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Development of U.S. Military Space Policy

THE HISTORICAL ORIGINS of U.S. military space policy date back to World War II, and a variety of accomplishments, setbacks, trends, and developments have been experienced during its six decades of existence. This chapter examines this historical development and places great emphasis on the military and political documents that have contributed to U.S. military space policy during this period. The first part of this chapter emphasizes military and military-related documents on U.S. space policy, while the second part of the chapter examines presidential space policy documents, which are generally produced by the National Security Council (NSC).

Background information on these documents and developments are provided, along with excerpts from these documents so readers can gain an understanding of the policies or programs that document writings were trying to communicate and advocate at the time of their creation. The documents should also provide illumination of the political and military environments prompting their creation. Many of these documents are compiled from two superlative documentary collections: *Orbital Futures: Selected Documents in Air Force Space History,* edited by David Spires (2004) and *National Security Space Project Presidential Documents: NSC Documents,* compiled by Stephanie Feycock. A particularly useful Web resource for some of these documents is the Federation of American Scientists Presidential Directives and Executive Orders Web site (www.fas.org/irp/offdocs/direct.htm).

This documentary enumeration is chronological and exhaustive but not comprehensive. It strives to list many of the major U.S. military space policy documents produced during the past six decades. Historians of the United States' civilian and military space programs will have divergent views on the significance of these documents and programs. This work hopes to give readers a substantive overview of these documents and the policy developments behind them.

Recognition that World War II's technological advances such as the German V-2 rockets made space a potential future forum for military activity began appearing in scientific literature as the war concluded in 1945. Writer Arthur C. Clarke (1917–), best known for science fiction novels such as *2001: A Space Odyssey* wrote an article in the October 1945 issue of the British technical journal *Wireless World Radio and Electronics* in which he asserted the feasibility of putting communication satellites in geosynchronous orbit around the earth (Clarke 1945, 305–308). Clarke's proposals on the growing possibility of space becoming an arena for human military activity and potential conflict was soon reflected in various documents produced by the U.S. military or for the military by civilian contractors.

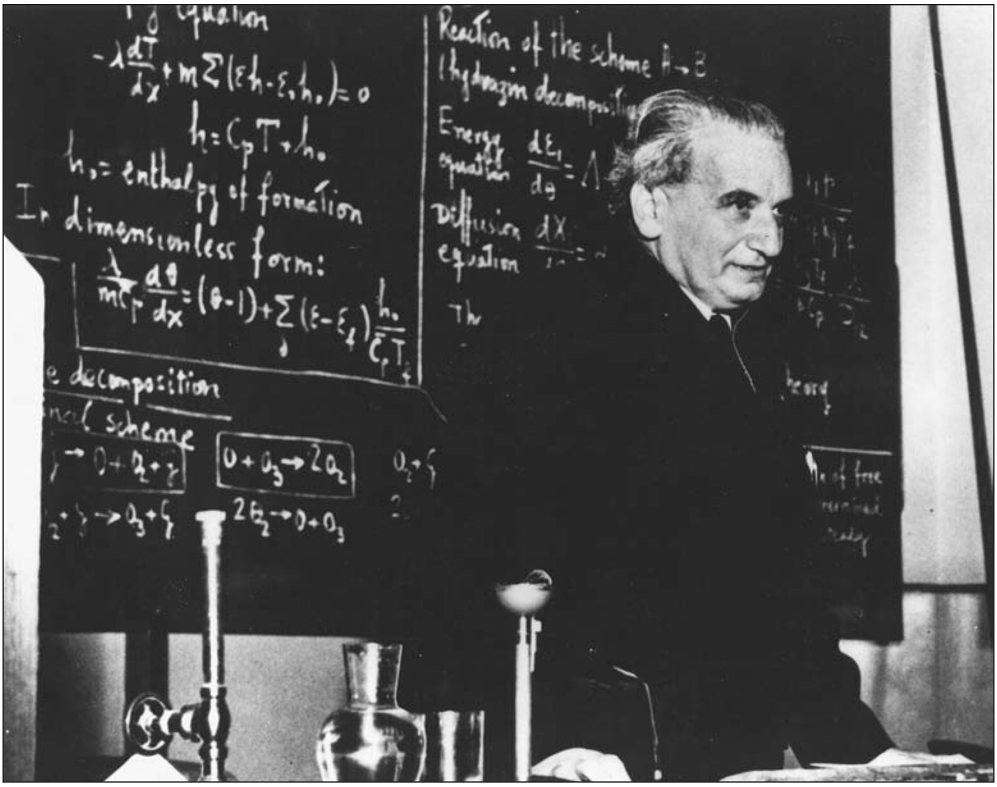
Military Documents—Karman Report Toward New Horizons (1945)

One of the earliest U.S. military reports examining potential military applications of space was produced through a collaborative effort between Army Air Forces commander general Henry (Hap) Arnold (1886–1950) and California Institute of Technology (Cal Tech) aeronautics professor Theodore von Karman (1881–1963) (Daso 2000; Gorn 1992). Arnold, a key leader in the development of U.S. military aviation, had met von Karman through a mutual acquaintance at Cal Tech in 1935, and the two developed a rapport with Arnold making regular visits to the university to watch wind tunnel experiments and discuss university aeronautical and rocket propulsion matters with von Karman. This collaboration continued throughout World War II and eventually resulted in a research project involving civilian and military researchers to examine future trends in military aeronautics (Spires 1998, 1–2, 7–10).

The cumulative result of this collaboration was the monumental series of reports entitled *Toward New Horizons* consisting of 34 monographs in 12 volumes, which Arnold received in December 1945. An exemplar of then cutting-edge scientific and technological forecasting, *Toward New Horizons* identified trends and potential opportunities in high-speed aerodynamics; aircraft materials and structures; designing and developing solid and liquid fuel rockets; guided missiles; unmanned aerial vehicles; guided and radar homing missiles; explosives and terminal ballistics; and aviation medicine. Von Karman authored two of the monographs "Science, the Key to Air Supremacy" and "Where We Stand" and used these works to advocate an enhanced research program for the emerging Air Force, predict that Intercontinental Ballistic Missiles (ICBMs) would achieve eventual operational success, and determine that earth-orbiting artificial satellites were feasible (U.S. Air Force Aeronautical Systems History Office 2002, 2; Spires 1998, 10–11).

Excerpts from *Toward New Horizons* emphasize the targeting options provided by emerging aeronautical technology; timely and accurate warning and response to attack; the importance of aerial reconnaissance for surveying enemy territory; transportation infrastructure and military installations; the need to integrate warning networks with fighter and missile squadron control to defeat enemy attack; and the need to have strong offensive forces to defeat enemy attacks as demonstrated by recent World War II experiences involving Britain and Japan (Gorn 1994, 128, 165, 168).

Toward New Horizons had significance in postwar Air Force development, because it ensured the importance of science and long-range forecasting within the Air Force. It recognized that ICBMs and other missile systems would become increasingly important in the years to come. Von Karman and his collaborators also proposed various organizational



Theodore von Karman, aeronautical theoretician and co-founder of the Jet Propulsion Laboratory (JPL) in Pasadena, California. Photo taken around 1950. *(NASA)*

reforms to military aviation including establishing separate facilities for supersonic and unpiloted aircraft and proposing a facility where aerodynamics, propulsion, control, and electronics could be studied in an integrated manner. These influences and subsequent developments and reports eventually moved U.S. military aviation to see itself as an armed service whose operational orientation and mission would encompass both aeronautical and astronautic responsibilities, which would go under the combined term aerospace (Spires 1998, 11; Gorn 1994, 14–16).

Earth Circling Spaceship (Project Rand) (1946)

A second early document produced with military and civilian collaboration that helped sculpt postwar U.S. military aerospace thought was the 1946 Project Rand report *Preliminary Design of an Experimental World-Circling Spaceship.* Project Rand was a military sponsored think tank based in Santa Monica, California, which later became known as the Rand Corporation. Examining existing technological capabilities and anticipated future engineering trends, this prescient document contended that technology and operational art had reached the ability to design and build vehicles capable of penetrating the atmosphere and achieving enough speed to become satellites orbiting the earth.

Report predictions contended that the United States could launch a 500-pound satellite into a 300-mile orbit within five years for $150 million. Additional factors covered in this report include technical feasibility studies examining matters such as craft propulsion options, the potential dangers of meteor strikes, trajectory analyses, the challenges involved in getting these vessels to reenter the earth through atmospheric heat, and the possibility of using a three-stage liquid hydrogen rocket booster instead of an existing single-stage Navy rocket. Report writers believed none of these technical challenges to be insurmountable.

Another section of this report examined potential military satellite uses in the chapter "The Significance of a Satellite Vehicle." This section asserted that satellites were nearly impregnable observation platforms capable of providing weather and bomb assessment data.

Additional assessments of this section maintained that a satellite could serve as a communications relay station positioned approximately 25,000 miles above the earth's surface so their rotational period would be the same as that of the earth. In this location, satellites could stay in geosynchronous orbit and provide effective global communications (Collins 2002, 74–75; Spires 1998, 14–15).

Regarding a satellite's military applications, this work also discussed the possibility of using satellites as offensive weapons, maintaining that satellites could provide accurate guidance for missiles and serve as missiles themselves (Spires 1998, 15). An example of this report's observations stressing compatibility between missile and satellite technology plus launch velocity requirements is reflected in the following passage:

> There is little difference in design and performance between an intercontinental rocket missile and a satellite. Thus a rocket missile with a free space trajectory of 6,000 miles requires a minimum energy of launching which corresponds to an initial velocity of 4.4 miles per second, while a satellite requires 5.4. Consequently, the development of a satellite will be directly applicable to the development of an intercontinental missile (Project Rand 1946, 10).

Another report prognostication, although somewhat overstated, presented a visionary future for the role satellite technology would play in subsequent decades, contending that a satellite could be an extremely powerful scientific tool and that the United States could inflame mankind's imagination by producing satellite craft (Project Rand 1946, 1–2).

This report clearly established the technical possibility of orbiting a satellite while ruling out its use as an offensive weapon, because existing propulsion systems were unable to launch heavy atomic weapons into Earth's orbit. This caveat and the high cost of developing weaponized satellites precluded further research in this area, and there would be greater military emphasis on developing missiles (Spires 1998, 16). Despite these shortcomings, this 1946 Rand report must be seen as the first authoritative recognition of the military potential of satellites and how space could become an arena for gathering military intelligence, if not conducting military operations. Subsequent years saw U.S. civilian and military policymakers make the first tentative steps toward incorporating space into overall national security priorities.

Operational Requirements for Satellite Operational System (1955)

Rand's emphasis on the feasibility and desirability of orbiting a reconnaissance satellite to monitor Soviet military activities eventually received greater receptivity from U.S. military planners despite initial skepticism.

During April 1951, Rand investigators produced two reports, "Utility of a Satellite Vehicle for Reconnaissance" and "Inquiring into the Feasibility of Weather Reconnaissance Vehicle," which asserted that improvements in television resolution technology would make satellite reconnaissance possible (Spires 1998, 28).

The March 1, 1954 Rand report "Project Feedback" provided further clarification on these 1951 reports by describing how an electro-optical television system could transmit data directly from satellites to ground receiving stations and a camera scanning technique that could be used to record satellite data. Project Feedback went on to assert that a satellite reconnaissance capability could be built with existing guidance, propulsion, and television technology within seven years for $165 million (Spires 2004, 1:200).

Subsequent technological and political developments led the Air Force to issue *General Operational Requirement #80 For a Strategic Reconnaissance Satellite Weapon System* on March 15, 1955. This document called for producing a visual reconnaissance capability of providing continuous coverage of airfields and missile sites at a resolution of 20 feet per side by 1965 (Spires 2004, 2:978).

Document content, which can be considered as an official U.S. commitment to developing a satellite reconnaissance surveillance system, covers a multifaceted variety of operational and technical topics including stressing support for developing a satellite weapon system capable of providing continuous reconnaissance of the earth to determine potential enemies war-making capabilities, that this satellite be launched from the continental United States and have Western Hemisphere monitoring stations, that system launch facilities be fixed, and that monitoring facilities be capable of continuous data and image handling, not susceptible to hostile interference, and be able to transmit this data to pertinent agencies (Spires 2004, 2:978–979).

Army Space Programs (1950s)

The Air Force was not the only U.S. military branch to express interest in developing the military potential of space. The U.S. Army also expressed interest in space as an emerging forum for conducting military operations during the 1950s. This interest had been

Wernher von Braun developed the V-2 rocket for Germany during World War II. After the war, von Braun emigrated to the United States and worked for the U.S. Army developing more advanced rockets. His work was integral to the development of the U.S. space program. *(Library of Congress)*

influenced by the German Wehrmacht's role in developing Germany's V-1 and V-2 rockets during World War II (Neufeld 1996).

Wernher von Braun (1912–1977), one of the leaders of Germany's rocket program, engineered the surrender of his top rocket scientists, plans, and test vehicles to the United States as World War II concluded in Europe. Von Braun and his colleagues were extricated from Germany by the U.S. Army in Operation Paperclip and installed at Fort Bliss, Texas. These individuals worked with the U.S. Army to develop ballistic missiles for the Army launching them at White Sands Proving Ground, New Mexico before moving to Redstone Arsenal near Huntsville, Alabama in 1950 where they began working on the Jupiter ballistic missile. This work achieved significant success for the United States in rocket guidance, solid-fuel technology, and warhead design and would likely have given the United States the first entry into space if the Eisenhower administration had not chosen to emphasize the importance of civilian astronautic research for political reasons. Consequently, the October 4, 1957 Soviet Sputnik launch became the first artificial satellite in space (Lambakis 2001, 11–12; U.S. National Aeronautics and Space Administration, Marshall Space Flight Center History Office, n.d. 1–2).

During February 1955, the Army Ballistic Missile Agency (ABMA) in Huntsville contracted with Western Electric Company and Bell Telephone Laboratories to study ways of countering emerging air defense threats such as ballistic missiles. In December 1955, Bell presented their findings to Redstone Arsenal's chief of army ordnance concluding that developing and deploying a missile defense system was feasible. The Bell study based this assessment on a series of 50,000 analog computer computations simulating the interception of ballistic missile targets, which concluded that intercepting an ICBM was possible and that a ballistic missile defense system could be deployed by late 1962 (Walker, Bernstein, Lang 2003, 25–26).

A subsequent Bell proposal in October 1956 involved the use of existing Nike missiles and an interchangeable variety of missile nose cones to handle the complete variety of potential ICBM threats. This proposal would have involved the Nike carrying 400-pound nuclear warheads and be capable of executing 10-G maneuvers at 100,000 feet to track and intercept hostile incoming missiles. A Nike intercepted a high-altitude supersonic target missile in November 1958 and in 1960 shot down two ballistic missiles during tests at White Sands, marking the first time a ballistic missile was destroyed by another missile (Walker, Bernstein, Lang 2003, 26).

In November 1956, Secretary of Defense Charles Wilson (1890–1961) gave the Army responsibility for developing, procuring, and manning land-based surface-to-air missile systems for point defense. The Army was given responsibility for developing missiles whose range was less than 200 miles while Air Force responsibilities covered missiles whose ranges exceeded 200 miles. Such defense was responsible for focusing on designated geographic areas, cities, crucial military and industrial installations, and covered air targets at altitudes out to a broad range of 100 nautical miles. On January 16, 1958 new secretary of Defense Neil McElroy (1904–1972) assigned the Army primary responsibility for ballistic missile defense missions involving missile, launch site, radar, and computer components (Walker, Bernstein, Lang 2003, 27, 30).

Prior to the National Aeronautics and Space Administration's (NASA) 1958 creation, the Army had launched the United States' first ballistic missile, and the first U.S. astronauts were sent into orbit by modified Army Redstone-designed rockets. During the summer of 1958, ABMA made the audacious proposal to plant a military colony on the moon. Designated Project Horizon, the Army wanted to land on the moon in 1965 and establish a 12-man outpost there by 1966.

Army estimates posited that this moon base would require logistics support from 64 Saturn rocket launches per year with each rocket carrying more than 266,000 pounds of cargo at a cost of $6 billion. Project Horizon plans called for constructing an underground lunar base that would include living quarters, storage areas, nuclear reactors, laboratories, a hospital, communications center, and dining and recreation rooms. Horizon never got off ground due to the Eisenhower administration's impending creation of NASA, which terminated the program and inherited most Army space programs (Walker, Bernstein, Lang 2003, 30–31; Springer 1999, 34–38; Neufeld M. J. 2005, 737–757).

Nevertheless, this project initiated the U.S. Army's interaction with space, which continues to the present as demonstrated by the presence of agencies such as the U.S. Army

Space and Missile Defense Command—an important part of current U.S. military space activities.

1958 Space Act

An important development affecting the future of U.S. military space programs was the 1958 Space Act creating NASA as the principal civilian U.S. Government space policy agency. The October 4, 1957 Sputnik satellite launch by the Soviet Union was an important factor propelling U.S. Government interest in developing an agency to coordinate U.S. space policy efforts. Another was the desire of many congressional leaders, led by Senate majority leader Lyndon Johnson (Democrat from Texas) (1908–1973), to make sure Congress was directly involved in directing U.S. space agency policy making. On February 6, 1958, the Senate created the Special Committee on Science and Astronautics with Johnson as its chair (McDougall 1997, 169–170). The House established a Select Committee on Astronautics and Space Exploration on March 5, 1958, which was chaired by House majority leader John McCormack (Democrat from Massachusetts) (1891–1980) (Portree 1998, 5).

The next several weeks saw a series of legislative maneuvers between Congress and the Eisenhower administration. Addressing a joint session of Congress on April 2, 1958, President Dwight D. Eisenhower (1890–1969) called for the creation of what became known as NASA to replace the existing National Advisory Committee on Aeronautics (NACA). Since NASA was intended to be a primarily civilian department, Eisenhower issued a directive ordering NACA and the Defense Department (DOD) to prepare to transfer non-military DOD space capabilities to NASA (Portree 1998, 5; Anderson 1981, 14–17).

Johnson and Senator Henry Styles Bridge (Republican from New Hampshire) (1898–1961) introduced the Senate version of this legislation, S. 3609, on April 14, and McCormack introduced the House version, H.R. 11991, on the same day with hearings beginning the next day (Portree 1998, 5). Subsequent weeks saw considerable legislative haggling over the military role of NASA and its relationship with DOD. The House version of this legislation gave DOD freedom to conduct space-related research and development and directed NASA to cooperate with DOD, which was at variance with Eisenhower administration sentiment that NASA *may* cooperate with DOD. The House sought to ensure that NASA remain free from military dominance without obstructing civilian or military activities by this agency (Erickson 2005, 73).

The Senate version of this legislation went beyond the House's and firmly established DOD's ability to have control over space program aspects that were uniquely associated with defense, and the Senate was more concerned that NASA would restrict DOD's space role. The Senate version won out in the end creating a National Aeronautics and Space Policy Board to coordinate civilian and military space policy operations and that NASA would remain a civilian agency except for "activities peculiar to or primarily associated with the development of weapons systems or military operations, [which] shall be directed

President Dwight Eisenhower speaks with Wernher von Braun at the dedication of the George C. Marshall Space Flight Center on September 8, 1960. *(Dwight D. Eisenhower Presidential Library)*

and controlled by the Department of Defense" (Erickson 2005, 73–75; U.S. Congress. Senate Special Committee on Space and Astronautics 1958, 1, 6, 12).

Further legislative maneuvering and a July 7 White House meeting between Johnson and Eisenhower saw the president agree with Johnson's suggestion that the president become the National Aeronautics and Space Policy Board chair and the group, which became known as the Space Council, would function like the NSC. On July 15, a House–Senate conference committee worked out the final version of this legislation, which unanimously passed both houses by voice votes the following day (Erickson 2005, 75).

Eisenhower signed the National Aeronautics and Space Act of 1958 on July 29. It called for the creation of NASA in October 1958 and made the following declaration of this new agency's institutional mandate:

> The Congress believes that the general welfare and security of the United States require that adequate provision be made for aeronautical and space activities. The Congress further declares that such activities shall be the responsibility of, and shall be directed by, a civilian agency exercising control over aeronautical and space activities by the United States, except that activities peculiar to or primarily associated with the development of weapons systems, military operations, or the defense of the United States (including the research and development necessary to make effective provision for the defense of the United States) shall be the responsibility

> of, and shall be directed by, the Department of Defense; and that determination as to which agency has responsibility for and direction of any such activity shall be made by the President.... (Erickson 2005; National Aeronautics and Space Act of 1958, 85–568).

Besides creating an organization that would have a significant impact in facilitating U.S. space science and exploration (Logsdon 1992; Launius 1994; Boone 1970; Portree 1998), this statute created two organizations to facilitate DOD–NASA coordination. The Space Council was charged with advising the president concerning duties prescribed in the Space Act. The Civilian-Military Liaison Committee (CMLC) was responsible for giving DOD and NASA the ability to advise and consult with each other on matters concerning aeronautical and space activities and keeping each organization informed on such activities their organizations engaged in. Subsequent years saw the Space Council periodically used as a forum for upper level administration officials to discuss space policy while CMLC proved ineffective because appointed members were powerless in DOD and NASA, and their perspectives could be ignored without consequence (Erickson 2005, 76–77).

Air Force Space Program Memo to Secretary of Defense (1958)

Creation of NASA, coupled with the February 1958 creation of the Advanced Research Projects Agency (ARPA) within DOD, resulted in the Air Force having to reluctantly relinquish management of its manned space programs to ARPA. In mid-August 1958, Eisenhower transferred overall responsibility for human spaceflight to NASA, which prompted Air Force undersecretary Malcolm MacIntyre (1908–1992) to write Secretary of Defense McElroy on September 17, 1958 urging him to clarify civil–military space roles and advocating ongoing Air Force–DOD participation in manned space activity. MacIntyre's argument also emphasized the Air Force's space booster monopoly and stressed avoiding program duplication with NASA (Spires 2004, 2:762).

MacIntyre's letter contents emphasize that space vehicles used for military reconnaissance or atmospheric or space weapons be DOD's responsibility, that space vehicles for nonmilitary space and exploration be NASA's responsibility, and that testing human reactions and capabilities in space be DOD and NASA responsibilities, while using existing expertise within the Air Force and its contractors (Spires 2004, 2:762–763).

Program duplication and coordination problems between NASA and DOD remained unresolved. The Air Force remained particularly concerned with NASA contractual, procurement, and technical support involvement with civilian contractors serving the Air Force and DOD. An August 15, 1959 Air Force–NASA agreement sought to encourage single-manager program responsibility and NASA use of Air Force facilities and procurement procedures. Delineating Air Force–NASA responsibilities became increasingly difficult under the Eisenhower and Kennedy administrations (Spires 2004, 2:762; Erickson 2005, 112–114; 296–314).

Special Panel on Satellite Reconnaissance (Killian Report) (1960)

The need for accurate intelligence reconnaissance of Soviet military capabilities was becoming increasingly important to U.S. policymakers in the late 1950s and prompted the development and programs of the U-2 spy plane and an increasing interest in satellite surveillance of the Soviet Union (Pedlow and Welzenbach 1998; Arnold 2005). Existing satellite surveillance programs such as Corona under Central Intelligence Agency (CIA) auspices (Day, Logsdon, and Latell 1998) and the Air Force's independent reconnaissance satellite Samos (Erickson 2005, 120, 182–183) were at various stages of development during the Eisenhower administration's final year.

Eisenhower had expressed concern to the U.S. intelligence community about specific technical requirements that reconnaissance satellites should possess to carry out their responsibilities. On July 5, 1960, the United States Intelligence Board (USIB), an interagency information exchange entity within the U.S. intelligence community at this time, issued the report "Intelligence Requirements for Satellite Reconnaissance," which was chaired by presidential science advisor and former Massachusetts Institute of Technology (MIT) president James Killian (1904–1988).

Killian's USIB panel recommendations asserted that the highest priority of U.S. satellite reconnaissance efforts should be developing a system capable of general search coverage emphasizing the Soviet rail network and ICBM sites, with coverage repeated monthly. The panel went on to recommend that the photographic resolution needed to accomplish such searches needed to approach 20 feet on a side, that surveillance of suspect ICBM

James R. Killian, president of the Massachusetts Institute of Techonology (1948–1959), and special assistant for science and technology to President Dwight D. Eisenhower (1957–1959). Killian was an important early presidential science advisor on military space matters. *(Library of Congress)* sites required a resolution capable of identifying ground objects five feet on a side, and that a system resolution exceeding five feet on a side would be essential before the end of 1962 to garner technical information on the highest priority targets (Spires 2:969).

Subsequent sections of Killian's report addressed management problems within the Samos program, criticized program duplication within other Air Force and DOD component organizations, advocated the need for developing a recoverable capsule high-resolution stereo-quality satellite photography capability, and supported the development of a centralized national film processing and evaluation center, which resulted in the January 18, 1961 creation of the National Photographic and Interpretation Center (NPIC) (Spires 2:970–71).

Representative conclusions from the Killian Report include the need for the United States to develop and maintain an operational satellite reconnaissance system with multifaceted capabilities and the recommendations that information acquired by photographic reconnaissance is now and will be of greater value than that obtained by electronic reconnaissance systems, that satellite reconnaissance information is most crucial in providing strategic intelligence information and should provide supplemental information on Soviet intentions, that satellite reconnaissance's most crucial assignment is locating suspect ICBM launch sites, and that when an ICBM site is located then a satellite reconnaissance system with satisfactory ground resolution should maintain surveillance of that site and report changes in its status (Spires 2004, 2:1050–1053).

Wiesner Committee Report (1961)

The victorious 1960 presidential campaign of John Kennedy (1917–1963) saw him place considerable emphasis on space policy and criticize what he regarded as deficiencies in the Eisenhower administration's response to Soviet space accomplishments. Following his narrow election triumph, Kennedy and his presidential transition organization appointed a committee to review the U.S. space program.

Chaired by MIT electrical engineering professor and later president Jerome Wiesner (1915–1994), the committee issued its report on January 10, 1961, which was highly critical of NASA organization and management and a "fractionated military space program." This report proceeded to recommend that one agency or military service assume responsibility for all military space development and asserted that the Air Force was the logical inheritor of this responsibility. Additional Wiesner report recommendations included the United States placing greater emphasis on booster development, manned space activities, and military applications in space, which convinced the Kennedy administration to adopt a more unified national space program with the Air Force receiving military space leadership preeminence (Spires 1998, 86–87; Spires 2004, 1:254).

Wiesner report content stressed both military and civilian benefits of an active role in space policy and concomitant scientific and economic enhancements. These included developing ballistic missiles for military security, emphasizing the importance of national prestige by stressing how space exploration had captured the imagination of international public opinion, that some space developments besides missiles can enhance national security through arms control inspections, and the importance of space in civilian applications such as satellites communications, broadcasting, navigation, geodesy, mapping, and meteorology (Spires 2004, 1:255).

Significant portions of the Wiesner report address critical emerging military benefits of an active U.S. role in space including land mass surveillance of Soviet–Sino bloc nations, the U.S. Air Force providing at least 90% of the resources and physical support required by other agencies and being the United States' principal source for future space system development and operations except for scientific research legally assigned to NASA. Additional Wiesner report content stressed the need for military research and development of large rocket boosters, the potential presence of large orbital bombs and 100–200 megaton ICBMs, communications blackouts resulting from space nuclear explosions, and crash programs to destroy or neutralize satellites, all of which could become part of future space security environments (Spires 2004, 1:260–261).

DOD Directive 5160.32 DOD Support of NASA (1961)

Concern over duplication between DOD and NASA military space programs as emphasized in the Wiesner report led Kennedy's Secretary of Defense Robert McNamara (1916–) to issue *DOD Directive 5160.32 Development of Space Systems* on March 6, 1961.

Secretary of Defense Robert McNamara works at his desk in the Pentagon in 1961. Originally focused on reorganizing the Pentagon's budgetary and bureaucratic processes, McNamara is most remembered for his role in major foreign policy decisions such as the Vietnam War. *(U.S. Department of Defense)*

Upon taking office in January 1961, McNamara assigned DOD's Office of Organization and Management Planning Studies to review military space program fractionation described in the Wiesner report. The resulting directive consolidated the Air Force's preeminence in military space matters. The directive mentioned that individual military services could conduct "preliminary research to develop new ways of using space technology to perform its assigned function" then went on to stress that subsequent technology proposals beyond this had to undergo review by DOD's deputy director of research and engineering (DDR&E) and had to receive ultimate approval from the secretary of Defense (Erickson 2005, 274–275; Wolf 1987, 363–64).

DOD Directive 5160.32 terminated interservice competition for space with the only remaining non-Air Force space programs being the Navy's Transit navigation satellite and the Army's Advent communication satellite. An additional result of this directive was its provisions granting DDR&E and the secretary of Defense final approval for all military space projects. This drastically restricted the Air Force's ability to do space development work without explicit DDR&E authorization. Furthermore, it reduced the Air Force ability in multiple efforts to place humans in space and extend U.S. nuclear deterrence capabilities into orbit, resulted in McNamara and his advisors insisting that Air Force space proposals produce clear identifiable enhancements to U.S. security, and insured that Air Force proposals not duplicate NASA research and development (Erickson 2005, 276).

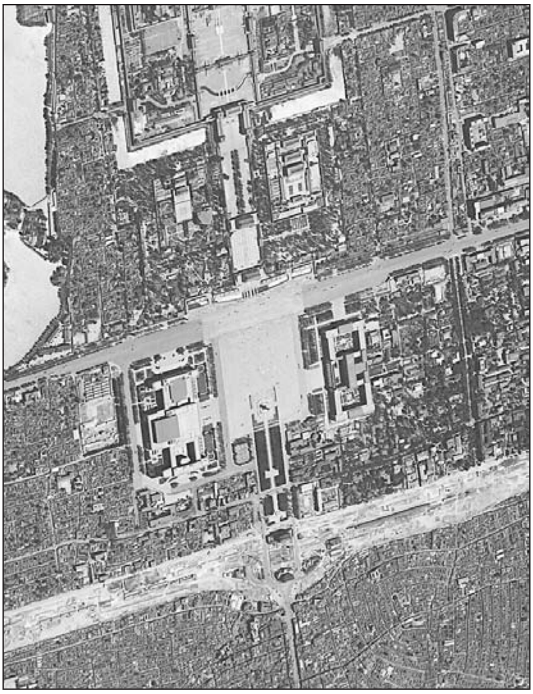
Management of National Reconnaissance Program (1961)

The growing success of the Corona satellite reconnaissance program by fall 1961 provided a measurable contrast with the failings of the Samos program. Corona's success increased pressure to incorporate the Army's mapping satellite project within Corona. The failed April 1961 Bay of Pigs mission in Cuba temporarily diminished the CIA's influence within U.S. national security policymaking and increased the desire of McNamara and other DOD officials to consolidate reconnaissance programs under DOD direction.

These developments bore fruit with a September 6, 1961 agreement between DOD and the CIA creating the National Reconnaissance Office (NRO) (Spires 2004, 2:973, 1081).

This agreement established a National Reconnaissance Program (NRP) for NRO to run all overt and covert satellite and overflight reconnaissance projects. Covert projects were to be run jointly by the CIA's deputy director for Plans and the under secretary of the Air Force, who was also appointed special assistant for Reconnaissance to the secretary of Defense and who reported directly to McNamara. The Air Force was given operational responsibility for managing and conducting NRP (Spires 2004, 2:973, 1081).

Examples of NRP's wide-ranging responsibilities and the secretive requirements of its institutional mandate include NRP comprising all overt and covert satellite and overflight reconnaissance projects encompassing photographic projects for intelligence, geodesy, mapping, electronic signals intelligence, and communications intelligence; establishing a



Satellite image of Beijing, China taken by the KH-7 satellite, developed by the National Reconnaissance Office, on May 27, 1967. This image is an example of Corona satellite imagery which was crucial for U.S. monitoring of foreign military developments. *(USGS)*

covert NRO to manage this program; developing a uniform security system to ensure only users designated by the U.S. Intelligence Board receive its products; and developing requisite cover and public information plans with the assistant secretary of Defense, Public Affairs, to lessen the potential political vulnerability of these programs (Spires 2004, 2:1081–1082).

This document ensured that NRO's existence would remain secret until it was publicly acknowledged for the first time in September 1992 (Day, Logsdon, and Latell 1998, 13).

Air Force Space Plan (September 1961)

Policy developments such as *DOD Directive 5160.32* and ongoing contentiousness between civilian and military policymakers over whether the U.S. military should play a role in space policy illustrated continuing controversy within the U.S. Government. The Air Force was determined that it should play a military role in space and that there should not be an artificial distinction between peaceful and military space activities.

An example of this growing Air Force realization's of space's military importance was expressed by retiring Air Force chief of staff general Thomas White (1902–1965) who asserted "I make this prediction, in the future, the people who control space will control the world" (Futrell 1989, 2:215). Concern over this perceived arbitrary space policy mission orientation between DOD and NASA was expressed by a number of Air Force leaders including General Bernard Schriever (1910–2005), the head of the Air Research and Development Command (Air Force Systems Command after April 1, 1961) and widely regarded as the architect of the Air Force's space and missile programs (U.S. Air Force 2005, 1; Lonnquest 1996; Neufeld J. 2005).

Schriever went on to argue that military space programs had not been supported properly, that there was little technical distinction between DOD and NASA space programs, and that the same sense of urgency existing around U.S. civilian space programs at that time should be applied to U.S. military space programs. Such sentiments proved to be critical drivers for the Air Force in developing the first Air Force Space Plan unveiled in September 1961. This plan saw the Air Force describe what it wanted to do in space, the programs it believed were required in areas such as a space station, weapons in space, and a major applied research effort distinct from NASA research, and the projected costs that would result in a nearly $1 billion increase in military space programs over the next two years (Erickson 2005, 277–278; Spires 2004, 1:324).

Specific plan details called for this applied research program to be conducted in fields such as guidance, propulsion, and sensors to insure that properly developed military potentials be quickly identified and decisively pursued. Plan writers maintained that this initiative would be supportive of an integrated national space program where Air Force capabilities and infrastructure would support the United States' national space program. Space plan proponents also contended that space capabilities would only be used when determined to be the best available or most cost-effective options to support existing mission areas such as reconnaissance and surveillance, defense, offense, command control, and support (Spires 2004, 1:148).

Document contents, including the review of Soviet military astronautic developments, stress the need to develop space technology for improving and maintaining national defense and assuring access to space for peaceful purposes; to develop an applied research program to insure national security, recognizing Soviet interest in militarily exploiting space; and the importance of the United States assessing the military potential of men in space (Spires 2004, 1:325–326).

A subsequent portion of this document expressed the then prevalent belief that manned systems could be more effective than unmanned systems in conducting certain military space activities. It concluded by stressing that the speed of human response is critical for effective military counteractions such as employing electronic countermeasures and that human adaptability to rapidly changing situations could be the only practical way of achieving successful performance in military space functions (Spires 2004, 1:327).

Air Force Space White Paper (1962)

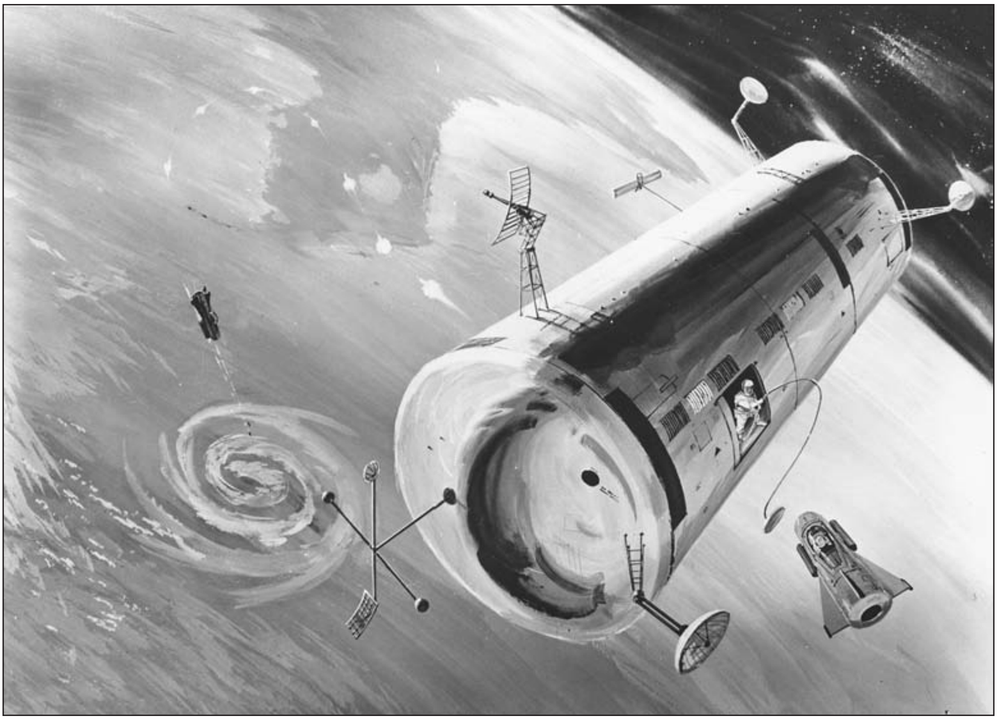
The 1961 Air Force Space plan underwent revision that occurred during 1962, with an updated document being issued in July that placed particular emphasis on manned spaceflight even though there was no consensus on the role military personnel should play in space. This revised plan reiterated the 1961 plans' emphasis on the Air Force's two reasons for being in space as enhancing the United States' military posture and having military patrol ability in space. It went on to stress the need to protect U.S. scientific activities in space and advocated enhanced space boosters; space weapons; developing reliable rendezvous, docking, and transfer procedures; and developing maneuverable reentry and precision recovery of spacecraft. These proposals did not gain Kennedy administration approval but provided insight into then existing institutional military space policy thinking and reappeared in modified form in future policy documents (Erickson 2005, 280–283; Spires 2004, 1:336).

The document's thinking demonstrated a more focused approach to incorporating military space policy into prevailing administration political priorities, which placed greater emphasis on supporting NASA programs. It also incorporates information learned from manned space missions such as John Glenn's (1921–) February 20, 1962 earth-orbiting mission and recognition of the technological challenges of operating in space. Applicable conclusions include strong Air Force advocacy of an aggressive military space program while acknowledging the undesirability of artificial separation between military and nonmilitary space responsibilities; recognizing the technological and operational challenges of space systems due to the absence of gravity and atmosphere and the presence of radiation; and the emerging importance of space systems in warning of ballistic missile attack, detecting nuclear explosions, geodetic measuring, providing surface navigation assistance, and meteorological surveillance (Spires 2004, 1:339–340).

Manned Orbiting Laboratory (1963)

The Manned Orbiting Laboratory (MOL) originated as a 1961 Air Force proposal to establish an ongoing military presence in space with piloted craft, manned surveillance, and a space station. Both the Air Force and Navy participated in MOL, whose program objectives included understanding what individuals could do in space, possible defense purposes of this capability, developing the technology and equipment to improve manned and unmanned spaceflight, and relevant technology and equipment experiments. MOL was designed to support two men in orbit for 30 days and its personnel were 17 astronauts selected by DOD who were test pilots and graduates of the Aerospace Research Pilot School at Edwards Air Force Base, California (Posey 1998, 75; U.S. Congress, House Committee on Science and Technology 1985, 208).

MOL formally began with a December 10, 1963 DOD announcement giving the Air Force program responsibility if the military could define and justify a military space mission NASA was unable to perform. The laboratory was intended to be launched to a 150-mile-high orbit and astronauts would leave their Gemini capsule to move to their work area. Cape Kennedy, Florida was the initial launch site, but this was then shifted to Vandenberg Air Force Base, California to achieve enhanced coverage of the Soviet Union. These astronauts were to stay in orbit for one to two weeks with a 30-day maximum



Concept image of the Manned Orbiting Laboratory, 1960. *(NASA)*

before returning to Earth. Astronaut responsibilities aboard MOL were to photograph Soviet bloc activity and inspect and destroy hostile satellites if necessary. MOL experiments were planned in areas such as tracking earth and space targets, electromagnetic intelligence surveys, multispectral photography, and poststrike target assessment. Air Force objectives were to launch an unmanned MOL in 1968 and have manned crews follow (Posey 1998, 75–76; Spires 1998, 129–130).

MOL experienced success in 1966 when the Air Force conducted a series of successful tests, including nine on-board experiments using a Gemini capsule, and the following year saw MOL planners complete design configuration work with a Gemini module and Titan rocket (Spires 1998, 131). Unfortunately for MOL, these accomplishments could not overcome congressional concern that MOL duplicated an ongoing NASA Apollo Applications Program involving lunar exploration and growing public displeasure over defense spending due to the Vietnam War. MOL was the most expensive Air Force research and development program that was not related to the Vietnam War. All of these factors and DOD's growing belief that national security space missions could be accomplished with unmanned spacecraft resulted in the program's cancellation on June 10, 1969 (U.S. Congress, House Committee on Government Operations 1966, 46; Spires 1998, 133). A more complete analysis of MOL is provided in the next chapter.

Outer Space Treaty (1967)

The Outer Space Treaty (OST), also known as the International Agreement on Peaceful Uses of Outer Space, is officially called "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies" was signed in Washington, London, and Moscow on January 27, 1967. The intent of this agreement was to prevent participating countries from putting nuclear weapons or other weapons of mass destruction in orbit around the earth or on the moon, planets, or artificial satellites, and that human uses of the moon and other celestial bodies would be for peaceful purposes and not be used for establishing military bases, installations, or fortifications; from testing weapons; or from conducting military exercises (U.S. Department of State Bureau of Verification, Compliance, and Implementation, n.d, 1–2; U.S. Congress Senate Committee on Aeronautics and Space Sciences 1967; U.S. Congress Senate Committee on Foreign Relations 1967).

OST has served as the principal international legal mechanism and source of international political sentiment for keeping space demilitarized. It has been the subject of a variety of assessments, and since its enforcement provisions are nonexistent, the treaty has been unable to prevent states or even transnational organizations like terrorist groups from using space as a real or potential arena for military conflict (Martinez 1998; Berry 2001; Sparling 2003). More detailed information on this treaty and textual excerpts are found in chapter 5.

Transitional Developments (1960s–1970s)

Technological and strategic developments were gradually increasing military uses of space as the 1960s wore on and this was reflected in fields such as meteorology and communications. During a nationally televised interview in May 1967, the Seventh Air Force Commander general William Momyer (1916–) discussed how space assets drastically enhanced military commanders battlefield knowledge and provided data for mission planning and implementation:

> As far as I am concerned, this weather picture is probably the greatest innovation of the war. I depend on it in conjunction with the traditional forecast as a basic means of making my decisions as to whether to launch or not launch the strike. And it gives me a little better feel for what the actual weather conditions are. The satellite is something no commander has ever before had in war (Spires 1998, 169–170).

U.S. military operations in Vietnam were also assisted by imagery derived from NASA's Nimbus satellites and by images produced by the Defense Meteorological Satellite Program (DMSP), which had been providing imagery for military planners since 1962. Such timely and accurate imagery enabled U.S. military commanders to know when weather would clear over targeted areas and made it possible to use night sensor imagery to forewarn pilots of enemy camouflage such as burning rice paddies that would produce smoke intended to obscure targets. Satellite meteorological information was particularly helpful in assisting Navy efforts to destroy the strategically important Thanh Hoa Bridge in North Vietnam, and assisted planners of the 1970 raid to rescue American prisoners of war at Son Tay by allowing the raid's schedule to coincide with a break in two tropical storms moving across the South China Sea onto the Vietnamese mainland (Spires 1998, 170; U.S. Air Force 2006; 1–2).

Notable communication satellite technology enhancements at this time benefiting military operations include the then unprecedented ability to provide real-time communications from operational theaters to U.S. military commanders as far away as Washington, D.C. This made it possible for military analysts to provide almost real-time battlefield intelligence far from the battlefield, which raised questions as to who would be responsible for commanding and controlling operational forces. It also posed the problem of creating a dispersed communications system connecting several remote terminals with a single central terminus that could be vulnerable to hostile interference or attack (Spires 1998, 170–171).

Military space policy developments at this time were also affected by the growing domestic and international opposition to the Vietnam War. This opposition was reflected in displeasure at U.S. attempts to build the Safeguard and Sentinel Antiballistic Missile (ABM) systems by both the Johnson and Nixon administrations by domestic and international critics of U.S. military policies. Critics of proposed U.S. ABM weapon systems believed they were of questionable technical reliability and doubted the Soviet missile arsenal warranted deploying an ABM system (U.S. Congress 1969, 22478–22749).

ABM system proponents, however, pointed to the need to counter ongoing growth in Soviet nuclear missile development and deployment, the need for having a dispersed domestic ABM capability to decrease the possibility of a third country or crazed military commander provoking a U.S.–Soviet nuclear exchange by decapitating U.S. military command and control authorities in Washington, increasing Soviet deployments of ABM facilities in dispersed regions of that country, and the belief that deploying an ABM system could be used as a bargaining chip in U.S.–Soviet arms control negotiations (U.S. Congress 1969, 22483; U.S. National Security Council 1970, 1–4; U.S. Central Intelligence Agency 1970, 20; Schneider 1971, 33).

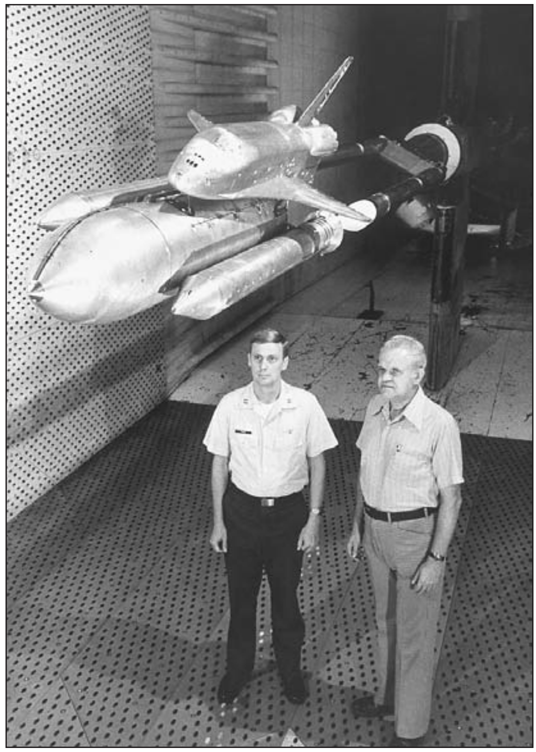
Both domestic and international sentiment for superpower arms control agreements proved more politically and diplomatically potent than taking prudent defensive measures against a growing Soviet nuclear arsenal. This resulted in President Richard Nixon (1913–1994) and Soviet general secretary Leonid Brezhnev (1906–1982) signing the ABM Treaty on May 26, 1972. Terms of this pact saw both nations agree to a limit of two ABM sites each with one of these sites being near the national capital and the other near an ICBM complex. Treaty provisions stated each ABM site could have 100 missiles, 100 launchers, and 15 additional launchers at test sites while regulating the types of radars at

President Richard Nixon and a Soviet official sign the Anti-Ballistic Missile (ABM) treaty on May 26, 1972. Soviet president Leonid Brezhnev stands in the background. The ABM treaty was the first significant arms limitation treaty between the United States and the Soviet Union and represented a major, if temporary, thaw in the Cold War. *(National Archives)*

each site. The ABM Treaty ultimately prevented each of these countries from defending their entire territory, which effectively negated its deterrent effect (Walker, Bernstein, and Lang 2003, B-17).

The absence of congressional support for even this minimal U.S. ABM capability caused the House of Representatives to vote to deactivate the Safeguard ABM system on October 2, 1975 and the Joint Chiefs of Staff (JCS) ordered the program terminated on February 10, 1976 (Bowen 2005, 50).

Ongoing concern over military space program duplication led Secretary of Defense Melvin Laird (1922–) to issue an updated version of *DOD Directive 5160.32* on September 8, 1970. This edict declared that space systems would be acquired and assigned according to guidelines used by other weapon systems. Existing programs were not affected by this policy, which meant that the Air Force would retain responsibility for developing and deploying space systems responsible for conducting warning and surveillance of enemy nuclear delivery capabilities and launch and orbital vehicle support operations. In addition, the other armed services could now compete on an equitable playing field for future military space programs in areas such as communications, navigation, mapping, charting, and geodesy. An ultimate result of this order was that it caused uncertainty in deciding



Captain William Tuck Jr., left, an Air Force test director, and Frank Urbaniak, an ARO Inc. engineer, examine a model of a space shuttle orbiter and launch vehicle prior to a transonic wind tunnel test at the Arnold Engineering Development Center, located at Arnold Air Force Base, TN, October 1, 1977. *(U.S. Department of Defense)*

which military service would be responsible for future management responsibility and operational relationships for communications, battlefield command and control, weather, and undefined major technology programs (Spires 1998, 172).

An additional noteworthy development in U.S. space policy that had military implications was the conclusion of the Apollo program and the development of the space shuttle also known as the Space Transportation System (STS) (Jenkins 1996; Heppenheimer 2002). The decision to construct the space shuttle was made by Nixon in January 1972 (Erickson 2005, 402).

The Air Force was initially skeptical about the space shuttle because of NASA's responsibility for its design and construction and due to questions about its long-term benefits. Air Force leaders initially saw the shuttle as a more cost-effective mechanism for launching larger and heavier satellites than could be done by then existing Atlas and Titan boosters. As the 1970s progressed, however, Air Force leaders came to see the shuttle as a multitasking vehicle that could preserve service interest in manned spaceflight following MOL's demise. This evolution in Air Force thinking about the shuttle was expressed in 1972 by Air Force secretary C. Robert Seamans, Jr. (1918–) who explained:

> The shuttle offers the potential of improving mission flexibility and capability by on-orbit checkout of payloads, recovery of malfunctioning satellites for repair and

> reuse, or resupply of payloads on orbit thus extending their lifetime. Payloads would be retrieved and refurbished for reuse and improved sensors could be installed during refurbishment for added capability (Spires 1998, 181).

This rationale also became reflected in Air Force policy that the shuttle would help the Air Force fulfill its satellite surveillance and reconnaissance missions. Subsequent Air Force involvement with the shuttle program would see military requirements be incorporated into shuttle contractor design studies assessing technology, scope, timing, and cost. The Air Force would have influence in selecting launch sites and ensuring the shuttle met the technical requirements for launches with military payloads (Spires 1998, 181–184).

DOD Space Shuttle Support Operations Center (1977)

The antimilitary political and diplomatic sentiment prompting the passage of the ABM Treaty, concern over ongoing Soviet military augmentation, gradual space shuttle program development, and continuing displeasure at military space fragmentation prompted the Ford and Carter administrations to take a renewed look at space policy issues. The 1976 Soviet decision to resume antisatellite (ASAT) weapons testing, after a four-year moratorium, led to a number of U.S. policy developments that increased the role of space in U.S. military operational planning (Spires 1998, 188; Spires 2004, 1:9).

This increasing realization of space's growing military importance was reflected in a May 9, 1977 letter from Air Force chief of staff general David Jones (1921–) to Air Force command authorities. This document stressed that the Air Force affirmed that its primary responsibilities in space involve developing weapons systems, military operations, and defending the United States, protecting the free use of space by providing essential space defense capabilities, and serving as DOD's executive agent for liaison with NASA and cooperating and coordinating with that agency on activities of mutual interest (Spires 2004, 1:48).

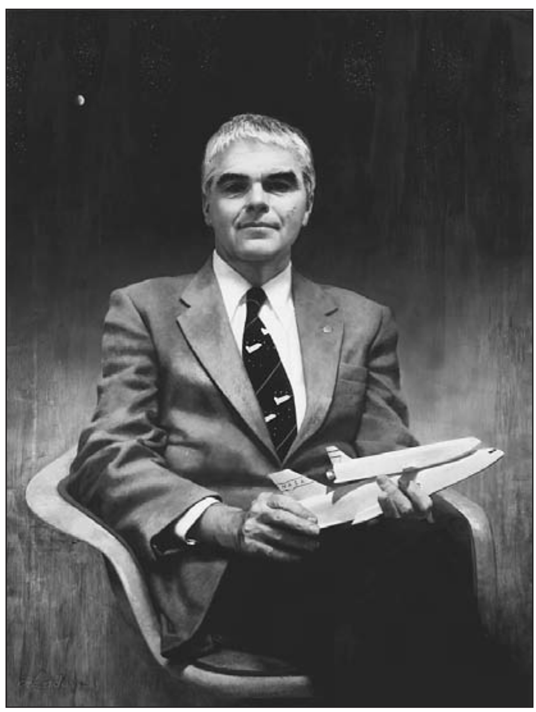
A follow-up 1977 document to this letter saw Jones's sentiments elaborated in greater detail, presented an overview of other U.S. military services space missions, and provided a more explicit statement of Air Force military space policy and relationship with the space shuttle. Relevant document content stresses that Army and Navy space programs were limited to covering Army geodesic and land mapping efforts and ground communication terminal development and the Navy using space for long-haul communication and nuclear ballistic missile submarine navigation. The document went on to stress that Air Force space responsibilities included developing, purchasing, and launching all DOD launch vehicles; providing the only U.S. military capability for tracking Soviet satellites and for attacking hostile space systems; and developing, deploying, and operating space systems for tactical warning and surveillance (Spires 2004, 1:49–50).

Although this document did not produce any major follow-up initiative during 1977, it served as a keystone for stimulating discussion and action on subsequent space issues in the intermediate future (Spires 2004, 1:11).

Space Operations Center (1979)

During the late 1970s, Secretary of the Air Force Hans Mark (1929–) sought to create an operational orientation for space within the Air Force, which he believed would establish Air Force space preeminence within the U.S. space community. In June 1979, Mark sent a letter to Air Force chief of staff general Lew Allen (1925–) in which he urged Allen to more clearly define the Air Force's role as DOD's executive agent for space operations and to submit such a request to DOD. Mark believed that if the Air Force became the executive agent it could replace NASA as the shuttle's lead agency and become the only organization capable of determining future space transportation. Mark received authorization from Secretary of Defense Harold Brown (1927–) to develop an organizational plan for operating the DOD space system including proposing the establishment of a DOD Space Operations Center, but was unable to have the Air Force chosen as executive military space agent (Spires 2004, 1:11, 58).

Mark then proceeded to try to get the Air Force executive agent authorization from existing Joint Chiefs of Staff (JCS) publications with particular emphasis on JCS Publication 2 *United Action Armed Forces,* which described Air Force responsibility for national air defense (U.S. Joint Chiefs of Staff, 2001). The Air Force wanted updated versions of JCS Publication 2 to accept the term "aerospace" as part of Air Force defense responsibilities because it incorporated both air and space into air force mission responsibilities. Aerospace, as a term, had a controversial history in Air Force doctrinal development with



Hans Mark served as Secretary of the Air Force from 1979–1981. *(NASA)* proponents and opponents of the term in Air Force leadership (Jennings 1990). However, the Air Force's judge advocate general (JAG) major general Walter D. Reed refused the Air Force's request to include aerospace within Air Force mission responsibilities because it would usurp secretary of Defense prerogatives to take such action (Spires 2004, 1:11–12, 59–60.

The Air Force achieved DOD executive agent status in 1981 as the following entry documents.

Draft DOD Directive 5160.32 Executive Agent for DOD Space Program (1981)

Air Force efforts to officially include space operations as a service mission component had been included in *Air Force Manual 1–1: Functions and Basic Doctrine of the United States Air Force* published February 14, 1979. This document asserted that space support, force enhancement, and space defense were the three missions Air Force space operations should execute. Space support operations involved launch and recovery activities, orbital support, and satellite surveillance and control. This document went on to assert that using space systems multiplied the effectiveness of surface, sea, and aerospace forces through conducting global surveillance, serving as penetration aids, delivering global communications capabilities, providing precise navigational and positioning data, and presenting detailed and current meteorological information (Futrell 1989; 2:690).

The Air Force's 1979 failure to achieve DOD executive agent for space status caused it to revise its efforts in this regard. This revision involved efforts to update the 1970 version of *DOD Directive 5160.32.* A proposed updated 1981 draft version of this directive proposed designating the secretary of the Air Force as executive agent for DOD space programs. Document compilers believed this official could serve as a single DOD contact source for military space activities and be able to coordinate with other military space entities. As "executive agent" the secretary of the Air Force could provide a centralized and equitable focus for space funding requirements, plans and programs, research and development, and space acquisition.

This proposal appeared at the onset of the Reagan administration, at a time when the new administration was beginning a major defense space policy review. Because of increasing momentum for creating an operational Air Force space command, key Air Force policymakers decided not to present this proposal although arguments supporting Air Force space executive agent authority appeared in future military space policy documents (Spires 2004, 1:12).

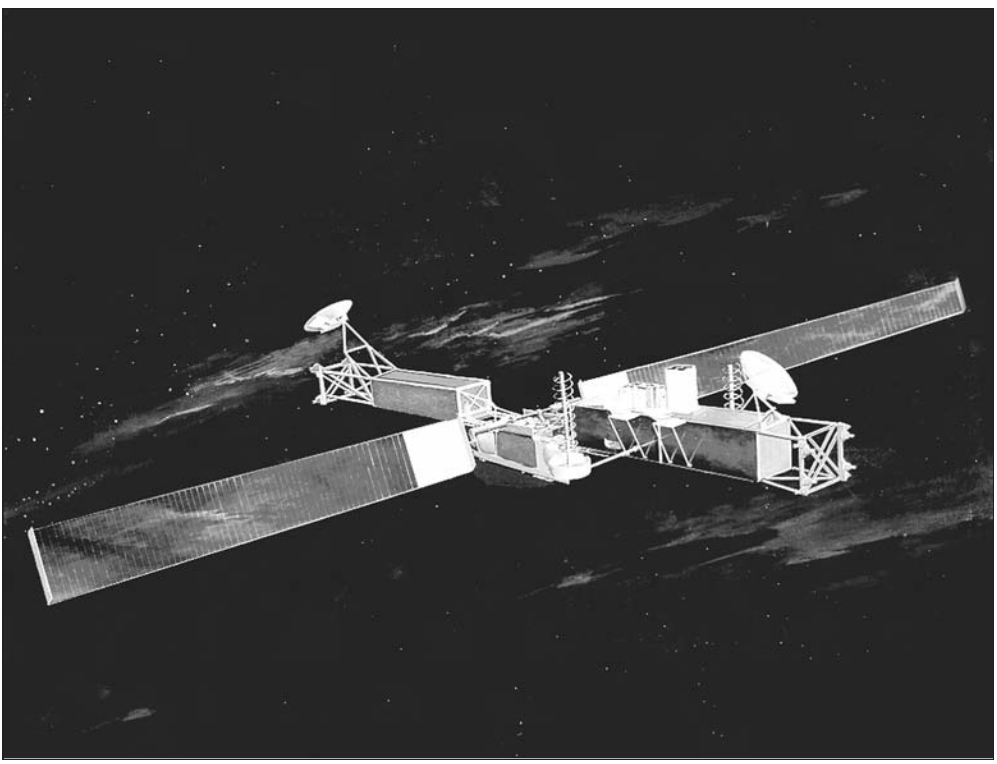
Sample features from this proposed revision of *Directive 5160.32* include the secretary of the Air Force being designated the executive agent for DOD space programs, the secretary of Defense being able to assign individual space systems segments to other DOD departments and agencies as appropriate, military satellite communications (MILSATCOM) responsibilities being assigned by the office of the secretary of Defense in accordance with

DODD (Department of Defense Directive) 5105.44, and other responsibilities for space systems and programs being assumed by the Air Force unless otherwise determined by the secretary of Defense (Spires 2004, 1:61).

MILSTAR Satellite (1982)

The late 1970s and early 1980s also saw military planners look for a strategic satellite system capable of supporting U.S. nuclear forces. The system that evolved out of these planners visions was MILSTAR, which was designed to avoid potential Soviet ASAT threats by orbiting in a supersynchronous orbit of 110,000 miles and operating in the extremely high-frequency range to provide additional bandwidth for space spectrum antijam techniques. On January 11, 1982 Deputy Secretary of Defense Frank Carlucci (1930–) sent a memorandum to the chairman of the joint chiefs of staff and military department secretaries directing them to give MILSTAR high priority in their service planning. A related DOD document on this subject called for initial MILSTAR operational capability by 1987 and a final operational capability by 1992 (Spires 2004, 2:1113, 1185, 1188).

MILSTAR represented the newest generation in a nearly four-decade old U.S. military satellite program (Arnold 2002). President Ronald Reagan (1911–2004) assigned MILSTAR



Artist's rendering of MILSTAR, a strategic satellite system launched in 1994. (U.S. Air Force)

"Highest National Priority" status in 1983, enabling it to proceed with few funding restrictions. The program experienced various cost overruns and bureaucratic administrative problems, which incurred congressional displeasure. These delays kept the first MILSTAR satellite from being launched until February 7, 1994 with fewer satellites, without a wide variety of survivability features, and with fewer ground control stations (Spires 2004, 2:1113; U.S. General Accounting Office 1992; U.S. General Accounting Office 1998).

Air Force Space Command Established (1982)

A far more important military space policy development than Air Force efforts to establish itself as DOD's executive space agent was the 1982 establishment of Air Force Space Command (AFSPACOM). Efforts toward such an organization with such an explicit mission focus within the Air Force had been ongoing for a number of years. An operational impetus toward such efforts was recognition that space counted for over 70% of military communications by the early 1980s and that all major U.S. military commanders relied upon satellites for command and control, intelligence, weather, navigation, and other crucial functions (Parrington 1989, 56). Preliminary steps in this regard included the inactivation of Aerospace Defense Command on October 1, 1979 and Mark's approval of the Air Force's decision to split the functions of Air Force Systems Command's Space and Missile Systems Organization (SAMSO) with the Ballistic Missile Organization and Space Mission (Spires 1998, 196).

Additional pertinent organizational changes saw the North American Air Defense Command (NORAD) Space Defense Center replaced with an operationally oriented center to be located near Cheyenne Mountain, Colorado. September 1981 saw the creation of the Directorate for Space Operations within the office of the Air Force's deputy chief of staff for Operations, Plans, and Readiness. Additional impetus to create an AFSPACOM came in late 1981 from Reagan administration efforts to modernize U.S. strategic nuclear forces. Further incentive for Air Force policymakers to promulgate an explicit space orientation came from Representative Ken Kramer (Republican of Colorado) (1942–) of Colorado Springs who introduced a resolution calling on the Air Force to rename itself the "aerospace force" and to create a separate space command (Spires 1998, 197–198, 201–202).

Air Force chief of staff general Lew Allen (1925–) wanted to control the process of centralizing Air Force space efforts as much as possible but had to contend with pressures from Congress as to the location of a space command and from other Air Force organizations concerned that a centralized space command might affect their corporate futures. During May 1982 Air Force secretary Verne Orr (1916–) appeared before Congress rejecting Kramer's proposal to call the Air Force the Aerospace Force and mentioned that a space command study was underway and nearly complete. On June 21, 1982 Allen announced that the new AFSPACOM would become effective on September 1, 1982 with headquarters at Colorado Springs (Spires 1998, 205; Futrell 1989, 2:697).

Air Force Space Command is responsible for centralizing Air Force space programs and assets and delivering them to operational users. The Command Post of the North American Air Defense Command (NORAD) Cheyenne Mountain Complex, April 1, 1984. Computer generated images are projected on two large display screens. *(U.S. Department of Defense)*

AFSPACOM was assigned responsibility for managing and operating space assets, centralizing planning, consolidating requirements, delivering operational support, and providing a closer interaction between research and development activities and Air Force space program operational users. AFSPACOM's commander was also charged with commanding NORAD and Aerospace Defense Command. May 1983 saw groundbreaking for a consolidated space operations center at Peterson Air Force Base near Colorado Springs, which would become responsible for controlling operational spacecraft missions and managing DOD space shuttle flights (Futrell 1989, 2:697).

Specific justification for AFSPACOM creation was described to a congressional committee as deriving from a Soviet threat in space, the United States' increasing dependence on space systems, an increasing national space resource commitment, the need to fully utilize the space shuttle to enhance manned space presence, and President Reagan's July 4, 1982 announcement that the U.S. space program's most important goal was strengthening national security (Futrell 1989, 2:698).

Orr provided a more lengthy explanation for AFSPACOM's creation emphasizing how increasing U.S. dependence on space and Soviet military policy developments were driving this U.S. decision:

> As in the 1920s when we were just learning about the possible uses of airpower, today we are still learning how space based capabilities can contribute to our na-

> tional defense posture. And *while some might view that space can be kept a weapons-free sanctuary free of military systems, history tells us that each time new technological opportunities present themselves, nations invariably employ them to avoid being placed in an inferior defense position.* Our nation will continue to pursue avenues to foster the peaceful use of space consistent with the President's national space policy. We and the Soviets are now… highly dependent on space for many military support functions, e.g., warning, communications and command and control. This dependence will undoubtedly grow. At a minimum then we must ensure that our space systems can operate in a hostile wartime environment, survive and continue our defense requirements. As national use of and investment in space increases, protection of our resources will be essential. Because such protection introduces the possibility of space-to-space, space-to-earth, and earth-to-space operations, it is in our national interest to be prepared to accomplish them. Prudent preparations such as ASAT, also give us a hedge against technological surprise, and ensure that we are not placed in a permanent position of disadvantage by Soviet initiatives (U.S. Congress, House Committee on Appropriations, Subcommittee on the Department of Defense 1983, 2:129–130).

Creation of AFSPACOM did not stop the desire of other armed services to develop their own space operational commands as evidenced by the Navy's 1983 decision to establish a Naval Space Command and long-standing Army space programs. The following year saw DOD accept a unified space command with Air Force, Army, Marine Corps, and Navy participation. A November 30, 1984 DOD press release announced activation of U.S. Space Command (USSPACECOM) as part of the military's growing emphasis on increasing cooperation between branches of the armed services, which included the emerging unified combatant command structure now part of U.S. military organizational efforts. This press release declared that this USSPACECOM would "better serve U.S. interests and the needs of our allies worldwide by providing an organizational structure that will centralize operational responsibilities for more effective use of military space systems" (Futrell 1989, 2:699–700; Locher 2002; Walker, Bernstein, and Lang 2003, B-1-B-53).

AFSPACOM remains a critical part of Air Force and U.S. military space policy planning a quarter century after its inception. It has experienced advances and setbacks during its institutional evolution such as management structure and acquisition practice problems and will continue to be a key player in formulating U.S. military space doctrine and policy (Stumborg 2006; U.S. General Accounting Office 1990; U.S. General Accounting Office 2000).

Military Space Doctrine (1982)

Formal activation of AFSPACOM provided further impetus to ongoing Air Force efforts to integrate space into official service military doctrine such as *Air Force Manual (AFM) 1.1* published in 1979. An example of such efforts to incorporate space power into

Air Force doctrinal practice came when the author of a document prepared for the 1981 Air Force Academy Military Space Doctrine Symposium asserted "military space doctrine should address… fundamental possibilities for space warfare now in the hope that we can plan more deliberately and prepare more decisively for the uncertain events that lie ahead." (Spires 1998, 206-207; Futrell 1989, 2:700).

Air Force efforts to incorporate space into its doctrinal documents had begun as far back as 1977 and culminated in the October 1982 release of *AFM 1.6 Military Space Doctrine* sponsored by General Charles A. Gabriel the new Air Force chief of staff (1928–2003). This document described space as the ultimate high ground, the outer reaches of the Air Force's operational medium, and an environment useful for conducting Air Force missions. It also asserted that aerospace power provided credible war-fighting capability from the battlefield to the highest orbit and that Air Force military interests included performing war-fighting missions with ground or space-based weapons systems that were consistent with national security requirements and overall national policy. Another crucial point of this document was that a modus operandi of U.S. space doctrine was ensuring free access to and transit through space for peaceful purposes for both military and civilian users. This required the United States possessing capable and prepared military capabilities so force could be used, if conflict was unavoidable, to achieve results favorable to the United States (Spires 1998, 206–207; Futrell 1989, 2:700).

Pertinent passages from this critical document outlining a military space policy role for the United States and how scientific and technological change now made this possible include:

> Space is the ultimate high ground. As the Air Force continues to lead in the development of space doctrine, strategy, and operations, great technical and management challenges lie ahead. The magnitude and direction of Soviet military space effort demand that we meet these challenges, employing the full range of aerospace assets in our nation's defense. . . Our scientific, technological, and industrial communities have established a resource base from which this nation can logically proceed with expanded space operations. Within that framework, our doctrine and strategy must evolve to provide the vision, focus, and direction to guide the development of future space programs, systems, and operational practice (Spires 2004, 1:65).

Additional explicit mission oriented tasks of how the Air Force will execute this emerging aerospace military doctrine stressed topics such as military space operations needing to contribute to U.S. interests in all environments, the Air Force needing to develop, operate, sustain, and deploy space systems to deter or resolve conflicts in favor of the United States, and being able to provide space-based surveillance, warning, and attack assessment to alert national command authorities and military commanders of potential attacks against the United States, its allies, and their forces (Spires 2004, 1:68).

An additional section of *AFM 1.6* includes various management, pedagogical, training, workforce, and general technological infrastructure requirements for implementing this doctrinal capability. These include promoting innovation to exploit emerging science and technology advances, making sure space programs are understood and fiscally sustainable, developing and maintaining pedagogical training programs for individual's leading space programs, and developing the required technology base, research and development programs, and acquisition policies to meet DOD, NASA, and other government space requirements (Spires 2004, 1:69).

Air Force Space Plan (1983)

Following the 1982 creation of AFSPACOM and publication that same year of *AFM 1.6,* the beginning of 1983 saw the Air Force seek to develop its own Air Force Space Plan. This document was published in March 1983 and described general military uses of space and identified four terms for space operations: space control, space support, force enhancement, and force application. Air Force Space Plan described space control as maintaining freedom of action in space and denying such autonomy to an enemy. Space support meant deploying, maintaining, and sustaining space equipment and personnel through space launch and orbital repair and recovery. Force enhancement encompassed defense support attributes including communication, navigation, and weather to enhance terrestrial and space-based forces. Force application involved performing combat operations in space.

Successful plan implementation proved problematic due to tension within Air Force organizations such as AFSPACOM and Air Force Systems Command over interpreting mission area functions. An additional problem with the plan occurred in October 1986 when the Air Force decided to separate AFSPACOM and USSPACECOM. This event saw AFSPACOM leadership going to a two-star general instead of a four-star general who did not have daily operational responsibility for crucial space resources, and reflected continuing disagreement within the Air Force on proper roles and missions and uncertainty about where space stood in Air Force policy planning (Spires 2004, 1:156–157).

Command Arrangement for Space (1983)

President Reagan's March 23, 1983 announcement about the proposed Strategic Defense Initiative (SDI) missile defense program provided critical support to planning and support for a unified space plan (Spires 1998, 218; Baucom 1992, 171–196). Following AFSPACOM's creation its commander general James Hartinger (1925–2000) proposed creating a unified command to centralize military space command activities, which received additional emphasis with the emergence of SDI. Gabriel agreed with Hartinger's objective and on June 7, 1983 these individuals provided the JCS with rationale for a unified command urging the JCS to seek presidential approval to take immediate action creating a unified space command to consolidate space control, space support, force application, and force enhancement operational control at Peterson Air Force Base, CO (Spires 2004, 1:481, 780).

This proposal was sent by Secretary of Defense Casper Weinberger (1917–2006) to national security advisor Robert McFarlane (1937–) on October 4, 1983, and in late November Weinberger requested presidential approval to establish a unified command for space on October 1, 1985 asserting that the JCS believed this would be the best way to ensure SDI's success. In late 1984, Reagan approved Weinberger's recommendation and USSPACECOM was activated on September 23, 1985 (Spires 2004, 1:481, 780–781; Piotrowski 1987; Lambeth 2004).

Boost Surveillance and Tracking System and Space Surveillance and Tracking System (1984)

Concern over the aging Defense Support Program (DSP) satellite fleet in the early 1980s lead military planners to look at possible replacement systems to enhance the timeliness of U.S. warning and response to hostile ballistic missile launches (Richelson 1999, 95–109). During the early 1980s the Air Force studied a DSP replacement program called "Advanced Warning System," which was absorbed in 1984 by the Strategic Defense Initiative Organization (SDIO), which was the agency directed to implement SDI. SDI changed this program's name to Boost Surveillance and Tracking System (BSTS) while also creating a complimentary program the Space Surveillance and Tracking System (SSTS). Both of these programs were charged with developing ballistic missile surveillance, detection, tracking, and assessment capabilities with the Air Force ordered to develop relevant technology with long lead times, to prepare program plans, and to evaluate system conceptual designs and their survivability (Spires 2004, 2:1097).

A May 7, 1984 memorandum prepared for Orr set out requirements for BSTS and SSTS programs emphasizing assorted attributes including providing ballistic missile tactical warning/attack assessments; satellite attack warning/verification; satellite targeting for antisatellite operations; and SDI surveillance, acquisition, tracking, and kill assessment (SATKA). Orr's memorandum also stressed the importance of technology demonstration efforts and encouraged the Air Force to identify and proceed with developing relevant technologies such as long-life cryogenic refrigerators, focal plane array manufacturing technology, and radiation hardened electronics (Spires 2004, 2:1130–1131).

BSTS failed to reach deployment during the later 1980s due to immature technology and cost problems, while SSTS evolved and eventually was incorporated into an existing missile defense agency program (Smith 2005, 2; U.S. Missile Defense Agency 2006, 1).

Defense Space Launch Strategy (1984)

During July 1982, President Reagan confirmed that the space shuttle remained the United States' primary space launch vehicle. Despite this declaration, Air Force officials

A Delta II rocket in the Strategic Defense Initiative program lifts off beside its launch tower September 29, 1989. The 1984 Defense Launch Strategy sought to diversify U.S. military space launch capabilities by allowing such launches to be carried out by vehicles other than the space shuttle. *(U.S. Department of Defense)*

remained concern that there be an adequate supply of expendable boosters for military launching needs. This concern was articulated during 1983 by Air Force Systems Command Space Division commander lieutenant general Richard C. Henry (1925–), who was concerned about the imminent shutdown of Titan and Atlas rocket production lines and reliance on a costly shuttle fleet with reduced operational schedules. Henry argued that the shuttle was most suitable for missions where there was clear need for human intervention and that manned activity was not required for satellites sent to geosynchronous earth orbit. In Henry's view, the solution to this predicament was investing in a mixed fleet of expendable launch vehicles (ELVs) from both government and commercial service providers (Spires 2004, 2:736, 890–893).

NASA officials, placed on the defensive by Henry's concerns, defended their agency's relationship with the military saying the military had acquired experience with unmanned space systems while neglecting manned spaceflight. These officials went on to urge that DOD make optimum use of the manned spaceflight capabilities developed by NASA and lobbied against military attempts to use both the shuttle and commercial launch capabilities.

The military was not persuaded by these NASA entreaties and succeeded in convincing Weinberger to issue a Defense Space Launch Strategy, which was published on January 23, 1984 (Spires 2004, 2:737, 894).

The Defense Space Launch Strategy agreed with the military's desire to have military launches done by the shuttle and commercial service providers, although it said the shuttle remained the primary launch system for routine DOD payloads. It used a contingency planning scenario justifying this mixed launch strategy while seeking to look at longer term military space launch requirements by stressing the need for the United States to have complementary launch systems in the event of unanticipated technical or operational problems and to have a launch system suitable for operating in crisis or conflict situations if the U.S. mainland were directly attacked (Spires 2004, 2:895).

The Defense Space Launch Strategy went on to mention that while commercial ELVs were affordable and available for DOD space launch requirements into the early 1990s, other DOD launch capabilities to meet requirements beyond then must be evaluated and validated to ensure that future national security space missions were not restricted by inadequate launch capability (Spires 2004, 2:895–896).

The tragic January 28, 1986 explosion of the shuttle Challenger that resulted in the shuttle fleet being grounded for over two and a half years proved the wisdom of adopting this mixed ELV strategy (National Aeronautics and Space Administration, 2006, 2).

Blue Ribbon Panel on the Future of the Air Force in Space (1988)

The Challenger tragedy and subsequent Titan booster launch failures prompted the Air Force to reexamine their involvement with the shuttle and their commitment to space.

In 1987 Air Force secretary Edward C. Aldridge (1938–) issued a white paper that was very critical of Air Force space policy and leadership, arguing that it had not shown institutional purpose or responsibility toward space, that there had been few truly new Air Force space initiatives, and that the absence of strong aggressive Air Force space program advocacy has created a leadership vacuum that organizations such as the Office of the Secretary of Defense (OSD), SDIO, USSPACECOM, and other armed services are moving to fill (Spires 2004, 1:80, 158).

This white paper convinced Air Force chief of staff general Larry Welch (1934–) to establish a "Blue Ribbon Panel on Space Roles and Missions" consisting of senior representatives from major Air Force commands during the spring of 1988. Welch justified another space study based on significant space policy statements emanating from DOD, the White House, technical advances, SDI's potential, and friction and funding problems with other military services. Welch was also concerned that although the Air Force had played a critical space role for 30 years and received 50% of the U.S. space budget and 75% of DOD controlled space funding that it was uncertain about its future space mission. He believed that the commitment of Air Force leaders to institutionalize space responsibilities was not shared throughout the service. This lack of commitment, in Welch's opinion, stemmed from not understanding space systems and their potential and a multiple user approach to space systems, which weakened space in the military budget process (Spires 2004, 1:158–159).

Consequently, Welch directed his panel to examine the Air Force's future role in space and near and long-term commitments needed to achieve the requisite support for combatant commanders. The panel issued its report in August 1988, which said Air Force space policy should be revised and reflect realistic capabilities and aspirations. It reaffirmed the four mission functions described earlier in the October 1983 Space Command arrangement document, and it asserted that AFSPACOM must continue to play a central role as advocate, operator, and single manager for space support, while USSPACECOM should normalize its relationship with AFSPACOM by returning to it operational control of peacetime space assets (Spires 2004, 1:159).

Relevant report determinations include the assertion that space power will play as decisive a role in future combat operations as airpower currently does, that the evolution of space power from providing combat support to space weapons is approaching and will take years instead of decades, that the Air Force's future is inextricably linked to space, and that implementation of this updated role requires the Air Force's corporate commitment, broad involvement, and the vision to make it a reality (Spires 2004, 1:390–395; Spires 1998, 234–238).

During February 1989, Air Force headquarters issued plan to implement Blue Ribbon panel recommendations. This plan proclaimed "the Air Force *is and will be* responsible for the global employment of military power above the earth's surface." It charged AFSPACOM with developing a "Space Roadmap" for updating the Air Force Space Plan and integrating existing Air Force space operations. This roadmap was intended to project military space policy into the 21st century by linking space systems to war-fighting requirements, global strategy, and the four military mission control areas of space control, space support, force enhancement, and force application from the 1983 Air Force Space Plan. This implementation plan maintained that space power would achieve equal importance to airpower in future combat, that the Air Force must prepare for space power to evolve from combat support to encompass all military capabilities, and that this roadmap must produce a coherent Air Force space role (Spires 2004, 1:159).

Transitional Developments prior to the Clinton Administration (1989–1992)

The George H. W. Bush administration saw the final decline and collapse of the Soviet Union, which would appear to have ended the role Soviet military space policy would play in prompting U.S. military space programs. This would not be the case though, as a series of domestic and global events in the early 1990s influenced and accelerated U.S. efforts to develop a viable military space program.

A significant domestic event was the October 1, 1990 Air Force Systems Command transfer of its launch-related centers, ranges, bases, and Delta II and Atlas E missions to AFSPACOM, which was part of overall Air Force efforts to enhance the integration and normalization of space operations throughout the Air Force. This event also represented

Patriot Tactical Air Defense Missile System is an air defense guided missile system manufactured by Raytheon that gained fame in the Persian Gulf War as the "Scud killer." Reports after the war revealed the relative inaccuracy of the Patriot against Saddam Hussein's Scud missiles. *(U.S. Department of Defense)*

a major step forward in the Air Force assuming an operational war-fighting perspective on space (Spires 1998, 240–241).

The most important of these events enhancing space as a major military operational player was Operation Desert Storm, which saw the United States lead an international military coalition to drive Iraqi armed forces out of Kuwait during January–February 1991. This conflict saw space assets play a critical role in ensuring the success of coalition operations. Space assets were used to target Iraqi military capabilities; these targets were, in turn, destroyed by precision-guided munitions using satellite data to guide them to their targets. Coalition forces made use of satellite reconnaissance to track and attempt to destroy launched Iraqi Scud missiles using Patriot missiles. Furthermore navigation, early warning, and Desert Storm communication objectives were all advanced using space assets. In addition, postwar assessments determined that space-based weather operations were critical in areas in providing information about data sparse combat areas, that timely data delivery was critical for airborne, ground, and sea-based operations, that having mobile meteorological satellite control capability was critical for combat operational success, and that tactical users in the field should have access to weather data (U.S. Air Force Space

Command 1991, 1; U.S. Department of Defense 1992; 543–575, 801–809; Rip and Hasik 2002, 334–357; Chun 2001; 112, 198–205).

An assessment of space's role in Desert Storm was provided by AFSPACOM commander general Thomas Moorman (born approximately 1940–) who stressed:

> Desert Storm was a watershed event for space systems. Satellites, and the ground systems and people trained to control them, played a crucial role in the outcome of the conflict. Space owned the battlefield. We had a robust on-orbit constellation and the inherent spacecraft flexibility to alter our operations to support specific needs of the terrestrial warfighter (Spires 1998, 260).

Desert Storm also served as culmination of gradual increases in military uses of space, which occurred during the 1980s. MILSATCOM were important in the 1982 British Falkland Islands campaign against Argentina, in the U.S. 1983 Operation Urgent Fury campaign in Grenada. Space systems also provided vital communications links and mission planning information in the 1986 Operation Eldorado Canyon bombing of Libya, GPS satellites were first used during Operation Earnest Will in 1988 to assist ships and helicopters conducting minesweeping operations in the Persian Gulf, and during 1989 satellites provided important communication links and weather data for Operation Just Cause in Panama (Spires 1998, 244–245).

Integrating space policy throughout the Air Force remained an ongoing service organizational challenge. An October 1991 report by the Air Force Office of Inspector General complained that the Air Force had failed to effectively normalize space within the service and reserve roles and missions issues throughout the broader military community. This document went on to maintain that Air Force space policy tenets received insufficient acceptance and that, despite Desert Storm's space accomplishments, the idea of space being a decisive factor in current and future combat operations was still viewed as excessively controversial and futuristic. The report also asserted that the Air Force had not accepted space as a critical component of mission planning or an equal partner with terrestrial and atmospheric components of the Air Force's mission (Spires 2004, 1:160).

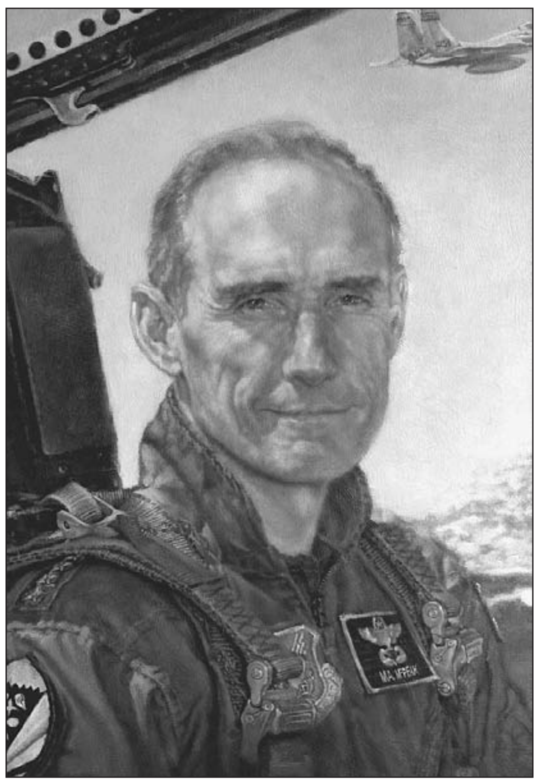
Military assessments of space also recognized that, despite the successes of space-based assets during Desert Storm, many deficiencies remained before large-scale space-based military operations could be performed. Air Force analysts recognized that existing space systems were insufficient for tactical use, that ground personnel generally lacked the requisite equipment and training to make optimum use of space capabilities, and Air Force leaders recognized that they must provide leadership in efforts to modernize space infrastructure, achieve technical enhancements to space systems, and increase space awareness throughout their service and U.S. armed forces (Spires 1998, 260).

These efforts to achieve continued growth in military awareness of the space continued as the Clinton administration began in 1993 and were first reflected in the work of another blue ribbon panel report on the Air Force's future in space.

Blue Ribbon Panel on Air Force in Space in the 21st Century (1991)

Air Force chief of staff general Merrill McPeak (1936–) established a second blue ribbon panel during the fall of 1992 lead by Moorman to address internal space roles and missions while also examining how events such as Desert Storm affected current and future Air Force space roles and missions. The panel issued its report in January 1993, and it served as the beginning of a new assertiveness about space and declared that the Air Force would be key to national strategy of projecting military power rapidly and decisively with expeditionary forces and that space would provide the United States with "global eyes and ear" and corresponding reach and power capabilities (Spires 2004, 1:160–161).

Examples of major report recommendations, which covered a multifaceted array of mission responsibilities including the growing importance of battlefield information management and control, included: that the Air Force become the sole manager for DOD space acquisition and commit to reducing the cost of space systems; that the Air Force advocate and support national efforts to sustain the space industrial base; that the Air Force lead development of a new space-lift system for meeting unmanned military, civil, and commercial needs; that the Air Force lead a comprehensive effort to develop and operate ASAT and ballistic missile defense capabilities; and that the Air Force develop the doctri-



Gen. Merrill McPeak, Air Force Chief of Staff (1936–). McPeak served as Air Force Chief of Staff during the early 1990s overseeing transformations in Air Force operational capabilities and promoting the growing importance of space in military operations. *(U.S. Department of Defense)* nal concepts and capabilities to gain battlefield information dominance and establish an Air Force Space Warfare Center, review DOD and intelligence community classification and information dissemination policies and practices, and make integrated aerospace employment a fundamental principle reflected in all Air Force education and training programs (Spires 2004, 1:400–414).

The Space Warfare Center recommended by the blue ribbon panel was activated on December 8, 1993 to advance Air Force and joint and combined space warfare through diverse innovation, testing, tactics, and development and training programs. This facility was renamed the Space Innovation and Development Center on March 8, 2006 (U.S. Air Force Space Command 2006, 1).

McPeak endorsed blue ribbon panel findings by the spring of 1993 and initiated another program to ensure the Air Force gained military space leadership, which was known as *Spacecast 2020,* described below (Spires 2004, 1:162).

Spacecast 2020 (1994)

Spacecast 2020 was a series of studies produced by Air University, the Air Force's professional military educational institution, during 1994 (U.S. Air University, Center for Strategy and Technology, 1994(a)). These studies sought to link existing and emerging space technologies in a coherent manner with national security missions. They also sought to reinforce Air Force space leadership and for that service to begin taking operational leadership of space (Carns 1995, 4–7).

Participants in this project included representatives from all U.S. military space commands, scientists, private sector industry, and the research community. Eighteen papers were produced by *Spacecast 2020* participants covering the broad categories of global presence, global reach, and global power. These papers stressed issues such as space transportation, the international economic competitiveness of the U.S. commercial space launch industry, and critical space industries and technologies in areas such as information architecture, space-based lasers with surveillance and counterforce capability, space-lift vehicles, and relevant professional military education (PME) requirements of a space-oriented military (Spires 2004, 1:162–163; Johnson 1993).

These reports were presented on June 22, 1994. The executive summary document stressed the traditional military importance of holding the high ground by maintaining that military space power provided unparalleled perspective and extremely rapid access to the earth's surface. Exploiting these advantages would have a major impact on intelligence, communications, command and control, navigation, force application, and other critical military operational aspects. It also mentioned that it provided the ability to "see over the next hill," which can reduce uncertainty and insecurity while promoting stability. This executive summary also contended that the United States needed to pursue a number of technological capabilities for optimal exploitation of space's high ground. These capabilities included existing ones, such as renewable space launch, to visionary or utopian capabilities, such as defending earth against asteroids in earth-intersecting orbits (Air University, Center for Strategy and Technology 1994(b), 3).

Numerous recommendations were made by *Spacecast 2020* participants in a variety of military operational areas. Two areas that are covered here include operational analysis and PME. Report compilers made the following recommendations for what they saw as the highest value space systems in these areas:

- Creating an integrated-demand architecture for capitalizing on global presence and providing the global view information required by military combatants and leaders.
- Developing a transatmospheric vehicle for space lift and global reach.
- Developing a multifunctional space-based laser system for global power counterforce and surveillance operations.
- Developing critical technologies contained within these systems including: high performance computing, micromechanical devices, and materials technology including various metals classes, ceramics, and carbon and ceramic composites (Air University 1994(b), 19–20).

Spacecast 2020 also examined the education and training that would be required for military space forces in the future. PME recommendations, whose relevance remains more than a decade, later include:

1. Protect future research sources by immediately stopping creation of print-only documents and publications at military educational and research institutions.
2. Begin to place all books and research papers online for easy access by military and civilian researchers.
3. Standardize, maintain, and enforce skills required in 2020 by requiring all PME participants to take technology orientation courses or test out of them.
4. Reinforce the status of PME higher learning institutions by designating them as centers for solutions to real-world problems. Incorporate more think-tank studies into military curriculum and take the experiences from *Spacecast 2020* and link them to all military and civilian education centers.
5. Encourage local units to develop their own PME and on-the-job training programs by recognizing such local program development as a pedagogical asset.
6. Continually monitor development of emerging technologies by regularly polling educational technology leaders.
7. Initiate PME system institutions by establishing direct links between military research institutions, laboratories, and staff colleges. Such links will enhance synergy between researchers, educators, and those using research results. Also flatten information distribution by sharing information at all organizational levels.
8. Prepare for future classrooms by reengineering them, including integrating more technology into classrooms and changing educational processes and methods.

9. Incorporate emerging technologies by taking advantage of civilian educational technological advances in interactive software and multimedia simulations.
10. Begin connecting individuals to the PME system by operating and linking education and training electronic bulletin boards at Air University and corresponding educational units in other services (Air University, Center for Strategy and Technology 1994(a), L-39-L-44).

Electronic access to *Spacecast 2020* is provided through Air University's Center for Strategy and Technology website (http://csat.au.af.mil/2020/) and the Federation of American Scientists website (http://www.fas.org/spp/military/docops/usaf/2020/).

New World Vistas (1995)

A complementary study to *Spacecast 2020* around this time period was *New World Vistas.* This study was commissioned by Secretary of the Air Force Sheila Widnall (1938–) and Air Force chief of staff general Ronald Fogleman (1942–), who directed the Air Force's Scientific Advisory Board (SAB) and other Air Force entities such as the U.S. Air Force Academy and Air University who participated in this endeavor to look at the Air Force's future. The initiative leading to what became a 15-volume compendium called *New World Vistas* was initiated in a two-page directive from Widnall and Fogleman to the SAB in November 1994. The study was inspired and influenced by the von Karman *New Horizons* study mentioned earlier in this chapter (Daso 1999, 70–71).

Widnall insisted that the report should examine the involvement of multiple services, simulation and modeling opportunities, and explore areas where drastic technological changes might affect the Air Force. A series of meetings were held at various locales in the United States during 1995 where panel participants brainstormed before presenting their report in December 1995 with public release beginning on January 31, 1996 (Daso 1999, 71–74).

SAB began preparing *New World Vistas* with the following assumptions about the existing technological and strategic environment. These included: the Air Force being required to fight at long distances from the United States with some operations being staged directly from the continental United States; the Air Force being prepared to fight or conduct mobility and special operations anywhere on short notice; that weapons are highly accurate, minimize collateral damage, and have minimal delivery and acquisition costs; the necessity of weapons delivering platforms to be lethal and capable of surviving hostile attacks; recognizing that future adversaries could be organized national militaries or terrorist groups; anticipating that targets could be fixed, mobile, or well-concealed and include geographic battlefields ranging from jungles to cities; the knowledge that adversary military capabilities will improve steadily and be difficult to anticipate; that the Air Force must detect and destroy chemical, biological, and nuclear weapons and their production centers; and that the number of Air Force personnel will decrease requiring optimization of individual performance (U.S. Air Force Scientific Advisory Board 1995, 5).

Sheila Widnall was President Bill Clinton's secretary of the Air Force from 1993 until 1997, the first woman to head a military service. *(U.S. Department of Defense)*

A key hypothesis of *New World Vistas* was that the realm of military conflict could shift from the earth's atmosphere into space and even the then emerging world of cyberspace. An outgrowth of this assessment was that national commercial communications and information systems will become increasingly interlinked with military counterparts and that advanced sensors and data-processing capabilities now give military commanders unprecedented detailed information on global operating conditions (Grier 1996, 20).

New World Vistas focused on specific technologies required to produce desired capabilities in the following six areas: Global Awareness, Dynamic Planning and Execution Control, Global Mobility in War and Peace, Projection of Lethal and Sublethal Power, Space Operations, and People. Where space operations are concerned SAB made a number of recommendations. These include using distributed satellite constellations relying on single or dual purpose satellites, reducing the time from satellite to launch to two years, using commercial vehicles to launch most military satellites, reassessing dedicated military systems like MILSTAR, examining different ways to protect satellite systems in the future, and ending the selective availability of Global Positioning System (GPS) satellites (U.S. Air Force Scientific Advisory Board 1995, 57–64).

More specific recommendations were provided in supplemental *New World Vistas* reports in areas such as information warfare, distributed satellite systems, communications, global positioning, space control, force projection, and related topics. Sample recommendations in these areas include: developing specific roadmaps to exploit commercial communications, positioning, environmental, and reconnaissance systems to assure their accessibility from daily peacetime operations through major regional conflicts; the Air Force developing and implementing a global terrestrial and satellite communications architecture built on DOD and commercial capabilities; possessing GPS systems with time transfer accuracies of a nanosecond or less to synchronize future communication and information; the Air Force ensuring that its most critical space assets are safe from attack by other nations, rogue groups, and major powers; the Air Force broadening the use of space to incorporate direct force projection against surface, airborne, and space targets; developing space munitions capable of precision strikes against surface and airborne targets; and working with other U.S. armed services to exploit virtual reality implementations to make space support more comprehensible to political leaders and war fighters by allowing these individuals to participate in a space-terrestrial operations continuum (U.S. Air Force Scientific Advisory Board 1996, vi–xi).

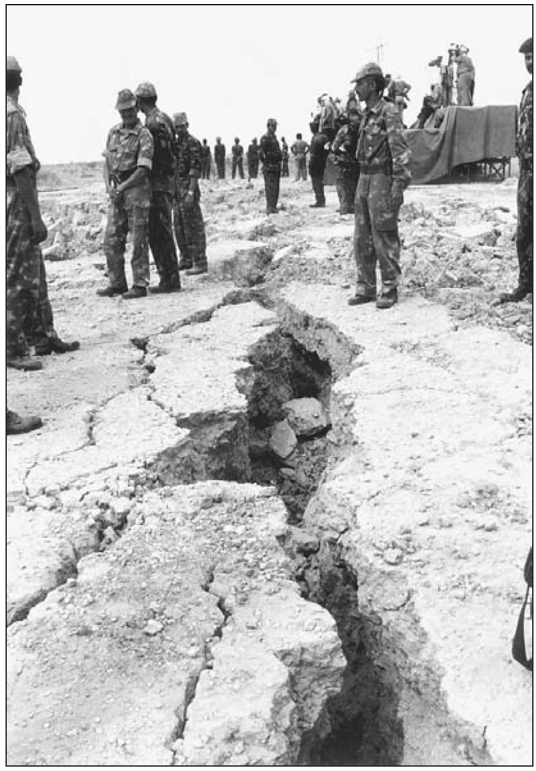
Rumsfeld Commission Ballistic Missile Defense (1996)

Iraq's use of Scud missiles during Operation Desert Storm, although failing to achieve military success for them, made U.S. and other international defense policymakers aware of emerging ballistic missile threats from developing countries following the Cold War (Nolan 1991; Chow 1993; Cunningham 1994).

This U.S. concern over missile proliferation focused on countries such as Iran, Iraq, India, Pakistan, and North Korea during the 1990s and was reflected in Section 721 of the fiscal year 1997 Intelligence Authorization Act. The act required the CIA to report to Congress every six months on foreign countries that had acquired dual-use (civilian and military) technologies that could be used to develop or produce weapons of mass destruction and the acquisition trends in such technologies by these countries (U.S. Central Intelligence Agency 1997, 1).

Congressional concern over what it saw as emerging ballistic missile threats to the United States from such countries was reflected in the fiscal year 1997 National Defense Authorization Act enacted on September 23, 1996. This legislation created a Commission to Assess the Ballistic Missile Threat to the United States to examine the characteristics and extent of this threat (National Defense Authorization Act for Fiscal Year 1997, 104–201).

This commission was chaired by former and future secretary of Defense Donald Rumsfeld (1932–). In its charter the Rumsfeld Commission was directed to scrutinize threats posed by ballistic missiles deployed on the territory of potentially hostile countries, launched from surface vessels, submarines, or aircraft operating off U.S. coasts, and deployed by potentially hostile countries on the territory of a third country to reduce the distance its ballistic missiles would have to travel to reach the United States. Additional commission responsibilities included examining the ability of existing and emerging powers to arm ballistic missiles with weapons of mass destruction; examining the domestic



Indian soldiers examine the giant cracks that appeared in the sun-baked ground on May 20, 1998 in Pokhran after India conducted nuclear bomb tests May 11–14, 1998. The tests raised fears of a nuclear arms race between India and Pakistan, who had fought three wars with each other in the last 50 years. This test amplified Rumsfeld Commission findings about the growing proliferation of ballistic missile technology. *(AFP/Getty Images)*

design, development, and production of nuclear materials and weapons by such states; reviewing the ability of these states to acquire relevant materials, technologies, and weapons through covert sales, transfer, or theft; and the U.S. intelligence community's current and future collection and analysis capabilities to warn of such threats (U.S. Commission to Assess the Ballistic Missile Threat to the United States 1998(a), *Report: Charter and Organization,* 1).

The Rumsfeld Commission released an unclassified version of its report in July 1998, which came in the aftermath of a year in which India and Pakistan tested nuclear weapons and Pakistan and Iran tested new ballistic missiles, demonstrating these countries' increasing missile design capability and sophistication (Towell 1999, 20). The nine commissioners reached the following unanimous conclusions in their assessment:

- Concerted efforts by a number of overtly or potentially hostile nations to acquire ballistic missiles with biological or nuclear payloads pose a growing threat to the United States, its deployed forces, and its friends and allies. These newer, developing threats in North Korea, Iran, and Iraq are in addition to those still posed by the existing ballistic missile arsenals of Russia and China, nations with which the United States is not now in conflict, but which remain in uncertain transitions. The newer ballistic missile-equipped nations' capabilities will not match those of U.S. systems for accuracy and reliability. However, they would be able to inflict major destruction on the United States within about five years of a decision to acquire such capability (10 years in the case of Iraq). During several of those years, the United States might not be aware that such a decision had been made.

- The threat to the United States posed by these emerging capabilities is broader, more mature, and evolving more rapidly than has been reported in estimates and reports by the intelligence community.
- The intelligence community's ability to provide timely and accurate estimates of ballistic missile threats to the United States is eroding. This erosion has roots both within and beyond the intelligence process itself. The community's capabilities in this area need to be strengthened in terms of both resources and methodology.
- The warning times the United States can expect of new, threatening ballistic missile deployments are being reduced. Under some plausible scenarios—including re-basing or transfer of operational missile, sea- and air-launch options, shortened development programs that might include testing in a third country, or some combination of these—the United States might well have *little or no warning before operational deployment* (U.S. Commission to Assess the Ballistic Missile Threat to the United States, *Report: Executive Summary* 1998(b), 1; U.S. Congress, House Committee on National Security, Research and Development Subcommittee 1998(b); U.S. Congress, House Committee on National Security 1998(a).)

Further illustration of the Rumsfeld Commission's concern over proliferating ballistic missiles was demonstrated on August 31, 1998 when North Korea launched a Taepo-dong missile capable of carrying a space satellite and with a range nearly sufficient to carry a small warhead to Alaska or Hawaii (Towell 1999, 20; Bermudez, Jr., 1998, 26).

Agreement Between NASA, NRO, and AFSPACOM (1998)

Achieving cooperation between military space agencies, and concomitantly civilian and military space agencies, has been a problem plaguing U.S. military space programs as shown in this chapter. The years 1995 and 1996 witnessed attempts between AFSPACOM and NASA to reach an agreement on exploring and exploiting future space launch activities and technologies, which came about in early 1997. AFSPACOM commander general Howell M. Estes III (born approximately 1943–), with approval of Air Force chief of staff Fogleman, concluded a memorandum of agreement with NASA administrator Dan Goldin (1940–), creating a partnership council between these two organizations effective February 28, 1997.

This council's mission was to improve interaction between these organizations to achieve more consistent long-range planning, more efficient resource allocation, increased technology partnerships, and more persuasive program advocacy. The AFSPACOM commander and NASA administrator were designated as cochairs as both organizations vowed to take the initiative in coordinating activities in areas of mutual interest (Spires 2004, 2:741).

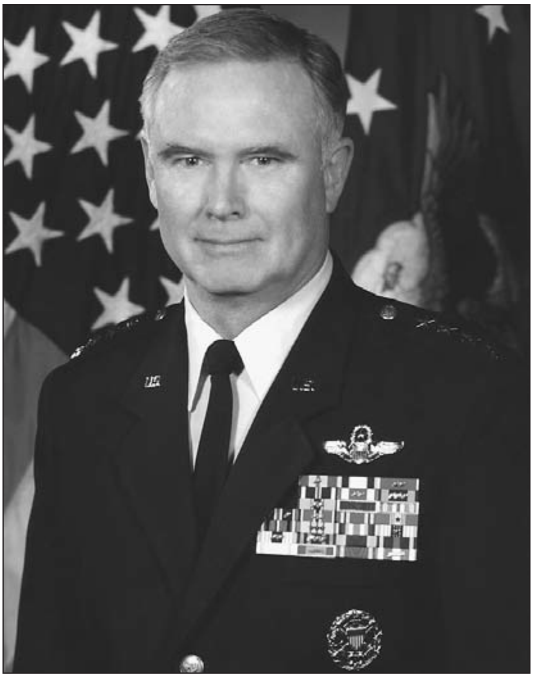
An outgrowth of this increased cooperation between these organizations came in a supportive May 1, 1997 memorandum from Assistant Secretary of the Air Force (Space) and NRO Keith R. Hall. An April 8, 1998 partnership council meeting included Hall and resulted in expansion of the council to include NRO as a full partner. On November 23, 1998 a memorandum of agreement was signed by Goldin, Hall, and new AFSPACOM commander general Richard B. Myers (1942–), the future chairman of the JSC, that brought NRO into this partnership council. The following paragraph documents the purpose of this interagency partnership:

> The Partnership Council is established to expand cooperation between AFSPC, NRO, and NASA. This cooperation is intended to achieve efficiencies, risk reduction, and better understanding of plans and activities in areas of mutual interest. Improving the level of interaction between the organizations should lead to harmonized long-range planning, more efficient resource allocation, expanded technology partnerships, and more compelling advocacy of programs. Anticipated results might include: streamlining operations costs, cross utilization of facility capabilities, consolidation of redundant facilities, sharing of support services, and leveraging of science and technology investments (Spires 2004, 2:742, 954).

Aerospace Force: Defending America in the 21st Century (2000)

Additional effort to promote expanded aerospace integration occurred within the Air Force as the new century and millennium began. This was reflected in a task force study commissioned by Air Force chief of staff general Michael Ryan (born approximately 1943–) and Secretary of the Air Force F. Whitten Peters (1946–), which culminated in the May 9, 2000 release of the report *Aerospace Force: Defending America in the 21*st *Century.* This report sought to portray the Air Force moving into the 21st century as a seamless and integrated aerospace force whose mission encompassed both air and space operations while taking steps to increase the ongoing integration of what had been separate air and space power components. *Aerospace Force* also sought to describe the benefits of aerospace integration in supporting joint military, civilian, and commercial operations and applications (Spires 2004, 1:17, 106–107; Barry and Herriges 2000, 42–47).

The report began with definitions of aerospace, one of which was "the seamless operational medium that encompasses the flight domains of earth and space." It went on to describe "aerospace force" as encompassing air and space systems, the people using and supporting such systems, and having the entire range of capabilities to control and ex-



Gen. Michael Ryan served as Air Force Chief of Staff between 1997–2001. *(U.S. Department of Defense)*

ploit the aerospace theater. "Aerospace integration" was defined as a series of actions harmonizing air and space skills into an aerospace force capable of advancing multiple U.S. military forces in parallel, sequential, and mutually coordinated actions. "Aerospace power" was declared to be using lethal and nonlethal means by aerospace forces to reach tactical, strategic, and operational goals (U.S. Air Force 2000, 3).

An important part of this report was its description of aerospace power as having five key attributes: Speed, range, perspective, precision, and three-dimensional maneuverability. The characteristics of these attributes are listed below:

Speed: the ability to move rapidly across the theater of operation and achieve effects quickly. Through the integration of air, space, and aerospace systems, we can identify and attack mobile or concealed targets with breathtaking speed. The speed of our operations can overwhelm adversaries unable to keep pace.

Range: the ability to project power over great distances. The integration of air and space capabilities vastly expands the potential range of our forces and allows us to achieve objectives from greater distances or from orbit.

Perspective: the ability to perceive both friendly and hostile activity at a distance and in context. Commanders throughout history have sought to control the "high ground" because it provides perspective over the battlefield. Integrated aerospace systems combine the broad perspective of earth, provided by space-based platforms with the high fidelity of airborne platforms.

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).