

The Civil Sector

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INTRODUCTION

A country's acquisition and maintenance of power is what helps guarantee its national security. A country's power is considered the sum of its military power, economic power, diplomatic power, technological power, and social power. These are the so-called *instruments of power*. This chapter uses the concept "instruments of power" as a lens through which to demonstrate how the civilian space activity carried out by the U.S. government contributes to U.S. power and thus to its national security. For example, the civilian space program contributes to the military, economic, and technological instruments of power through its scientific and technological accomplishments of potential relevance to national security. It also contributes directly to U.S. diplomatic and social instruments of power through the *international prestige* and *national pride* that result from its achievements. Looking at the civilian space program through this lens provides an important perspective on the development and implementation of civilian space policy. It also provides one justification for the continuing large government investments in the U.S. civilian space program, both in absolute terms and in comparison to the investments of other leading countries. For example, in 2006, the United States' share of global government spending on civilian space activities was approximately sixty per cent of the world's total.

This chapter provides an overview of the evolution of civilian space policy and activities. It discusses the processes through which space policy is developed, and the government structures through which the civilian aspects of that policy are implemented. It concludes with an overview of those current and emerging issues in the civilian space sector of particular relevance to national security interests.

THE EVOLUTION OF CIVILIAN SPACE POLICY AND PROGRAMS

After almost five decades of operations, the U.S. civilian space program has seen triumph – twelve Americans walked on the moon between 1969 and 1972 – and tragedy – three Apollo astronauts died during a launch pad test in January 1967 and fourteen astronauts died in the January 1986 and February 2003 space shuttle accidents. From its peak budgets during the build up needed to send people to the moon, the resources allocated to NASA rapidly decreased after 1970 to approximately twenty per cent of their highest level, and have stayed relatively flat as a share of the overall Federal budget for more than thirty-five years. Apollo created in NASA an organization that believed that it would be able to continue to pioneer both robotic space science and human exploration, and it has had difficulty adjusting its expectations to the resources it could command; there has been a continuing tendency to try to do too much with too little. It has also had difficulty adjusting to a post-Cold War mindset where it was not in competition with the Soviet Union for space leadership. Nonetheless, NASA has continued for most of its existence to symbolize American power to the rest of the world and to serve as a source of pride for the American public

Americans to the Moon

In 1959 NASA set human missions to the moon and eventually other planets as its long-range goal and began very preliminary planning on what the technical and financial requirements of such an undertaking might be. The White House caught wind of this planning, and President Eisenhower in December 1960, just a month before leaving office, was briefed on what NASA was thinking. His reaction was strongly negative. Eisenhower's space policy since the creation of NASA in 1958 as a reaction to the launch of Sputnik-1 had been marked by modest ambitions and a cautious entry into all realms of civilian space activity; the president wanted to contain the ambitions of enthusiastic space advocates, and setting out on a journey to the Moon was well beyond what he thought justified, given the high costs involved.

Space policy was not a high priority issue at the start of John F. Kennedy's administration in 1961. That was to change less than three months later, on April 12, 1961, when the Soviet Union became the first country to place a human, Yuri Gagarin, into orbit and return him successfully to earth. Once again the United States was second in a highly visible area of technological accomplishment.¹ Once again, the media and the Congress demanded a U.S. response. President Kennedy decided that the United States could not continue to cede space leadership to the Soviet Union. On April 20, he asked his top space adviser, Vice President Lyndon Johnson, to get answers to the following questions: "Do we have a chance of beating the Soviets by putting a laboratory in space, or by a trip around the moon, or by a rocket to land on the moon, or by a rocket to go to the moon and back with a man? Is there any other space program that promises dramatic results in which we could win?"²

The technical answer to these questions came from Wernher von Braun, now working for NASA after being employed by the U.S. Army from 1945-1960, who told the Vice-President that with its existing rocket, the Soviet Union had a good chance of being first to accomplish everything on the president's list except sending a man to the moon and back. That would require both the Soviet Union and the United States to develop a new, more powerful rocket; not surprisingly, von Braun thought that the United States could do that before the U.S.S.R.

The political rationale for a decision to compete with the Soviet Union came in a May 8 memorandum signed by Secretary of Defense Robert McNamara and the man Kennedy had chosen to head NASA, James Webb. They recommended an across-the-board acceleration of the U.S. space effort, with its focus being a lunar landing mission. "It is man, not machines, that captures the imagination of the world," they told the President. They added, "Dramatic achievements in space symbolize the technological power and organizing capability of a nation." For this reason, "*this nation needs to make a positive decision to pursue space projects aimed at enhancing national prestige* [italics

¹ The October 4, 1957 launch of Sputnik 1 had catalyzed action in the United States to create a new civilian space agency and give it the assignment of carrying out a variety of programs, but President Eisenhower did not believe that it was in the U.S. interest to try to match the Soviet Union in highly visible space achievements. John F. Kennedy had a different view.

² John F. Kennedy, "Memorandum for the Vice-President," April 20, 1961, in John M. Logsdon *et al.*, eds., *Exploring the Unknown: Selected Documents in the History of the U.S. Space Program*, Volume I, Organizing for Exploration, NASA SP-4407(Washington: Government Printing Office, 1995), p. 423.

in original]” because space achievements and the prestige they conferred were “part of the battle along the fluid front of the cold war.”³

Kennedy accepted these recommendations and on May 25, 1961 told a joint session of Congress that it was “time for this nation to take a clearly leading role in space achievement which in many ways may hold the key to our future on earth.” As the centerpiece of his speech, he said “I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to earth.”⁴

This was the beginning of Project Apollo, which led to the spectacular Apollo 8 circumlunar flight at Christmastime 1968, the Apollo 11 first lunar landing on July 20, 1969, and five subsequent sorties to the lunar surface. The Apollo program achieved its basic objective – beating the Soviet Union to the moon. (The Soviet Union did attempt both flights around the moon and a lunar landing, but a combination of a late start, insufficient funding, and poor political and management decisions led it to abandon its effort in the early 1970s.)

Apollo also defined the lasting character of the U.S. civilian space program, one centered on developing large and complex systems for human space flight. In the aftermath of the Kennedy speech, NASA created a new “field center” in Houston, Texas (now the Johnson Space Center) to manage its human flight activity and a new launch center on Merritt Island, Florida (now the Kennedy Space Center) to accommodate the massive rockets needed to launch people to the moon. Apollo required a peaceful, but war-like mobilization of financial resources; in the months following the President’s speech, the NASA budget was increased by 89 per cent, and by another 101 per cent in 1962. At its peak, the NASA budget was over four per cent of the overall Federal budget. (It has been less than one per cent in recent decades, as will be discussed below.) When NASA began operations in October 1958, it had approximately 8,000 employees; at the peak of Apollo, NASA employed over 34,000 people working with over 375,000 industrial and academic contractors. This space industrial and academic base in future

³ James E. Webb, NASA Administrator, and Robert S. McNamara, Secretary of Defense, Memorandum to the Vice-President with Attached “Recommendations for Our National Space Program: Changes, Policies, Goals,” May 8, 1961 in Logsdon, *Exploring the Unknown*, pp. 444, 446.

⁴ John F. Kennedy, “Urgent National Needs,” May 25, 1961, in Logsdon, *Exploring the Unknown*, p. 453.

years contributed to both civilian and national security space and defense efforts; Apollo also resulted in increased enrollments in university science and engineering programs.

In addition to Apollo, NASA during the 1960s undertook an increasingly ambitious space science effort and did pioneering work in developing the technologies that enabled the development of a commercial satellite communications industry and of operational meteorological satellites. With a robust overall NASA budget, these efforts were not in conflict for scarce resources, unlike the situation in the thirty-five years since Apollo. By the time that Neil Armstrong stepped on the lunar surface, it was clear that the United States had achieved the “clearly leading role in space achievement” that John Kennedy had called for eight years earlier.

What Do You Do After You Have Been to the Moon?

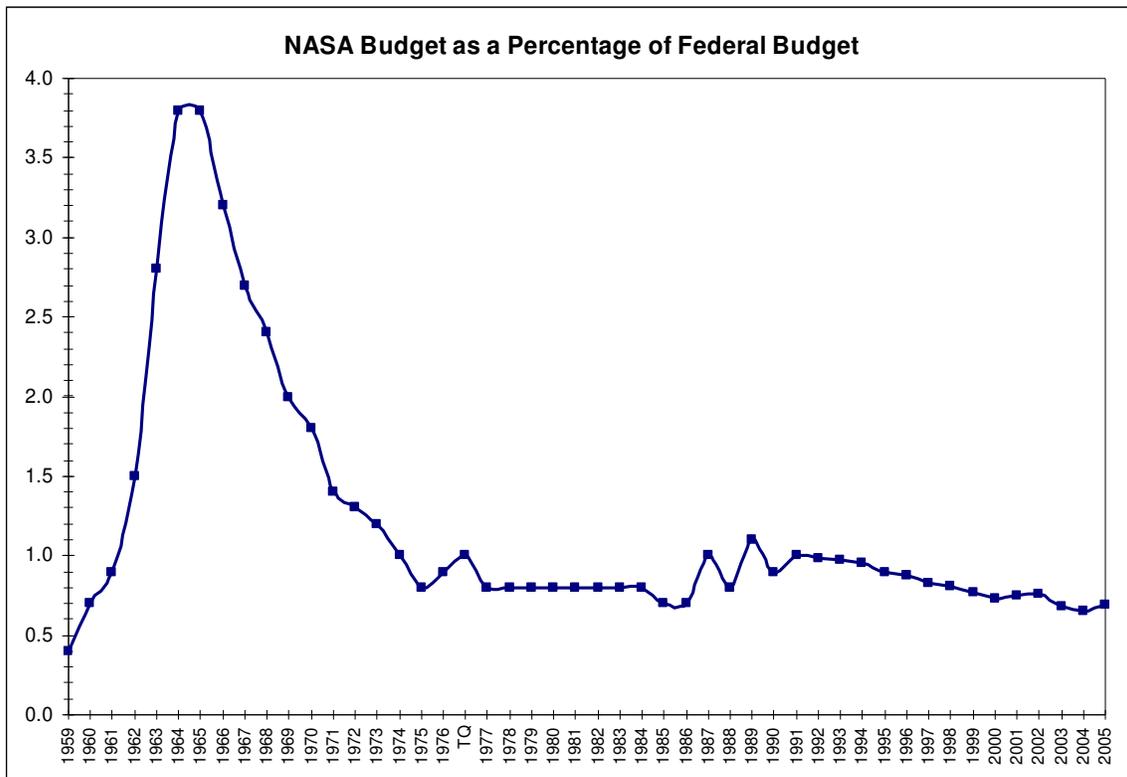
The people of the United States and their government have been willing, in the 35 years since the end of the Apollo program, to continue a substantial civilian space program, but only at a level of funding that has forced NASA to constantly operate on the edge of viability in terms of achieving its ambitious objectives. Even so, the program is still seen by national leaders as an important element of U.S. global leadership and national power. In addition, government civilian space programs provide essential operational services such as meteorological observation and remote sensing of the Earth’s surface, and government organizations to promote and regulate private sector space activities have emerged in recent years.

Figure 1 shows the pattern of resources allocated to NASA over its history. Two things are remarkable about this pattern. The one most usually remarked upon is the rapid buildup of funding in the early 1960s in support of Project Apollo. Equally remarkable, however, is the rapid decrease in financial resources allocated to NASA between 1965 and 1974, and even more so the stability of that allocation over the past 35+ years. It is impossible to escape the conclusion that, whatever the specific content of the NASA program at a particular time, the American public and their leaders, through the political process, have consistently decided to allocate less than one per cent of the annual federal budget to the civilian space program.. This decision has been made, and reinforced, as the federal budget for each successive fiscal year has been assembled in the White House and

approved or modified by the Congress. Within that allocation, national leaders have expected NASA to carry on a successful program of human spaceflight as well as its other activities. The result, as the Columbia Accident Investigation Board observed with respect to the 2003 *Columbia* Space Shuttle accident, has been an agency striving to “do too much with too little.”⁵

The first step in the process of formulating a policy to guide the civilian space program after the end of the Apollo program was the creation in February 1969 of the

Figure 1



Space Task Group, chaired by Vice-President Spiro T. Agnew. This group was charged by President Richard M. Nixon with preparing “definitive recommendations on the

⁵ Report of the Columbia Accident Investigation Board, Volume I, August 2003, p. 209.

direction which the U.S. space program should take in the post-Apollo period.” In its September 15, 1969 report, the Space Task Group set out several ambitious options for the future and proposed, “as a focus for the development of new capability,” that “the United States accept the long-term option or goal of manned planetary exploration with a manned Mars mission before the end of the century as the first target.”⁶ Intermediate objectives recommended by the report included a series of increasingly larger space stations in low-Earth orbit, continuation of lunar exploration, and a reusable logistics vehicle – called a space shuttle – to reduce the costs of regular operations in space.

Accepting the Space Task Group’s recommendations would have meant accepting a long-term national commitment to a robust program of human spaceflight, with repeated trips to the moon and, eventually, forays to Mars. This was not at all what Richard Nixon and most of his advisers had in mind for the post-Apollo space effort. On 7 March 1970, the White House released a presidential statement on the future of the U.S. space program. The statement was cast both as a response to the Space Task Group report and as an evaluation of where the civilian space program fit into the country’s future. Its message was clear: “Space expenditures must take their proper place within a rigorous system of national priorities. What we do in space from here on in must become a normal and regular part of our national life and must therefore be planned in conjunction with all of the other undertakings which are important to us.”⁷ To Richard Nixon and his advisers, the rationale that had been accepted at the start of the Apollo program – that national prestige itself was an adequate justification for an expensive human space flight program - was not an acceptable justification for an expansive post-Apollo space program, especially given their desire to reduce Federal spending overall and the resource demands of winding down U.S. engagement in South East Asia. They did not want to put an end to human spaceflight and its associated contributions to national self-image and prestige, but they were unwilling to set an ambitious, Apollo-like goal to guide that effort.

⁶ Space Task Group, *The Post-Apollo Space Program: Directions for the Future*, September 1969, in Logsdon, *Exploring the Unknown*, p. 524.

⁷ Richard M. Nixon, “Statement About the Future of the United States Space Program,” 7 March 1970, in U.S. President, *Public Papers of the Presidents of the United States: Richard Nixon, 1970* (Washington, DC: GPO, 1971), p. 251.

The first program that NASA had hoped to gain post-Apollo approval to develop was a 12-person space station launched by the large rocket developed for Apollo, the Saturn V. In addition, NASA proposed developing a fully reusable Earth-to-orbit launch vehicle called the space shuttle to carry crew and supplies to the space station and to carry out other space operations. When the Nixon administration as part of its decision to reduce the NASA budget refused to approve the space station, NASA in the fall of 1970 deferred—not canceled—its space station plans and directed its shuttle contractors to design a vehicle capable of carrying pieces of a space station into orbit. Thus the current strong link between the Space Shuttle and International Space Station programs actually has its roots in decisions taken more than 35 years ago. In the interim, NASA attempted to get White House approval to develop the Space Shuttle.

In 1971, there was intense debate within the Executive Branch and its advisers of whether to approve such a development. While Nixon's scientific and budgetary adviser favored further reductions in the NASA budget and even the cancellation of the Apollo 16 and 17 missions, the President's long-time confidant Caspar (Cap) Weinberger disagreed. He told the President in an August 1971 memorandum that further reductions of the NASA budget and cancellation of the remaining Apollo missions "would be confirming in some respects, a belief that I fear is gaining credence at home and abroad: That our best years are behind us, that we are turning inward, reducing our defense commitments, and voluntarily starting to give up our super-power status, and our desire to maintain world superiority." Nixon wrote on the memo "I agree with Cap."⁸

It was arguments such as this, linking a continued strong civilian space program to national image, which led in January 1972 to approval of Space Shuttle development. Even so, the Shuttle that emerged from the 1970-1971 policy process was a product, according to the Board that investigated the 2003 *Columbia* accident, of "a series of political compromises that produced unreasonable expectations—even myths—about its performance," with a "technically ambitious design [that] resulted in an inherently vulnerable vehicle."⁹

⁸ Memorandum for the President from Caspar W. Weinberger, Deputy Director, Office of Management and Budget, via George M. Schultz, "Future of NASA," August 12, 1971 in Logsdon, *Exploring the Unknown*, pp. 547.

⁹ Report of the Columbia Accident Investigation Board, p. 21.

In order to make the case that the investment in developing the Space Shuttle was cost-effective, NASA had to gain the agreement of the civilian leadership of the military and intelligence communities that when it became operational, the Space Shuttle would be the only launch vehicle for almost all national security payloads, including the most critical classified payloads. In order to gain this agreement, NASA had to design a Shuttle with specific performance characteristics, including the size of its payload bay and its ability to maneuver upon re-entry. Meeting these requirements increased the technological risks of the vehicle and increased its operating costs.

NASA spent the rest of the 1970s developing the Space Shuttle and readying it for its first flight, which took place (more than two years behind schedule) on April 12, 1981. Soon after that first flight, the new NASA leadership set as its two top priorities bringing the Shuttle to operational status as soon as possible and getting presidential and congressional approval to develop a Shuttle-launched space station. NASA had deferred its space station ambitions in 1970, but they re-emerged as soon as the Shuttle began flying. In 1970, NASA had decreed that any shuttle that might be developed needed to be capable of launching a modular space station, and no alternatives to using the Space Shuttle in this role were considered at the inception of the space station program.

Also in 1981, after only two Shuttle flights, President Ronald Reagan approved a formal policy statement saying that the Space Shuttle would be the primary space launch system for both United States military and civil government missions. This policy was reinforced in a 1982 statement of National Space Policy, which said that “completion of transition to the Shuttle should occur as expeditiously as possible” and that “government spacecraft should be designed to take advantage of the unique capabilities of the STS [Space Transportation System, another designation for the Space Shuttle].”¹⁰

The U.S. Air Force, as the launch agent for both military and intelligence spacecraft, early on recognized the dangers of this “all eggs in one basket” policy. Soon after the Shuttle was declared operational on July 4, 1982, after only four flights, the Air Force began to argue that the risks and costs of the system could be a detriment to its ability to perform its launch responsibilities for critical national security payloads. Most

¹⁰ The White House, National Security Decision Directive 42, “National Space Policy,” July 4, 1982, in Logsdon, *Exploring the Unknown*, p. 591.

of those payloads had been designed since the late 1970s so that they could only be launched on the Shuttle.

Beginning in 1983, the Air Force campaigned for approval of a backup to the Shuttle in order to provide assured access to space for such payloads. NASA fought this move. The dispute between the Air Force and NASA reached the White House in early 1985, where it was decided in favor of the Air Force. This decision led to the development of the Titan IV expendable launch vehicle, which was capable of launching the largest military and intelligence spacecraft. After the January 1986 *Challenger* accident, the Titan IV became the primary launcher for large national security missions, and those spacecraft that had been intended for Shuttle launch had to be redesigned at high cost. In addition, the Department of Defense had agreed to bear the multi-billion dollar costs of creating launch facilities for the Space Shuttle at Vandenberg Air Force Base on the California coast, so the Shuttle could be launched into polar orbit. After the *Challenger* accident, the White House decided that this facility would not be used. These actions created tensions between the military and intelligence space programs and the civilian space effort that persists even today.

In addition, the White House in 1986 decided that the Space Shuttle would no longer be marketed as a launch vehicle for commercial payloads such as communication satellites, and existing Shuttle launch contracts were voided. This left NASA as the only user of the Shuttle, and assembly and servicing of a space station as its primary mission.

President Reagan had approved space station development in 1984, over the opposition of the Department of Defense, which saw no military value in the project; at that point the facility was to be completed within a decade. The primary public justification for the space station was the scientific and technological potential of research carried out in a well-equipped laboratory in the microgravity space environment of Earth orbit, but the fact that the Soviet Union, after abandoning its efforts to send people to the moon, had launched since the early 1970s a series of rudimentary stations also influenced the U.S. decision. For example, one aerospace company ran a television advertisement portraying a Soviet space station and asking “Shouldn’t we be there too?”

From its inception, the space station program ran into cost overruns and schedule delays, and its first elements were not launched until 1998, with a crew taking up

permanent occupancy only in November 2000. After its 1988 return to flight following the *Challenger* accident, the Space Shuttle flew a variety of missions, launching various spacecraft ranging from probes to Jupiter to the Hubble Space Telescope (to which it also flew a 1993 servicing mission to correct the effects of an incorrectly ground mirror). The Shuttle also served as a surrogate space station, as its crew carried out various microgravity experiments during missions lasting as long as sixteen days. But from 2000 on, the Shuttle's primary mission has been space station assembly and servicing; the link between the Shuttle and the space station created almost thirty years earlier remained unbreakable.

The space station, and to some degree, the Space Shuttle programs reflected an important policy shift in the U.S. approach to linking space activities to broader foreign policy interests. While Apollo had been a unilateral demonstration of U.S. power, in the post-Apollo period the White House decided that the space program should become an instrument of U.S. leadership in international partnerships. Rather than leading through singular achievements, the goal became a demonstration of U.S. capability as the managing partner, together with other countries, in complex technological undertakings. While the robotic space science program had from its inception been characterized by international cooperation, only in 1969 did NASA begin to court international partnerships in its human space flight program. European countries and Canada contributed elements to the Space Shuttle program, and Japan joined them in 1984 as a partner in the space station. After the end of the Cold War and the collapse of the Soviet Union, Russia also joined the station partnership in 1993, and the program became known as the International Space Station (ISS). As ISS assembly began in 1998, sixteen countries were members of this partnership.

By the start of 2003, NASA's future looked relatively stable. In the preceding two years, cost overruns in the U.S. portion of the space station had appeared, threatening the program's schedule and causing tensions between the United States and its ISS partners. But it seemed as if NASA had gotten the ISS under managerial control, and the Space Shuttle was flying regularly and expected to remain in service until at least 2020. There had been several attempts to develop a replacement for the Shuttle, but at the turn of the century none was in sight. The robotic space science program was moving forward with a

series of impressive missions in the 1990s, and even more ambitious missions were being planned.

However, on February 1, 2003 the Space Shuttle orbiter *Columbia* broke up upon re-entry into the atmosphere after a 16-day mission; all seven crew members died. In the aftermath of the *Columbia* accident, there was a searching re-examination of the goals and content of the NASA program. The result of this re-examination was a fundamental shift in U.S. civilian space policy; that shift will be discussed below.

ACTORS, POLICIES, AND ORGANIZATIONS

The civilian space sector is composed of a variety of organizations and actors concerned with creating and implementing U.S. civilian space policy. This section provides an overview of the actors involved in creating that policy, the process by which policy decisions are reached, and the organizations that implement space policy and operate the nation's civilian space program. Starting at the top, the White House formulates policy, Congress provides oversight and funding, and on occasion writes White House policy into law, and multiple executive branch organizations implement laws, policies, and funded programs.

NASA is the biggest and most well known organization charged with implementing U.S. civilian space policy. However, the National Oceanographic and Atmospheric Administration (NOAA), which is part of the Department of Commerce, also plays a significant role, although its activities are less well known. There is also an Office of Space Commercialization in the Commerce Department; it is based within NOAA. In addition, the Federal Communications Commission, the Office of Commercial Space Transportation, part of the Federal Aviation Administration within the Department of Transportation, and the U.S. Geological Survey (USGS) of the Department of the Interior have roles in the civilian space sector. The Department of State is involved in international space interactions. .

As discussed previously, the civilian space sector is responsible for the U.S. human space flight program as well as robotic space and Earth science missions. Human space flight garners the largest budget, the most human resources, and the most prestige.

Although the science program's research accomplishments are substantial (Two researchers have won the Nobel Prize for their space-based work.) significant, the human space program generates the most public attention and enthusiasm. Although they co-exist within the same overall organization, there have been tensions between NASA's human space flight and robotic science efforts since NASA began operations in 1958. While the overall NASA budget was at a high level during Apollo, these tensions were muted. Since 1969, they have increased as NASA tries to balance its limited budget between the two sets of activities..

The civilian space program supports U.S. national security directly via the prestige it provides the United States and indirectly as it supports the U.S. economic, military and social instruments of power by helping stimulate U.S. superiority in science, technology, and engineering. Furthermore, the civilian space sector is intertwined with the military space sector in significant areas. The terms "dual use" or "multi use" describe technology and programs used for both civilian and military applications, such as Global Position Satellites or polar-orbiting meteorological satellites.

International cooperation is an important feature of the U.S. civilian space program. It is called for in the National Aeronautics and Space Act of 1958, and is epitomized by the sixteen-country International Space Station program. The civilian space program has enjoyed a significant amount of success with partner nations in its scientific, exploratory and human space flight missions, but questions about the payoffs for such partnerships are growing and barriers to cooperation, such as U.S. export control regulations, are getting more difficult to overcome.

This section first discusses the actors that develop formal statements of space policy and determine space budgets in the White House. The contributions of Congress to the policy process are then discussed. Then a detailed overview of how civilian space policy is implemented through various executive branch organizations is provided.

Actors That Generate Policy

The President determines national space policy within the legal boundaries and funding provided by Congress. A number of bodies within the White House provide policy advice for the president, including the National Security Council (NSC), the Office

of Science and Technology Policy (OSTP), the Office of Management and Budget (OMB), and the National Economic Council (NEC). The Administrator of NASA reports directly to the president and thus can provide his own views on space policy issues to the chief executive. Cabinet-level officials and their representatives from the Defense, State, Commerce, Transportation, Interior, and Homeland Security Departments, the Director of National Intelligence, and the Central Intelligence Agency also provide input to the President, as necessary, to guide the formulation of U.S. national space policy, usually in the context of their participation in one of the Councils noted above.

The U.S. Congress also shapes national space policy through legislation, such as the National Aeronautics and Space Act of 1958 or various authorization or appropriation bills. Significant space policy related legislation is relatively infrequent, however, so Congress exercises its policy role mostly through oversight of the executive branch and by controlling the purse strings.

The White House: The 1958 NASA Act created a National Aeronautics and Space Council at the White House level to coordinate interagency space policy. The Council was to be chaired by the President and to have a small staff. President Eisenhower made little use of the Council. John F. Kennedy proposed making the Vice President the Council chair, and the Congress agreed. Under Vice President Lyndon B. Johnson, the Council played a seminal role in developing space policy during the Kennedy administration. Under Presidents Johnson and Nixon, the Council had limited influence, and Richard Nixon abolished it in 1973. During the late 1970s and early 1980s, the lead role on space policy within the Executive Office of the President was assigned to the Office of Science and Technology Policy (OSTP), which was created in 1976. In 1982, President Ronald Reagan shifted that role to the National Security Council. Congress reestablished a National Space Council in 1988, and during the term of President George H.W. Bush (1989-1993) the Council and its staff played an active role in space policy development. During this period the Council was chaired by Vice-President Dan Quayle. President Bill Clinton again abolished the Council in 1993. Rather, President Clinton created a National Science and Technology Council under the auspices of the Office of Science and Technology Policy. This Council oversaw the development of all science

and technology policies, including space, during the Clinton administration. In 2001, President George W. Bush reassigned primary responsibility for developing space policy back to the National Security Council and its staff, who work in close collaboration with OSTP space staff. As this summary suggests, there is no one accepted approach to the management of space policy development at the level of the president, and all concerned agencies participate regardless of which organization has the lead role. Within the Executive Office of the President, only a small number of staff members are dedicated to the space policy area. Their work is crucial to the development of options for consideration by policy-level officials in the various bodies described above.

Whatever the lead organization for developing space policy, the process leading to policy decisions is similar. Representatives of the concerned executive agencies, with whatever White House organization has been designated as lead playing a coordinating role, work together to draft a new policy or revise an existing one. This process usually begins with mid-level officials, and gradually involves more senior people until a draft policy is agreed upon and sent to agency heads for their comments and ultimate approval. Only rarely does the policy statement reach the president and his most senior aides until there is agreement on its contents, although on occasion disagreements cannot be resolved at levels lower than agency heads and the president.

The result of this process is usually a formal statement of either a general National Space Policy or a policy related to a specific area of space activity, such as Earth observation, position, navigation and timing, space exploration, or space transportation. Elements of these policy statements may be classified, but there is almost always an unclassified fact sheet issued that summarizes the policy.¹¹

Space policy decisions are also frequently made in the context of the annual process through which the President prepares his budget for submission to the Congress. A small staff within the Office of Management and Budget has year-round contact with NASA and other space-active agencies, and reviews agency budget proposals when they are submitted to the White House, usually in September. Between September and the

¹¹ The most recent statement of National Space Policy was released on October 6, 2006. It can be found at www.ostp.gov/html/US%20National%20Space%20Policy.pdf. Other policy statements on specific areas of space activity, such as remote sensing, positioning, navigation, and timing, and space transportation can also be found at www.ostp.gov.

time that final decisions are made on the budget at the end of the year, there is intense interaction between OMB and NASA on one hand and OMB and the White House policy makers on the other to shape a space budget that matches Presidential priorities and fiscal realities.¹²

U.S. Congress: Relatively few members of Congress give focused attention to space policy issues; rather, subcommittees within the Senate and House are designated to deal with space issues, and it is their senior members who become space specialists. Other members of Congress become involved with space issues if they are particularly important in their states or districts. Authority is also divided between the authorizing subcommittees, which provide a policy framework for space activities and oversee their implementation, and appropriations subcommittees, which decide on the funding to be made available for space. With respect to authorization, in the Senate the Subcommittee on Science, Technology, and Space of the Committee on Commerce, Science and Transportation concerns itself with issues surrounding such executive branch organizations as NASA, NOAA, the National Science Foundation (NSF), and OSTP. In the House of Representatives, the Subcommittee on Space and Aeronautics of the Committee on Science takes the lead role concerning issues related to the U.S. civilian space program including NASA, and commercial space activities within the DOT and DOC.

Subcommittees of the Senate and House Appropriations Committees review space funding requests and appropriate funds to agency budgets. These subcommittees do not only deal with space issues; they also appropriate funds for several other, often unrelated, executive branch agencies.

A New Space Policy with an Emphasis on Space Exploration

In the aftermath of the February 1, 2003 *Columbia* accident, there was a searching re-examination of the goals and content of the NASA program. The result of this re-examination was a fundamental shift in U.S. civilian space policy, one that has given

¹² The most recent NASA budget can be found by inserting the appropriate fiscal year in the following URL: www.whitehouse.gov/omb/budget/fy2007/nasa.html

NASA an open-ended mission, to “implement a sustained and affordable human and robotic program to explore the solar system and beyond.”

In the immediate aftermath of the shuttle accident, the Columbia Accident Investigation Board was created by NASA. As its investigation evolved, the Board decided that, to get to the roots of the accident, it had to broaden its focus from the physical causes of the accident to the policy, organizational, and management context within which the accident had occurred. In its August 2003 report, the Board also discussed “future directions for the United States in space.” The Board observed that there had been a “lack, over the past three decades, of any national mandate providing NASA a compelling mission requiring human presence in space,” and suggested that this lack, and the consequent absence of political will to develop a replacement for the aging space shuttle, constituted “a failure of national leadership.”¹³

President George W. Bush and his key advisers took this criticism to heart, and in the fall of 2003 a small group of individuals from NASA and the Executive Office of the President developed a proposal for returning NASA’s focus to exploration beyond Earth orbit, rather than to continue with an emphasis on utilization of the International Space Station and on repetitive space shuttle flights to the ISS. The President approved this proposal, and announced what has come to be called the “Vision for Space Exploration” in a speech at NASA Headquarters on January 14, 2004. The key elements of the Vision include:

- ◆ Complete the International Space Station
- ◆ Safely fly the Space Shuttle until 2010
- ◆ Develop and fly the Crew Exploration Vehicle no later than 2014
- ◆ Return to the moon no later than 2020, and stay on the lunar surface for increasingly longer periods of time
- ◆ Extend human presence across the solar system and beyond, beginning with human voyages to Mars

¹³ Report of the Columbia Accident Investigation Board, August 2003, Chapter 9.

- ◆ Promote international and commercial participation in exploration.¹⁴

This new policy direction lays out a major implementation challenge for the nation's principal civilian space agency, NASA. If public and political support for what has come to be called the Vision for Space Exploration remains stable in the next decade, the United States will be well on its way back to the Moon.¹⁵

Implementing U.S. Civilian Space Policy

This section provides an overview of the organizations that implement space policy and operate the nation's civilian space program. The most visible and important organization is NASA, but NASA is a research and development agency, and operational responsibility for civilian space efforts is exercised by other agencies or by the private sector once a particular capability is demonstrated.. For example, the National Oceanic and Atmospheric Administration (NOAA) in the Department of Commerce is responsible for operational meteorological satellite programs, and the U.S. Geological Survey (USGS) in the Department of the Interior is responsible for the Landsat Earth observation satellite program. Other organizations, such as the Office of Commercial Space Transportation in the Department of Transportation and the Office of Space Commercialization in the Department of Commerce, do not operate space systems but also are involved in implementing space policy, as is the Federal Communications Commission.

National Aeronautics and Space Administration¹⁶

NASA Headquarters: NASA is the largest organization in the U.S. civilian space program and conducts the most visible U.S. space activities, such as human space flight with the Space Shuttle and International Space Station, and space science with such

¹⁴ The President's January 14, 2004 speech and associated policy statement can be found at <http://www.whitehouse.gov/news/releases/2004/01/20040114-3.html>. (Accessed October 27, 2006)

¹⁵ For information on the current status of NASA's exploration efforts, see <http://www.exploration.nasa.gov>.

¹⁶ More information about NASA and its activities can be found at www.nasa.gov.

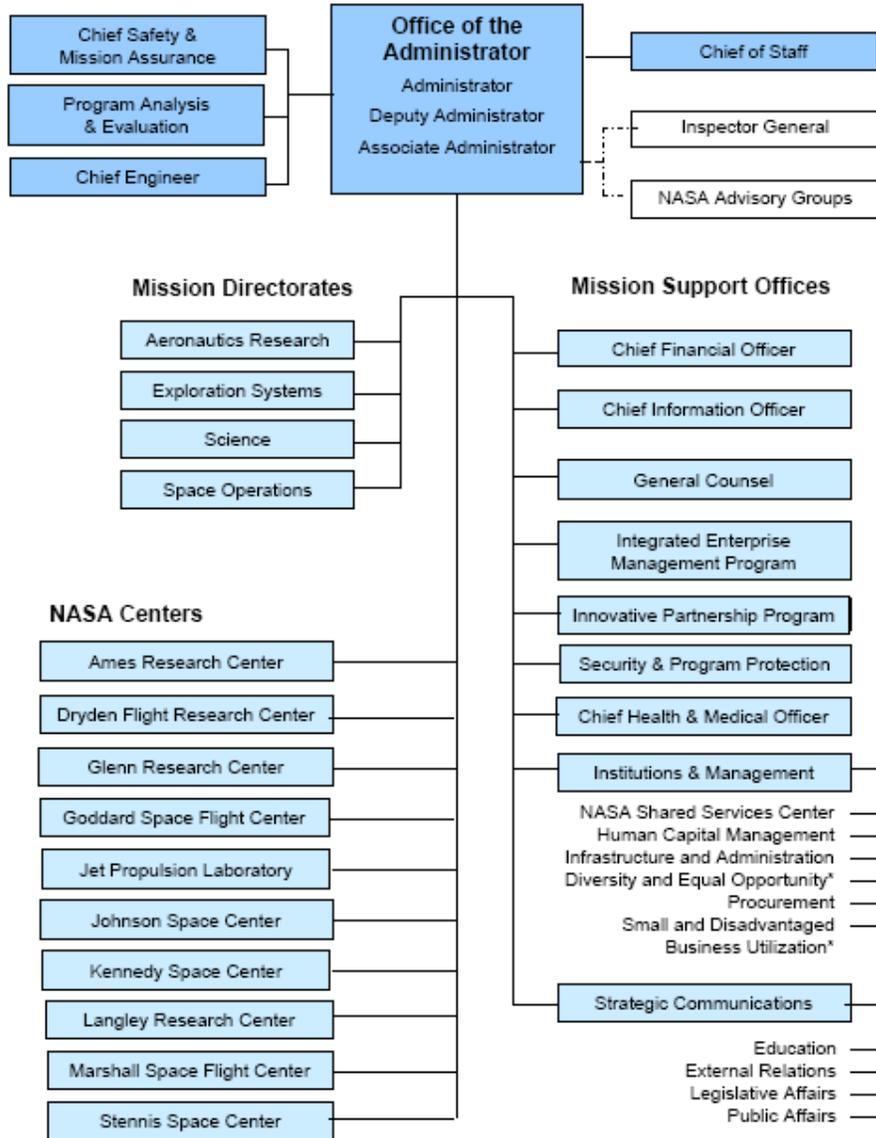
programs as the Hubble Space Telescope, robotic missions to Mars, and other space and Earth science missions.

NASA is an independent agency that reports directly to the White House. NASA headquarters is located in Washington D.C. and there are nine other installations, known as “field centers,” located around the United States, plus the Jet Propulsion Laboratory, which is managed for NASA by the California Institute of Technology but in its other respects is a tenth NASA center. The NASA workforce fluctuates but is comprised of approximately 19,000 civilian service employees. NASA grants and contracts support also a large work force in universities across America and in the aerospace industry.

There are four Mission Directorates within NASA Headquarters: Exploration Systems, Space Operations, Science, and Aeronautical Research. The NASA Headquarters is responsible for liaison with the White House, other Executive Branch Agencies, the Congress, NASA’s international partners, the media, and the general public. Through its mission directorates, it develops the projects and programs, and associated budgets that NASA’s field centers are responsible for implementing. Figure 2 is a NASA organizational chart (current as of February 2006).¹⁷

¹⁷ Information about the various organizational elements of NASA can be found at <http://www.nasa.gov/centers/hq/organization/index.html>

National Aeronautics and Space Administration



* In accordance with law, the offices of Diversity and Equal Opportunity and Small and Disadvantaged Business Utilization maintain reporting relationships to the Deputy Administrator and Administrator.

Figure 2. NASA Organization

NASA's FY 2007 budget request was \$16.72 billion; this was 0.6 per cent of the overall Federal budget requested by President George W. Bush in February 2006. (See

Table 1) Within this budget, NASA was asked to fly the Space Shuttle for the minimum number of missions required to complete assembly of the International Space Station, estimated to be 16 flights, carry out a robust program of space and Earth science, support aeronautical research, and get started on developing a replacement for the space shuttle and on the new Vision for Space Exploration. Most outside observers agreed that there were inadequate resources to carry out all these missions effectively.

National Aeronautics and Space Administration Budget (In millions of dollars)	
<u>Area of Activity</u>	FY 2007 Request (millions of dollars)
:	
<i>Space Operations (Shuttle and ISS)</i>	6,234
<i>Science</i>	5,330
<i>Exploration Systems</i>	3,978
<i>Aeronautics Research</i>	724
<i>Cross-Agency Support Programs</i>	491
Inspector General	34
Total, Discretionary budget authority	16,792

Table 1. NASA FY2007 Budget Request

Johnson Space Center (JSC), located in Houston Texas: JSC is the lead center for all U.S. human space flight including space shuttle and ISS activities, and responsibility for

astronaut training. The Mission Control Center (MCC) directs all space shuttle missions after their launch and manages all activity onboard the International Space Station. JSC will manage the development of the spacecraft that will replace the space shuttle as the means for carrying American astronauts to space, the Crew Exploration Vehicle, which is to be called Orion. About 110 astronauts are currently eligible for flight assignments.

Kennedy Space Center (KSC), located near Cocoa Beach, Florida: KSC is the only launch base for U.S. human spaceflight, including Apollo program launches, current Space Shuttle launches, and most likely future Crew Exploration Vehicle launches. (Launches in the Mercury and Gemini programs took place at the adjacent Cape Canaveral Air Force Station.) KSC prepares the spacecraft and launch vehicles for each mission, operates each countdown and manages end-of-mission landing recovery activities. KSC also coordinates all expendable vehicle launches carrying NASA payloads at Cape Canaveral Air Force Station in Florida, Vandenberg Air Force Base in California, or elsewhere. KSC also prepares ISS hardware for launch.

Marshall Space Flight Center (MSFC), located in Huntsville, Alabama: MSFC is responsible for key space launch and propulsion system development. In other words, MSFC develops large rockets for human exploration, from the Saturn 1B and Saturn V used during Apollo to the new Crew Launch Vehicle and Cargo Launch Vehicle, which will be known as Ares-1 and Ares-5.. It also will manage robotic lunar exploration missions and the development of a new lunar lander for human missions to the moon.

Stennis Space Center (SSC), located in southern Mississippi: SSC is NASA's primary center for rocket engine testing and is America's largest rocket test complex.

Ames Research Center (ARC) in Mountain View, California: Ames is a leader in information technology research with a focus on supercomputing, networking, and intelligent systems as well as nanotechnology, fundamental space biology, biotechnology, aerospace and thermal protection systems, and human factors research. Ames also

conducts research on the effects of gravity on living things and the nature and distribution of stars, planets and life in the universe

Goddard Space Flight Center (GSFC), located in Greenbelt, Maryland, a suburb of Washington D.C.: Goddard operates numerous scientific spacecraft including the Hubble Space Telescope, making GSFC the largest organization in the U.S. engaged in researching the Earth, the solar system, and the universe through satellite based observations. Goddard also manages the operational Space and Ground Network that supports the Human Spaceflight Program, as well as Earth orbiting missions, international, commercial, classified and unclassified national missions.

Jet Propulsion Laboratory (JPL) – California Institute of Technology, located in Pasadena California: JPL is a federally funded research and development center managed and staffed by Caltech for NASA. JPL is responsible for interplanetary, deep space scientific and exploratory missions. Recent, JPL missions include the Mars Exploration Rovers Spirit and Opportunity, the Deep Impact spacecraft which blasted a crater in a comet, and the Cassini mission to Saturn and its moon Titan. JPL is also responsible for management of NASA's Deep Space Network, a global network of antenna complexes for controlling deep space spacecraft and retrieving data from them.

Dryden Flight Research Center (DFRC), located at Edwards Air Force Base, California: The DFRC is NASA's primary installation for flight research. Dryden is chartered to conceive and conduct experimental flight research for integrated flight and propulsion controls; advanced optical sensors and controls; viscous drag reduction; advanced configurations; high-altitude, long-endurance aircraft; remotely piloted vehicle technology; hypersonic vehicle experiments; high-speed research for civilian transportation; atmospheric tests of advanced rocket and air-breathing propulsion concepts; instrumentation systems; and flight loads predictions. In carrying out this mission, Dryden operates some of the most advanced research aircraft in the nation. It

also serves as a backup landing site for the Space Shuttle and a facility to test and validate design concepts and systems used in development and operation of manned spacecraft.

Glenn Research Center (GRC), located in Cleveland, Ohio: Glenn is engaged in research, technology, and systems development programs in aeronautical propulsion, space propulsion, space power, space communications, and microgravity sciences in combustion and fluid physics.

Langley Research Center (LARC), located in Hampton, Virginia: Founded in 1917, Langley was the nation's first civilian aeronautical research facility. Langley leads NASA initiatives in aviation safety, quiet aircraft technology, small aircraft transportation and aerospace vehicles system technology. It supports NASA space programs with atmospheric research and technology testing and development. More than half of Langley's research is in aeronautics. Its workforce is comprised of 1906 civilian servants and 1,400 contractors for a total workforce of approximately 3,300.

Other Executive Branch Implementing Agencies

National Oceanic and Atmospheric Administration (NOAA): NOAA is a significant actor in the U.S. civilian space sector and directly supports U.S. national security through its operation of civilian and military meteorological satellite programs, space environment monitoring, and its international space cooperation activities.

NOAA is a element of the Department of Commerce, with its headquarters located in the Department of Commerce in Washington D.C. NOAA conducts research and gathers data about the oceans, atmosphere, space, and sun. It provides these services through five major organizations: the National Weather Service, the National Ocean Service, the National Marine Fisheries Service, NOAA Research, and the National Environmental Satellite, Data and Information Service (NESDIS). NOAA also issues the licenses required for private-sector Earth observation missions.

NESDIS is the nation's primary source of space-based meteorological and climate data and is the world's largest environmental space organization.¹⁸ NESDIS headquarters is in Silver Spring, Maryland, and it has facilities in Suitland, Maryland; Wallops, Virginia; Fairbanks, Alaska; Asheville, North Carolina; and Boulder, Colorado. NESDIS develops, acquires, and operates U.S. civilian environmental satellites which are used for weather forecasting, climate monitoring and other environmental applications such as fire detection, ozone monitoring and sea surface temperature measurements. The NESDIS budget request for FY2006 was \$1.034 billion million. Its workforce is comprised of approximately 750 employees.

The NOAA – NESDIS satellite system is composed of Geostationary Operational Environmental Satellites (GOES) and Polar-orbiting Environmental Satellites (POES). They are operated from the NOAA Satellite Operation Facility in Suitland, Maryland. GOES spacecraft produce the satellite weather photos the public associates with television weather forecasts and internet satellite weather maps. There are two operational POES spacecraft and two operational GOES spacecraft. Non-fully operational POES and GOES spacecraft, with degraded sensor capabilities, but still providing useful data, are also part of the system.

NOAA's Space Environment Center (SEC) is the lead national and international warning center for disturbances in the space environment that can affect people and equipment. SEC performs critical space weather operations, jointly staffed by NOAA and the U.S. Air Force, to provide forecasts and warnings of solar and geomagnetic activity to users in government, industry, the private sector, and the public. It also conducts research to understand the space environment. The SEC is located in Boulder, Colorado.

NOAA also plays a lead role for the U.S. in international space cooperation, especially with regard to space-based Earth observation. In July 2003, NOAA organized the first-ever Earth Observation Summit. The result was agreement on creating a Global Earth Observation System of Systems (GEOSS). On February 16, 2005, 55 countries endorsed this plan for comprehensive, coordinated, and sustained observations of the Earth. GEOSS will allow scientists and policy makers in many different countries to

¹⁸ More information on NESDIS is available at <http://www.nesdis.noaa.gov>.

design, implement and operate integrated, compatible Earth observation systems. It will link existing satellites, buoys, weather stations, and other observing instruments. The Strategic Plan for the U.S. Integrated Earth Observation System (IEOS) will become the U.S. component of the Global Earth Observation System of Systems (GEOSS). The Interagency Working Group on Earth Observations is co-chaired by the White House Office of Science and Technology Policy (OSTP), NASA, and NOAA and reports to the National Science and Technology Council's (NSTC) Committee on Environment and Natural Resources (CENR).

The above summary of NOAA activities highlights the multi-use nature of civilian space-based Earth observation systems and their vital contribution to U.S. national security. Moreover, the military, intelligence and commercial space sectors benefit significantly from the basic space services provided by NOAA.

U.S. Geological Survey (USGS): USGS is an agency of the Department of the Interior. Its headquarters are located in Reston, Virginia. It is currently responsible for the operation of the Landsat-5 and Landsat-7 satellites. As of early 2006, Landsat-5 was likely to fail soon after 22 years of operations; Landsat-7 was launched in 1999. NASA developed and launched these spacecraft, and the USGS operates the satellites and manages the data the satellites provide. Landsat spacecraft operations are performed at the NASA Goddard Space Flight Center by contractors under USGS supervision. The USGS uses Landsat data sales to partially fund operations but neither satellite's sensors are currently fully operational and as the quality of data has degraded, the sales of data have dropped. There are plans to launch a Landsat 8 satellite, but that would happen only after a data gap of several years. The United States has as a policy objective of continuity in Landsat-type data, and a Landsat Data Continuity Mission is contemplated to bridge this gap.¹⁹

Office of Space and Advanced Technology, Department of State (SAT): The Office of Space and Advanced Technology handles international space issues for the Department of State. Among its goals are: to ensure that U.S. space policies support U.S. foreign

¹⁹ More information about the space activities of the USGS can be found at <http://landsat.usgs.gov>

policy objectives; to ensure that U.S. international initiatives and political commitments on space are science-based, protect national security, advance economic interests, and foster environmental protection; and to enhance U.S. space leadership and the competitiveness of the U.S. aerospace industry. The SAT office has primary responsibility for U.S. representation on the United Nations Committee on the Peaceful Uses of Outer Space, where a wide range of civil space issues are discussed among nations. In the 1960s and 1970s, this committee developed the Outer Space Treaty and three related United Nations conventions, which serve as the bedrock of international space law. The SAT Office also represents the State Department in interagency deliberations on civil space policy issues, maintains the official U.S. registry of objects launched into outer space, reviews export license requests for space technology, and provides support to NASA for a network of overseas emergency landing sites for the Space Shuttle.

Office of Space Commercialization: The Office of Space Commercialization is the principal unit for the coordination of space-related issues, programs, and initiatives within the Department of Commerce. It is housed within NOAA/NESDIS, but performs its functions for the Department as a whole. The goal of the office is to foster an economic and policy environment that ensures the growth and international competitiveness of the U.S. commercial space industry. The office conducts activities in three primary areas: policy development, market analysis, and outreach/education. In fulfilling these roles and functions, the Office of Space Commercialization focuses its efforts on a select group of commercial space industry sectors, including satellite navigation, satellite imaging, space transportation, and entrepreneurial space business. The office also participates in broad discussions of national space policy and other space-related issues.²⁰

²⁰ More information about the Office of Space Commercialization can be found at <http://www.nesdis.noaa.gov/space/>

Regulatory Agencies

Office of the Associate Administrator for Commercial Space Transportation (AST) This office is part of the Federal Aviation Administration, which in turn is part of the Department of Transportation. Its mission is to ensure protection of the public, property, and the national security and foreign policy interests of the United States during a commercial launch or re-entry activity and to encourage, facilitate, and promote U.S. commercial space transportation. Established in 1984 as the Office of Commercial Space Transportation (OCST) reporting to the Secretary of Transportation, it was transferred to the FAA in November 1995.

Under its authorizing legislation, AST is given the responsibility to:

- regulate the commercial space transportation industry to ensure compliance with international obligations of the United States and to protect the public health and safety, safety of property, and national security and foreign policy interests of the United States;
- encourage, facilitate, and promote commercial space launches and re-entries by the private sector;
- recommend appropriate changes in Federal statutes, treaties, regulations, policies, plans, and procedures; and
- facilitate the strengthening and expansion of the United States space transportation infrastructure.

In fulfilling its responsibilities, AST issues launch licenses for commercial launches of orbital rockets and suborbital sounding rockets. The first U.S. licensed launch was a suborbital launch of a Starfire vehicle on March 29, 1989. Since then, AST (including its predecessor, OCST) has licensed more than 100 launches. AST also licenses the operations of non-federal launch sites, or "spaceports." AST is also involved in setting

the government regulatory framework for private human space flight efforts – “space tourism.”²¹

Federal Communications Commission (FCC): The FCC is an independent United States government agency, directly responsible to Congress. The FCC was established by the Communications Act of 1934 and is charged with regulating interstate and international communications by radio, television, wire, satellite and cable. Within the FCC, the primary organization responsible for space-related issues is the Satellite Division of the International Bureau. The primary mission of the Satellite Division is to serve U.S. consumers by promoting a competitive and innovative domestic and global telecommunications marketplace. The Division strives to achieve this goal by: (1) authorizing as many satellite systems as possible and as quickly as possible to facilitate deployment of satellite services; (2) minimizing regulation and maximizing flexibility for satellite telecommunications providers to meet customer needs; and (3) fostering efficient use of the radio frequency spectrum and orbital resources. The Division also provides expertise about the commercial satellite industry in the domestic spectrum management process and advocates U.S. satellite communication interests in international coordination and negotiations.²²

DOD Interactions with Civilian Space Agencies

In addition to the contentious NASA- Air Force relationship with respect to the Space Shuttle, the Department of Defense, usually through the U.S. Air Force, has on other occasions worked closely with NASA and other civilian agencies on space matters. While NASA during the 1970s and early 1980s allocated only limited funding to advanced space transportation technology, the Department of Defense did support a fair amount of such research and technology development related to advanced-technology crew-carrying systems. By the early 1980s, these efforts were focused on a vehicle that used air-breathing engines to accelerate to hypersonic or perhaps even orbital velocity.

²¹ More information about the Office of Commercial Space Transportation can be found at <http://ast.faa.gov/>

²² More information on the Satellite Division of the FCC can be found at <http://www.fcc.gov/ib/sd/>

The Air Force program was focused on a TransAtmospheric Vehicle (TAV), while a separate, highly classified, Advanced Research Projects Agency (ARPA) study was called Copper Canyon. In late 1985, all Department of Defense research and development activity on hypersonic flight was consolidated into a program that became known as the National Aerospace Plane (NASP); NASA joined the Department of Defense as a minority funder and co-manager of the NASP effort. This program was given presidential endorsement in the 1986 State of the Union Address. In his address, President Ronald Reagan spoke of an “Orient Express” that would, “by the end of the decade,” be able to “take off from Dulles Airport [near Washington, DC], accelerate up to 25 times the speed of sound attaining low Earth orbit, or fly to Tokyo within two hours.”²³

DOD-NASA work on NASP continued through the late 1980s, with DOD bearing some 80 percent of its costs. However, the NASP program struggled to achieve its technological and schedule goals. A 1988 Defense Science Board report concluded that the program’s advocates had been overly optimistic in their initial promise of an early flight demonstration. A year later, the Air Force withdrew funding from the program, and the White House, in 1989, approved a stretch-out of the program with NASA taking over full management control with a flight demonstration of the X-30 test vehicle to come only after relevant technologies had been developed. In the face of competing budget priorities and slow technological progress, the NASP program was canceled in 1992, after \$1.7 billion had been spent on it. At that point, the cost of a full X-30 flight-test program was estimated at \$17 billion, with another \$10–20 billion to develop an operational vehicle. No flight demonstration was attempted, but the program left a technological legacy for future advanced space transportation efforts.

In 1994 a Presidential Decision Directive established the National Polar-Orbiting Operational Environmental Satellite System (NPOESS). At the time, the U.S. operated completely separate civilian and military polar-orbiting environmental satellite systems to collect meteorological, oceanographic and space environmental data. These are POES and the Defense Meteorological Satellite Program (DMSP) respectively. NPOESS will reduce this duplication of effort by establishing a single satellite system to replace both

²³ http://www.c-span.org/executive/transcript.asp?cat=current_event&code=bush_admin&year=1986 (accessed October 26, 2006)

DMSP and POES. The NPOESS program is managed by an Integrated Program Office consisting of representatives from the Department of Commerce, Department of Defense, and NASA.²⁴

In 1998 the U.S. Air Force transferred control of its DMSP satellites to the Department of Commerce as an interim step toward the merger of the two systems. DMSP and POES operations were consolidated at the NOAA Satellite Operation Facility in Suitland, Maryland. All DMSP spacecraft are operated by NESDIS with coordination and oversight provided by the U.S. Air Force Space and Missile Center. In addition, a fully capable DMSP backup satellite operations facility is operated by the U.S. Air Force Reserve at Schriever Air Force Base, Colorado.

The NPOESS program has been troubled with large cost overruns and schedule delays. The first launch of an NPOES satellite is not expected until 2013. Until then, the converged POES and DMSP programs will have to continue to provide the environmental data needed by both civilian and military users.

The NOAA-Department of Defense relationship exemplified by DMSP demonstrates the link between the civilian space sector and the military space sector and again highlights the multi-use nature of space systems and technology.

IV. CONCLUSION

With his January 14, 2004 speech announcing the Vision for Space Exploration, President George W. Bush set out a direction for NASA, the central U.S. civilian space agency, that could persist for decades. The President indicated that “The fundamental goal of this vision is to advance U.S. scientific, security, and economic interests through a robust space exploration program.”

With this policy declaration, the United States hopes to rebuild the close link between its leading civilian space activity, human space flight, and national security interests. That link had become attenuated in the more than thirty years since the end of

²⁴ More information on NPOESS can be found at [http:// www.ipo.noaa.gov](http://www.ipo.noaa.gov)

the Apollo program, with the failed partnership in the operation of the Space Shuttle and Department of Defense opposition to the approval of a space station program.

The connection between space exploration and national security is not associated primarily with war-fighting capability; it is much more linked, as it was at the start of the Apollo program, to using space achievements as an instrument of national leadership. NASA Administrator Michael D. Griffin clearly articulated this rationale in an April 2006 speech:

The most enlightened, yet least discussed, aspect of national security involves being the kind of nation and, doing the kinds of things, that inspire others to want to cooperate as allies and partners rather than to be adversaries. And in my opinion, this is NASA's greatest contribution to our nation's future in the world. At NASA, we beat swords into plowshares to fulfill one of the oldest, strongest, and most persistent dreams of mankind: to know and experience what lies beyond the horizon. We have reached the point where there are no more horizons on Earth, and people everywhere know it. We see, repeatedly, that as nations and societies attain the technical capability to attempt spaceflight, first robotic and then human, they do so. And they will continue to do so. They don't go because we did, and they won't stop if we stop. They go because that is what people do, when they can.

Today, and yet not for much longer, America's ability to lead a robust program of human and robotic exploration sets us above and apart from all others. It offers the perfect venue for leadership in an alliance of great nations, and provides the perfect opportunity to bind others to us as partners in the pursuit of common dreams. And if we are a nation joined with others in pursuit of such goals, all will be less likely to pursue conflict in other arenas. . . .

. . . Imagine if you will a world of some future time – whether it be 2020 or 2040 or whenever – when some other nations or alliances are capable of reaching and exploring the moon, or voyaging to Mars, and the United States cannot and does not. Is it even conceivable that in such a world America would still be regarded as a leader among nations, never mind the leader? And if not, what might be the consequences of such a shift in thought upon the global balance of economic and strategic power? Are we willing to accept those consequences? In the end, these are the considerations at stake when we decide, as Americans, upon the goals we set for, and the resources we allocate to, our civil space program.²⁵

²⁵ http://www.nasa.gov/pdf/146291main_NationalSpaceSymposium_new.pdf. Accessed October 27, 2006.

There is little doubt that the U.S. civilian space program has served as an important instrument of U.S. national power, both in terms of the concrete capabilities it has provided the nation and in terms of its contributions to maintaining U.S. global leadership. It is very unlikely that a future President would commit the country to a highly mobilized effort along the lines of Project Apollo; that was perhaps a unique undertaking. But if the citizens of the United States accept as part of the country's portfolio of national activities "a sustained and affordable program of human and robotic exploration," the civilian space program can continue to be an important element of U.S. global strength.