24–33.

Smith, M. S. 2005. *Military Space Programs: Issues Concerning DOD's SBIRS and STSS Programs.* Washington, D.C.: Library of Congress, Congressional Research Service.

Sparling, W. P. 2003. "Cries of the Hunchback: Is Space a Theatre of War or a Sanctuary?" *Marines Corps Gazette* 87(5): 63–65.

Spires, D. N. 1998. *Beyond Horizons: A Half Century of Air Force Space Leadership.* Peterson Air Force Base, CO: Air Force Space Command.

Spires, D. N., ed. 2004. *Orbital Futures: Selected Documents in Air Force Space History.* 2 vols. Peterson Air Force Base, CO: United States Air Force Space Command.

Springer, A. M. 1999. "Securing the High Ground: The Army's Quest for the Moon." *Quest: The History of Spaceflight Quarterly* 7 (2): 34–38.

Stares, P. 1985. *The Militarization of U.S. Space Policy, 1945–1984.* Ithaca, NY: Cornell University Press.

Stumborg, M. F. 2006. "Air Force Space Command: A Transformation Case Study." *Air and Space Power Journal* 20 (2): 79–88.

Thomas, G. B. 1999. "External Shocks, Conflict and Learning as Interactive Sources of Change in U.S. Security Policy." *Journal of Public Policy* 19 (May/August): 209–231.

Thomas, T. L. 2004. *Dragon Bytes: Chinese Information War Theory and Practice from 1995–2003.* Fort Leavenworth, KS: Foreign Military Studies Office.

Towell, P. 1999. "Missile Defense Tug of War." *CQ Weekly,* 57 (1): 20–21.

United Nations General Assembly. 2005. *Official Records,* A/60/PV.61, December 8, 22–23. New York: United Nations General Assembly.

U.S. Air Force. 2000. *The Aerospace Force: Defending America in the 21st Century: a White Paper on Air Force Integration* 3, 6–7. [Online article or information; retrieved 11/20/06.] www.af.mil/shared/media/document/AFD-060726–029.pdf.

U.S. Air Force. 2001. *Space Operations: Air Force Doctrine Document 2–2.* [Online article or information; retrieved 11/20/06.] www.dtic.mil/doctrine/jel/service_pubs/afdd2_2.pdf.

U.S. Air Force. 2004. *Counterspace Operations: Air Force Doctrine Document 2–2.1.* [Online article or information; retrieved 11/20/06.] www.dtic.mil/doctrine/jel/service_pubs/afdd2–2–1.pdf.

U.S. Air Force. 2005. "Architect of Air Force Space and Missile Programs Dies." [Online article or information; retrieved 11/2/06.] www.af.mil/news/story.asp?storyID=123010834.

U.S. Air Force. 2006. "Defense Meteorological Satellite Program." [Online article or information; retrieved 11/7/06.] www.af.mil/factsheets/factsheet_print.asp?fsID=94&page=1.

U.S. Air Force Aeronautical Systems Center History Office. 2002. *Wright From the Start: Toward New Horizons,* 1–2. [Online article or information; retrieved 10/19/06.] www.ascho.wpafb.af.mil/START/CHAP7.htm.

U.S. Air Force Scientific Advisory Board. 1995. *New World Vistas: Air and Space Power For the 21st Century: Summary Volume.* Washington, D.C.: U.S. Air Force Scientific Advisory Board.

U.S. Air Force Scientific Advisory Board. 1996. *New World Vistas: Air and Space Power for the 21st Century: Space Applications Volume.* Washington, D.C.: U.S. Air Force Scientific Advisory Board.

U.S. Air Force Space Command. 1991. *Desert Storm "Hot Wash" 12–13 Jul 1991.* Peterson Air Force Base, CO. [Online article or information; retrieved 11/13/06.] www.gwu.edu/%7Ensarchiv/NSAEBB/NSAEBB39/document7.pdf.

U.S. Air Force Space Command. 2006. *Space Innovation and Development Center.* [Online article or information; retrieved 11/15/06.] www.afspc.af.mil/library/factsheets/factsheet.asp?id=3651.

U.S. Arms Control and Disarmament Agency. 1996. *Arms Control and Disarmament Agreements: Texts and Histories of Negotiations.* Washington, D.C.: U.S. Government Printing Office.

U.S. Central Intelligence Agency. 1970. *Intelligence Memorandum: Soviet ABM Defenses—Status and Prospects.* Washington, D.C.: Central Intelligence Agency.

U.S. Central Intelligence Agency. 1997. *Report of Proliferation-Related Acquisition in 1997.* [Online article or information; retrieved 11/17/06.] https://www.cia.gov/cia/library/reports/archived-reports-1/acq1997.html.

U.S. Commission to Assess the Ballistic Missile Threat to the United States. 1998(a). *Report: Charter and Organization,* 1. [Online article or information; retrieved 11/17/06.] www.fas.org/irp/threat/missile/rumsfeld/charter.htm.

U.S. Commission to Assess the Ballistic Missile Threat to the United States. 1998(b). *Report: Executive Summary,* 1. [Online article or information; retrieved 11/17/06.] www.fas.org/irp/threat/missile/rumsfeld/execsum.htm.

U.S. Commission to Assess United States National Security Space Management and Organization. 2001. *Report.* [Online article or information; retrieved 11/20/06.] www.fas.org/spp/military/commission/report.htm.

U.S. Congress. *Congressional Record.* August 6, 1969. Vol. 115, pt. 17: 22478–22479, 22483.

U.S. Congress. *Congressional Record.* May 25, 1971. Vol. 107, pt. 7: 8877–8882.

U.S. Congress. House Committee on Appropriations. Subcommittee on the Department of Defense. 1983. *Department of Defense Appropriations for 1984: Part 2.* Washington, D.C.: U.S. Government Printing Office.

U.S. Congress. House Committee on Government Operations. 1966. *Missile and Space Ground Support Operations: Twenty-Third Report.* House Report 89–1340. Washington, D.C.: U.S. Government Printing Office.

U.S. Congress. House Committee on National Security. Research and Development Subcommittee. 1998(a). *Ballistic Missile Threat Posed by Iran.* Washington, D.C.: U.S. Government Printing Office.

U.S. Congress. House Committee on National Security. 1998(b). *Findings and Conclusions of the Commission to Assess the Ballistic Missile Threat to the United States.* Washington, D.C.: U.S. Government Printing Office.

U.S. Congress. House Committee on Science and Technology. 1985. *Astronauts and Cosmonauts Biographical and Statistical Data [Revised-June 28, 1985].* Washington, D.C.: U.S. Government Printing Office.

U.S. Congress. House Committee on Science and Technology. Subcommittee on Space Science and Applications. 1987. *Assured Access to Space: 1986: Hearings, February 26–August 14, 1986.* Washington, D.C.: U.S. Government Printing Office.

U.S. Congress. House Committee on Science, Space, and Technology. Subcommittee on Space. 1994. *Convergence of Civilian and Defense Polar-Orbiting Satellites.* Washington, D.C.: U.S. Government Printing Office.

U.S. Congress. House Committee on Science, Space, and Technology. 1995. *National Space Transportation Policy.* Washington, D.C.: U.S. Government Printing Office.

U.S. Congress. Office of Technology Assessment. 1988. *Launch Options for the Future: A Summary.* Washington, D.C.: U.S. Government Printing Office.

U.S. Congress. Senate Committee on Aeronautics and Space Sciences. 1967. *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies: Analysis and Background Data.* Washington, D.C.: U.S. Government Printing Office.

U.S. Congress. Senate Committee on Armed Services. 2006(a). *Advanced Policy Questions for Dr. Robert M. Gates Nominee to be Secretary of Defense.* [Online article or information; retrieved 12/5/06.] http://armed-services.senate.gov/statemnt/2006/December/Gates%2012–05–06.pdf.

U.S. Congress. Senate Committee on Armed Services. Subcommittee on Strategic Forces. 2006(b). *Department of Defense Authorization for Appropriations for Fiscal Year 2006: PT 7: Strategic Forces.* Washington, D.C.: U.S. Government Printing Office.

U.S. Congress. Senate Committee on Armed Services. Subcommittee on Strategic. 2002. *Report of the Commission to Assess United States National Security Space Management and Organization.* Washington, D.C.: U.S. Government Printing Office.

U.S. Congress. Senate Committee on Armed Services. Subcommittee on Strategic and Theater Forces. 1982. *Strategic Force Modernization Programs.* Washington, D.C.: U.S. Government Printing Office.

U.S. Congress. Senate Committee on Commerce, Science, and Transportation. 1999. *Transfer of Satellite Technology to China.* Washington, D.C.: U.S. Government Printing Office.

U.S. Congress. Senate Committee on Foreign Relations. 1967. *Treaty on Outer Space.* Washington, D.C.: U.S. Government Printing Office.

U.S. Congress. Senate Committee on Foreign Relations. 1981. *Strategic Weapons Proposals.* Washington, D.C.: U.S. Government Printing Office.

U.S. Congress. Senate Special Committee on Space and Astronautics. 1958. *National Aeronautics and Space Act of 1958.* Senate Report 85–1701. Washington, D.C.: U.S. Government Printing Office.

U.S. Congressional Budget Office. 2006. *Alternatives to Future U.S. Space Launch Capabilities.* [Online article or information; retrieved 12/1/06.] http://purl.access.gpo.gov/GPO/LPS75737.

U.S. Department of Defense. 1992. *Conduct of the Persian Gulf War: Final Report to Congress.* Washington, D.C.: U.S. Department of Defense.

U.S. Department of Defense. 2003. *Department of Defense Directive 5101.2.* [Online article or information; retrieved 11/20/06.] www.dtic.mil/whs/directives/corres/pdf/51012.pdf.

U.S. Department of Defense. 2006. *Annual Report to Congress: Military Power of the People's Republic of China 2006.* Washington, D.C.: U.S. Department of Defense.

U.S. Department of Defense. Office of the Assistant Secretary of Defense (Public Affairs). 2005. "Air Force Press Conference on Evolved Expendable Launch Vehicle Program." [Online article or information; retrieved 11/29/06.] www.defenselink.mil/transcripts/2005/transcript.aspx?transcriptid=2256.

U.S. Department of State. 1997. *History of the National Security Council, 1947–1997.* Washington, D.C.: U.S. Government Printing Office.

U.S. Department of State. 2001. *ABM Treaty Fact Sheet: Announcement of Withdrawal from the ABM Treaty;* 1–2. [Online article or information; retrieved 11/29/06.] www.state.gov/t/ac/rls/fs/2001/6848.htm.

U.S. Department of State. Bureau of Verification, Compliance, and Implementation. n.d. "Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space, and Under Water." 1–5. [Online article or information; retrieved 11/22/06.] www.state.gov/t/ac/trt4797.htm.

U.S. Department of State. Bureau of Verification, Compliance, and Implementation. n.d. "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies." 1–2. [Online article or information; retrieved 11/6/06.] www.state.gov/t/ac/trt/5181.htm.

U.S. Department of State. Office of the Historian. 1997. *History of the National Security Council, 1947–1997.* [Online article or information; retrieved 11/21/06.] http://purl.access.gpo.gov/GPO/LPS3006.

U.S. General Accounting Office. 1990. *Defense Reorganization: DOD's Efforts to Streamline the Space Command.* Washington, D.C.: U.S. General Accounting Office.

U.S. General Accounting Office. 1992. *Military Satellite Communications: Milstar Programs Issues and Cost-Saving Opportunities.* Washington, D.C.: U.S. General Accounting Office.

U.S. General Accounting Office. 1994. *National Space Issues: Observations on Defense Space Programs and Activities.* Washington, D.C.: U.S. General Accounting Office.

U.S. General Accounting Office. 1998. *Military Satellite Communications: Concerns with Milstar's Support to Strategic and Tactical Forces.* Washington, D.C.: U.S. General Accounting Office.

U.S. General Accounting Office. 2000. *Defense Acquisitions: Improvements Needed to Military Space Systems' Planning and Education.* Washington, D.C.: U.S. General Accounting Office.

U.S. Missile Defense Agency. 2005. *A Day in the Life of the BMDS.* [Online article or information; retrieved 11/1/06.] www.mda.mil/mdalink/html/video.html.

U.S. Missile Defense Agency. 2006. *Space Tracking and Surveillance System,* 1. [Online article or information; retrieved 11/9/06.] www.mda.mil/mdalink/pdf/stss06.pdf.

U.S. National Aeronautics and Space Administration. 2006. "Mission Archives: Shuttle Missions." [Online article or information; retrieved 11/10/06.] www.nasa.gov/mission_pages/shuttle/shuttlemissions/list_main.html.

U.S. National Aeronautics and Space Administration. Marshall Space Flight Center History Office. n.d. "Dr. Werner von Braun First Center Director, July 1, 1960–January 27, 1970." ; 1–2 [Online article or information; retrieved 10/27/06.] http://history.msfc.nasa.gov/vonbraun/bio.html; 1–2.

U.S. National Archives and Records Administration. 2006. *United States Government Manual 2006–2007.* Washington, D.C.: National Archives and Records Administration.

U.S. National Security Council. 1970. "Memorandum for Dr. Kissinger: A Safeguard Site at Washington for FY 71?" [Online article or information; retrieved 11/7/06.] www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB60/abm03.pdf; 1–4.

U.S. National Security Council. 1990. [Online article or information; retrieved 11/1/07.] *National Security Directive 46: Cape York.* http://bushlibrary.tamu.edu/research/pdfs/nsd/nsd46.pdf.

U.S. National Security Council. 2006(a). *National Security Space Project Presidential Decisions: NSC Documents.* Compiled by Stephanie Feycock. Washington, D.C.: George C. Marshall Institute.

U.S. National Security Council. 2006(b). *National Security Space Project Presidential Decisions: NSC Documents Supplement: Newly Declassified Excerpts.* Compiled by R. C. Hall. Washington, D.C.: George C. Marshall Institute.

U.S. Office of Science and Technology Policy. 2006. *U.S. National Space Policy,* 1–2; [Online article or information; retrieved 11/29/06.] http://ostp.gov/html/US_NationalSpace_Policy.pdf.

Walker, J., L. Bernstein, and S. Lang. 2003. *Seize the High Ground: The Army in Space and Missile Defense.* Washington, D.C.: U.S. Army Center for Military History.

Wolf, R. I. 1987. *The United States Air Force: Basic Documents on Roles and Missions.* Washington, D.C.: United States Air Force Office of Air Force History. [Online article or information; retrieved 11/1/06.] http://purl.access.gpo.gov/GPO/LPS48765.

Zegart, A. B. 1999. *Flawed by Design: The Evolution of the CIA, JCS, and NSC.* Stanford, CA: Stanford University Press.

Ziarnick, B. D. 2004. "The Space Campaign: Space-Power Theory Applied to Counterspace Operations." *Air and Space Power Journal* 18 (2): 61–70.