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## AMERICA'S SPACE POLICY: COUNTDOWN TO MAJOR REFORMS

### INTRODUCTION

**T**he special Presidential Advisory Committee on the future of the U.S. Space Program, chaired by Norman Augustine, Chief Executive Officer of Martin Marietta Corporation, last December issued its Report that correctly identifies a number of the serious problems with America's space program.<sup>1</sup> As important as what it said is what it omitted. It failed to recommend substantial policy changes. This illustrates the confusion concerning America's proper goals in space and the best means of achieving them.

If activities in space were purely a private matter, this confusion would give policy makers little need for concern. But the federal government will spend \$15 billion this year on civilian space activities alone. In the face of rising taxes and a shrinking economy, American taxpayers are entitled to ask why they must fund a space program.

**Place, Not Program.** Discussions of America's space policy usually fail to answer this question. This is in part because federal policy makers tend to assume that by supporting the National Aeronautics and Space Administration (NASA), the federal agency that plans and conducts most government space activities, or the shuttle or the proposed space station, they are supporting America's goals in space. They forget that space is a place, not a policy or program. If activities in space are worthwhile, it is necessary to discover whether just certain groups or the nation as a whole stand to benefit from these activities, and then who should bear the costs of operations. Policy makers must ask whether particular space activities properly belong in the public or the private sector.

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<sup>1</sup> *Report of the Advisory Committee on the Future of the U.S. Space Program* (Washington, D.C.: U.S. Government Printing Office, December 1990).

America's space program should stand on two pillars: the first is government, the second is private sector. The principal interest of the federal government in space is defense and national security. America's ability to launch intercontinental nuclear missiles, to defend against foreign missiles with a space-based defense system, and to put surveillance satellites in orbit are essential to the nation's defense. If defense activities produce new technologies that also have commercial applications for the private sector, this is an incidental though welcomed benefit.

Ideally, space exploration and scientific research should be a concern of the private sector, not of the government. In the past and even today, private foundations and universities fund and carry out research in various areas of science. Commercial activities involving space, like communications satellites, launch services or production of materials requiring the weightless environment of space, are private sector matters.

**Government Leap.** The federal government jumped deeply into space when NASA was created in 1958 to carry out space exploration and basic space science research. Policy makers felt at that time that only government could carry out such costly tasks. The Apollo Moon landings from 1969 to 1972 were great engineering, scientific, and human achievements. But the inherent problems of NASA as a government agency, dependent on public funds and political support for its existence, became apparent as it sought a role for itself after Apollo.

In the past two decades NASA has moved well outside its original goals of exploration and research. Worse, NASA hinders development of a fully private commercial space sector. Example: NASA used federal subsidies for shuttle launches intentionally to keep the private sector out of the launch business. Example: the planned \$37 billion space station mainly provides a place to which the shuttle can fly, like a giant public works project in orbit providing jobs for NASA bureaucrats and contractors at public expense, while not serving well scientists, researchers, and private enterprise.

Since the January 28, 1986, shuttle Challenger disaster, some modest reforms have eliminated NASA subsidies for shuttle payloads and have required NASA to contract with private firms to launch its own payloads that do not require the large capacity of the shuttle.

**Reforms Inadequate.** These reforms are not enough. What is needed is a strategy to give back to the private sector its proper role in space and to eliminate the power of government to hinder private sector space activities.

There are good reasons for activities in space. Most, however, do not require the existence of an agency like NASA. To move the space program more rapidly in a free market direction, and avoid wasting more money, George Bush should revamp the program completely. His reforms should:

- 1) Drop plans to build a government space station, letting the private sector meet these commercial or scientific needs;**

- 2) Phase out the shuttle program and evaluate whether a new generation of launch vehicles is needed at all in light of a more limited government role in space and an expanded private role;**
- 3) End NASA's direct role in the Mission to Planet Earth project to study this planet's weather and environment, and transfer to a more appropriate government agency the planning and operations of the mission;**
- 4) Completely reorganize NASA, returning it to its original science and exploration functions, or close NASA entirely, turning over its legitimate functions to other government agencies and the private sector;**
- 5) Postpone NASA plans to return to the Moon and to go to Mars, and instead identify private sector alternatives or consider a limited government role promoting the so-called "enabling" technologies needed for such missions;**
- 6) Assign the National Space Council, headed by Vice President Dan Quayle, the task of closely monitoring reforms to make certain they are carried out;**
- 7) Establish an enterprise zone in space, in which government anti-trust, tax laws and other regulations that hamper private commercial activity would be suspended;**
- 8) Begin negotiations for an international Space Trade Community that would establish free trade in space services and eliminate government subsidies and rules that discriminate against private enterprise in space.**

## **CONFUSION OVER AMERICA'S GOALS IN SPACE**

Over the past year, technical problems with the shuttle and the inability of NASA to fulfill its own launch schedule have focused criticism on America's space program. Of special note is last December's Report by the Presidential Committee headed by Martin Marietta's Augustine. The Report points out that while most Americans support a space program, there is virtually no agreement on what kind of program it should be. That is, Americans cannot define their country's interests in space. The Report notes that NASA is over-committed, trying to do too many things at once, and that its projects tend to grow in cost and complexity, and thus become extremely inefficient.

After this solid analysis, the Report falters and retreats, itself failing to define clearly what America's goals in space should be. As a result, the Report offers only half-hearted reforms rather than the bold changes necessary to deal with the space program's chronic problems.

**Two Pillars.** Policy makers must keep in mind that space is a place, not a policy or program. There are indeed worthwhile activities involving travel in space. But policy makers must ask who should undertake such activities, who benefits and who should pay. Too often the answer to the latter question is, "The government." Too often the former questions are ignored. An answer to the questions should reveal that a sound space policy should stand on two pillars: government and private sector.

## GOVERNMENT GOALS IN SPACE

### **Goal #1: Defense and Security.**

The primary purpose of the federal government is to defend Americans. This requires activities in space. Much American rocket development was to meet Pentagon needs for intercontinental ballistic missiles. Surveillance satellites monitor military activities in other countries. The Strategic Defense Initiative (SDI) will expand government's role in space. Future activities in Earth's orbit by other countries suggest a future security role for the U.S. in space.

### **Goal #2: Foreign policy.**

The State Department uses the space program to promote good will with other countries. Astronauts from Costa Rica, Germany, and Saudi Arabia, for example, have flown on the shuttle. NASA gives special treatment to foreign governments by providing low priced communications satellite launches. But by giving away services paid for by American taxpayers, NASA takes potential customers away from American private sector providers. This makes such uses of public revenues questionable. In any case, such activities should be charged in full to the State Department, not to NASA.

### **Goal #3: Basic defense research.**

The legitimate role of the Pentagon's Defense Advanced Research and Projects Agency (DARPA) is to explore and develop new technologies, often space related, with direct defense applications. Many government-developed defense technologies have potential commercial or scientific applications as well. When national security is not endangered, the government should make these technologies available to the private sector on the most liberal and generous terms, either through licensing use of the technologies or, preferably, by selling them outright.

## PRIVATE SECTOR GOALS IN SPACE

### **Goal #1: Commercial activities.**

Commercial activities in space should be the exclusive concern of the private sector. The commercial uses for space were recognized early in the space era with the 1962 launch of the Telstar communications satellite. America's prospering satellite industry earns some three-quarters of the \$8 billion annual revenues of commercial space activities. In addition to communications, satellites provide remote sensing from space, to detect deposits of minerals on Earth like oil, or to examine crops and soil. For decades satellites have been used to track the weather. Other commercial benefits could result from space activities. In the future, for example, production of new industrial materials in the zero gravity of space could become profitable; the Moon could become a source of valuable minerals. Space-launch services, just like commercial trucking services or passenger airline services, should be a private sector matter. NASA, however, has provided most launch services.

### **Goal #2: Exploration.**

The exploration of the Moon and other planets is not inherently a government task, contrary to claims by NASA supporters. Businesses, private foundations, research organizations, and universities should plan, pay for, and carry out such missions. In the past, large science projects have been a private concern. The largest working telescopes in this century, for example, were privately funded.<sup>2</sup> The first liquid fuel rocket was developed and launched privately in 1926 by inventor and physicist Robert Goddard. It is argued that the costs of space activities are too high and thus require government funding. Scientists, of course, can dream of projects so costly that only a government can foot the bill. But government resources also are limited. More important, the costs of space activities are high in part because of the government role. Since NASA has had a monopoly on most space activities, there have been few market incentives to lower costs.

### **Goal #3: Basic research.**

It is argued that because some critical areas of research will have practical, profitable applications only in the future, initial investments are too costly for the private sector. Thus, it is argued, the government must underwrite research into man's ability to live in space, into new forms of propulsion, and into new forms of spacecraft structure. Such an agreement ignores several facts. First, most technological breakthroughs are made by the private sector; second, high taxes make it more difficult for businesses to invest in costly and economically risky research; and third, government funding for research and development is often directed by political pressures and considerations.

Some supporters of government research point to commercial spin-offs of the research, citing Teflon, which was developed as part of NASA's effort to reach the Moon. Yet it might be less costly and fairer to consumers and taxpayers to let the private firms decide, for example, whether there is a need and market for a non-stick coating for frying pans and to let them risk their money producing such products.<sup>3</sup>

## **THE ORIGIN OF AMERICA'S SPACE POLICY**

America's long planned entry into the space age was accelerated in 1957 by the Soviet launch of Sputnik, the first artificial satellite. At that time security concerns were foremost in the minds of United States government officials, since a Soviet Union that could launch satellites eventually would be able to launch intercontinental missiles. U.S. officials also reckoned that America's ability to place men and satellites into space would burnish America's international prestige as a

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- 2 These telescopes are on Mount Wilson, California, funded by the Carnegie Foundation, and on Mount Palomar, California, funded by the Rockefeller Foundation. The largest telescope, soon to be completed, is on Mauna Kea, Hawaii, and is paid for principally by the W.S. Keck Foundation.
  - 3 The Augustine Committee acknowledges that some "benefits can be reaped by other more direct means." *Op. cit.*, p. 3.

leader in technology, science, and expanding mankind's frontiers — as the surprise Sputnik launching did for the U.S.S.R.

In 1958, the federal government created the National Aeronautic and Space Administration (NASA), a civilian agency to carry out America's space program. Work on rockets for military purposes was kept separate in the Pentagon. NASA's original mission was to promote exploration and basic scientific research. It was assumed at the time that for security and financial reasons, space activities were outside of the scope of the private sector.

In 1961, President John F. Kennedy announced America's intention to put a man on the Moon by the end of that decade. This America did accomplish on July 20, 1969, with Project Apollo. Five other landings followed, the last in 1972. While marvelous as engineering, scientific and human achievements, the lunar landings encountered serious economic and administrative problems. Aiming for a Moon landing within the decade drove up the cost of the project.

The best known exploration projects, other than the Moon landings, were the 1976 Viking landings on Mars, the Voyager missions to Jupiter, Saturn, Uranus, and Neptune during the 1970s and the 1980s, and this year's Magellan mapping mission to Venus. Most of these operations were conducted by the Jet Propulsion Laboratory in Pasadena, California, technically part of NASA but with considerable autonomy. Satellites to collect data on the stars, galaxies and the evolution of the universe also have yielded important scientific data. The most commercially successful uses of space include communications and weather satellites and satellites for studying the Earth.

## FROM EXPLORATION TO FREIGHT SERVICE

Because of Project Apollo, NASA early on saw its fate tied to costly, big-ticket projects that required most of its resources. Typical is the space shuttle. NASA has argued that the shuttle should be the primary means of putting men and cargo into space, whether for defense, scientific or commercial reasons, whether for government or private payloads. The shuttle was to be a reusable vehicle that would place payloads in space cheaper than expendable — or non-reusable — launch vehicles. To assure that the shuttle would have enough cargo to make it cost effective, NASA eliminated its alternative heavy launch vehicle, the huge Saturn V rocket that had put the astronauts on the Moon.

The shuttle design resulted in part from decisions made to maximize political support for the project.<sup>4</sup> This boosted costs and technical problems. Example: the

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4 The choice of the solid rocket boosters that ultimately caused the Challenger explosion illustrates the politicized nature of NASA. The plan for these boosters submitted by the Utah-based Morton Thiokol Company came in last on design quality. Yet then-NASA Administrator James Fletcher accepted the Thiokol design and gave that company what is now a \$2 billion contract. Before taking over at NASA, Fletcher had been on the Board of Directors of Pro-Utah, a lobbying group for that state. See David P. Gump, *Space Enterprise Beyond NASA* (New York: Praeger, 1990), p. 19.

Pentagon wanted a vehicle that could maneuver in the atmosphere rather than simply glide in for a relatively straight-line landing. This meant equipping the shuttle with 34,000 fragile and expensive heat resistant tiles that are very time consuming to maintain. The tiles' added weight equals half of the shuttle's cargo capacity, reducing the amount it can carry into space.

The shuttle's costs rose so much during the 1970s that its primary potential customer, the Pentagon, threatened to pull out of the project altogether. As a result, President Jimmy Carter, in the late 1970s, required all government payloads, military and civilian, to be carried on the shuttle. In 1981, the first manned shuttle was launched, years behind schedule and billions of dollars over budget. To guarantee itself enough payload to justify the program, NASA offered to launch private business cargos bound for space at subsidized launch rates. This, of course, made it impossible for private firms to compete with NASA and thus blocked development of American private sector launch businesses. To make matters worse, the shuttle was an extremely inefficient way to launch most cargo. To put a small satellite into orbit with the \$3 billion shuttle is the equivalent of purchasing an eighteen wheel tractor trailer to go to the corner store for milk.

Though touted as an economizing venture, the shuttle failed to reduce launch costs. The cost of putting a one pound payload into space increased from around \$3800 for the Saturn V to some \$6000 in 1985 dollars for the shuttle.<sup>5</sup> True shuttle costs may be even higher but are masked by questionable accounting methods. Example: the so-called reusable solid rocket boosters fall off the shuttle into the sea after use; the sections of the rocket then are picked up by ship, sent by train to facilities in Utah, reconstructed there by technicians and shipped back to Cape Canaveral, Florida, for re-use. The official price tag on the "re-usable rocket boosters," however, does not reflect these extra costs. Whether these reusable rockets thus are cheaper than expendable launch vehicles is doubtful. Finally, the shuttle took NASA far afield of its primary goals of science and exploration. Instead, the shuttle puts the government into the trucking business.

## RECENT REFORMS

In studying the January 1986 shuttle Challenger disaster, policy makers began to recognize that there are problems when government pursues what should be private sector goals in space. To address the problems, the Department of Commerce pushed reforms to aid American private sector commercial space efforts. Among the new policies promoted by Commerce and the Reagan Administration:

- ◆ NASA was barred from launching commercial payloads unless they require the large cargo capacity or other special attributes of the shuttle, or involve national security or foreign policy.<sup>6</sup>

5 Gump, *op. cit.* p. 16.

6 First steps on this reform came prior to the shuttle disaster, in the 1985 Commercial Space Launch Act.

- ◆ NASA was to stop subsidizing commercial cargos; businesses requiring the shuttle to launch payloads would have to pay the full cost. This has been done to some extent.
- ◆ NASA was to get out of the space launch business and to hire private firms to launch payloads not requiring the shuttle. Considerable progress has been made in this area, though the NASA bureaucracy continues to slow the process.
- ◆ NASA and the Air Force were to rent unused launch facilities to private launchers at fair and commercially reasonable terms. A pricing agreement generally acceptable to the private sector has been concluded.

In 1989, with authorization from Congress, George Bush established the National Space Council, headed by Vice President Dan Quayle and including Cabinet members dealing with space activities, and heads of other interested agencies.<sup>7</sup> With an executive secretary and staff, the Council coordinates and monitors U.S. space policies. In the past year the Council has taken the lead in reviewing America's goals in space. It currently is reviewing space commercial, transportation, and exploration policy.

## PROBLEMS WITH NASA

Over the past five years, policy makers have shown renewed interest in America's space program. NASA's budget, for example, has grown from \$4.89 billion in fiscal 1988 to over \$15 billion in fiscal 1992. But too little attention has been paid to the question of whether more money for a government agency actually will advance the country's goals in space.

NASA has strayed far from its original mission of basic science and exploration. If policy makers wish, at minimum, to return NASA to its original mission or, better, to begin the process of making non-defense space activities a private sector concern, a review of the space agency's current projects is necessary.

### The Space Station

Planning for the proposed space station Freedom was begun in the early 1970s. This is NASA's big ticket mega-project. Projected costs for a full-size station have grown from under \$10 billion to \$37 billion.

Although there are many questions about the space station, one thing is undisputed: it will not serve America's defense or security needs. In fact, to get Japanese government help with the space station, the U.S. essentially promised

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<sup>7</sup> The members of the National Space Council are the Secretaries of Commerce, Defense, Energy, State, Transportation, and Treasury, the President's Chief of Staff, the Director of the Office of Management and Budget, the Assistant to the President for Science and Technology, the National Security Advisor, Director of the Central Intelligence Agency, the Administrator of NASA, and the Executive Secretary of the Space Council.

Japan that it would conduct no military or intelligence activities on the station. NASA maintains that the station will meet at least three goals: 1) to facilitate scientific experiments; 2) to study the biological effects of space flight on men; and 3) to act as a way station for future flights to the Moon and Mars. But evidence suggests the station would meet its goals poorly, at too high a cost if it meets them at all.

**Private Options.** According to the Augustine Committee report: "We do not believe that the space station Freedom... can be justified solely on the basis of the (non-biological) science it can perform, much of which can be conducted on Earth or by unmanned robots."<sup>8</sup> Even where a station is needed, private options might be available. For example, Space Services Industries, a Houston-based private firm, designed a small, unmanned station that would cost between \$500 million and \$750 million and could have been launched years before the NASA station. It wanted NASA as the primary or anchor tenant on the station. Fearing that the Space Services Industries station would undermine NASA's own station, NASA refused to rent space from the private firm. The result: the mini-station never got off the ground.<sup>9</sup>

Another problem is that some important experiments could not be performed on the NASA station for the very reason that it is manned. Human presence may be too disruptive for extremely sensitive experiments. Ironically, in arguing for a slower construction schedule, Associate NASA Administrator William Lenoir in November 1990 noted that not manning the station for three or four years would allow more time for scientific research that otherwise would be disturbed by a human presence.<sup>10</sup>

Augustine Committee members also state that "We doubt that the space station will be essential as a transportation mode — certainly not for years to come."<sup>11</sup> The full-size station is not designed as a way-station for Moon or Mars missions. Conversion for such a use would add to its already huge price tag. And in any case, private firms told a confidential interagency U.S. government working group in 1987 and 1988 that a Moon base could be constructed without a space station.

**Chance of Accident.** There is doubt whether a full size station ever could be built. At least 27 shuttle flights would be required to build this station. Yet a 1990 study finds that for the next 34 shuttle flights, there is a 50 percent chance of losing another shuttle in an accident.<sup>12</sup> Such a loss, with a replacement cost of \$4 billion or \$5 billion each, probably would bring both shuttle and station activities to a halt and leave America's civil space program in ruins.

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8 Augustine Committee Report, p. 6.

9 For a discussion of other alternatives to the NASA station, see T.A. Heppenheimer, "Beyond Tomorrowland," *Reason Magazine*, May, 1991.

10 *Aviation Week and Space Technology*, November 12, 1990.

11 Augustine Committee Report, p. 6.

12 U.S. Congress, Office of Technology Assessment, *Access to Space*, April 1990, p. 45.

Reacting to criticism, NASA has developed plans for a scaled down station. Yet the National Research Council, part of the private National Academy of Sciences, which advises NASA on policy matters, finds that this smaller station "does not meet the basic research requirements" for which it is planned and "Neither the quantity nor quality of research that can be conducted on the proposed station merits the proposed investment."<sup>13</sup>

Only for space biology may a full size station provide research facilities that cannot be duplicated on Earth. But given the likelihood that the station would not achieve its other goals, it is necessary to ask whether such research is worth the \$37 billion station cost. Further, the National Research Council maintains that a smaller station will not even allow for this research.

NASA did not design the station in response to requests of paying customers standing in line for its services. Rather, the station is a public works project driven more by concerns for jobs and money at NASA than for America's interests in space. It is an engineering project that, like a road leading nowhere, serves no real purpose. The Bush Administration, nevertheless, supports a downsized station, which it claims will cost "only" \$30 billion. Noting that research is only one reason for a station, Vice President Quayle states: "The most compelling reason for building a space station is that it is a necessary step to further America's leadership in exploring space."

## MISSIONS TO THE MOON AND MARS

Establishing a permanently manned Moon base or traveling to Mars clearly are part of NASA's mandate of space exploration. Yet there are problems in pursuing these goals now. First, a Moon base need not be built by NASA. A confidential interagency U.S. government working group in 1987-1988 considered the feasibility of a Moon base built and maintained by the private sector. Under this plan the government would offer a one-time cash prize to any private group that could construct a permanently manned Moon base by 2010. The government then would lease space on the base for thirty years, paying rent totalling from \$5 billion - to \$10 billion. Such an arrangement was used in aviation's early years when the government offered prizes to individuals, or private groups, for specific types of aircraft or parts. When asked by the working group whether a privately-developed space station is realistic and feasible, the answer was "Yes!" but only if NASA stayed out of the way.

Whether built by the public or private sector, there is need for greater public discussion of the purposes and goals of a Moon base. The Moon could host scientific experiments or manufacturing too hazardous to be done on Earth. Yet it is necessary to compare the price tag with the benefits of such a venture and ask whether the money might better be spent on other priorities.

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13 "Skeleton Space Station Declared Unfit," by Kathy Sawyer, *The Washington Post*, March 15, 1991, p. A1 and A 16.

The Mars mission faces the same questions posed of other NASA projects. First, is it the best use of resources or are there more important scientific priorities? Second, what is to prevent the costs from skyrocketing as was the case with the shuttle and the space station? And third, will the NASA monopoly on the mission hinder private sector space activities?

**“Brilliant Pebbles.”** Supporters of a Mars mission offer the Strategic Defense Initiative (SDI) as a model. Until last year, a special office in the Pentagon, directly accountable to the White House and in part insulated from Congressional and industry pressure for special favors, managed SDI development. When Phase I of SDI originally was proposed in 1987 its cost was estimated at \$147 billion in 1988 dollars. But the SDI Organization has developed innovative and less costly ways of providing strategic defense. One system, known as “Brilliant Pebbles,” was largely responsible for cutting the estimated cost of Phase I down to \$50 billion. Mars mission supporters are pressing for a special office similar to the Strategic Defense Initiative Organization reporting to the White House or Space Council, that could finance enabling technologies while avoiding the problems of a costly and inefficient NASA, seeking to protect its bureaucratic empire and subject to political and industry pressures.

Whether this approach is needed or workable requires extensive public discussion on the government’s appropriate role in developing the nation’s infrastructure. When it decided to use planes to fly the mail in the 1930s, the U.S. Post Office in effect created a business for the fledgling aviation industry until the industry developed a commercially viable plane, the Douglas Aircraft Company DC-3. The government also gave small grants to individuals or small firms to examine or develop new aircraft technology.

## **THE MISSION TO PLANET EARTH**

A planned project that NASA shares with the Commerce Department’s National Oceanic and Atmospheric Administration (NOAA), the Department of Energy and the Environmental Protection Agency, is the Mission to Planet Earth. It is designed to study the environment, climate, and weather. The trouble is that NASA should not be involved in this effort. The reason: the mission is not basic space-related research or exploration. NASA is involved, it appears, mainly to justify building a space station or as a way to get involved in programs dealing with the environment. This may be deft bureaucratic and budget maneuvering by NASA, but will have little to do with space.

If there is a market need, private weather services will conduct research on their own with private satellites. If a government role is required, NOAA, which is responsible for weather prediction, would be the appropriate agency. Yet NOAA poorly managed the Landsat project, which studies the Earth through satellite sensing.

## **ORGANIZATIONAL PROBLEMS**

Taking away from NASA some of its projects like the station or the shuttle may help return NASA to its original exploration and research missions. But even here, NASA still would be pursuing goals best left to the private sector. This likely would continue to drive up the costs of space activities and hinder private sector space efforts.

A major reason for the space program's high costs is the system by which NASA procures its hardware and services. Like the Pentagon, NASA designs a system in great detail and then seeks contractors to build it, charging NASA cost plus a profit. This is called cost-plus pricing. Sometimes, as the project proceeds, the contractor explains that the cost for some part of the project is growing. NASA then agrees to pay more. Sometimes NASA changes the specifications; contractors then increase the price accordingly. By contrast with a competitive bidding approach, an agency does not design a system in detail, but sets general performance standards and contracts with the lowest bidding private provider for a fixed fee.

Even a pared-down NASA still could hinder private sector space efforts. NASA owns the most space-related infrastructure. Nearly all major launch, tracking and communications facilities, worth billions of dollars, are government property. The shuttle is NASA property, as will be the manned space station. Its \$15 billion annual budget, meanwhile, gives NASA a great deal of influence over the direction of space activities. NASA decides which universities and firms receive research grants. Private companies often must seek NASA funds and thus, understandably, are reluctant to criticize NASA or oppose its projects.

## **IS NASA NECESSARY?**

To accelerate reform in America's space program, policy makers must ask whether NASA itself is necessary or whether it should be closed and its functions transferred to other government agencies or left to the private sector entirely. Defense-related space activities are best managed by the Pentagon. It correctly balked at relying on the shuttle to launch defense payloads. Instead the Pentagon is using cheaper, more reliable expendable launch vehicles. Placing commercial payloads into space never should have been NASA's responsibility. It is the private sector's. So is the Mission to Planet Earth's study of the environment, climate and weather. If any government agency is to be involved, it is perhaps NOAA, not NASA.

This leaves exploration and basic research as NASA's primary tasks. But most planetary probes are managed by the Jet Propulsion Laboratory (JPL) in Pasadena, California. JPL need not work through NASA but could propose projects and seek funds directly from Congress. As for basic research in spacecraft design and aeronautics, this is carried out by Langley Research Center in Hampton, Virginia, and other federal agencies. As with JPL, Langley could deal directly with Congress. Space biology research, meanwhile, could be conducted by the National Institutes of Health.

NASA might become a coordinator of the various agencies' space work. It could, for example, identify the potential applications of SDI technology for rocket design and even commercial applications. Even here, the various agencies could deal with each other directly and not need NASA as middle man.

If NASA were simply shut down, with its functions transferred to other government agencies or to the private sector, all NASA employees would not necessarily be out of the space business. JPL, for instance, would hire ex-NASA workers for its expanded exploration responsibilities. The private sector would absorb NASA veterans for the private launch and space station services to businesses, government agencies, and research institutions.

## **DOMESTIC BARRIERS TO PRIVATE SPACE ACTIVITIES**

The private sector has demonstrated its ability to meet commercial and other space challenges if the government leaves it alone. Private communications satellites perhaps are the most successful form of space enterprise. And in spite of NASA's opposition, there have been private launches. Martin Marietta Corporation launched the private Japanese Communications satellite and the Skynet communications satellite for the British Ministry of Defense in 1989. In that same year McDonnell Douglas Company launched the BSBR-I communications satellite for the private British Broadcasting Company and in 1990 launched the BSBR-II for the same firm.

Smaller firms also are challenging NASA's monopoly. Houston-based Space Services, Incorporated launched its private, suborbital Conestoga I rocket in 1982. And Starstruck, Incorporated, a small Redwood City, California, firm, launched a suborbital rocket of its own design in 1984. Space Industries, Incorporated, designed the mini-space station that NASA refused to rent space on for fear of endangering its own station project.

**Costly and Risky.** Even more than with other new commercial endeavors, space businesses are extremely costly and risky. As the Challenger accident shows, a mistake can result in the loss of money and lives. This was a major reason why many policy makers felt that only government could carry out activities in space. Businesses thus might do better to cooperate or pool resources in basic research, development, and operations. Operations in space by private businesses might only be possible with joint ventures and consortia between a number of countries. The trouble is that federal antitrust laws might make this difficult. Further, in the case of private launches, economic activities take place in many states. A rocket might be launched from one state with tracking facilities in various other states. Different state regulations could make such operations difficult.

High taxes, meanwhile, make it difficult for businesses to accumulate the capital necessary for expensive investments in space activities. Finally, as with all American businesses, private space ventures face a plethora of government regulations and controls that make such enterprises, which may not make a profit for years, too costly to start or maintain.

## INTERNATIONAL BARRIERS TO PRIVATE SECTOR SPACE ACTIVITIES

When NASA was formed, the private sector role in space was not envisioned. Thus, many international treaties make it difficult or impossible for private companies to engage in commercial space activities. The Intelsat Corporation, for example, created in 1973 by the Intelsat Agreement among 114 countries, maintains an international satellite communications network. Subscriber governments are shareholders in Intelsat and agree to apply its regulations to their own businesses and agencies. Unfortunately, Intelsat enjoys special monopoly status at the expense of the private sector. Article 14 D of the Agreement requires private firms wishing to provide international satellite telecommunications services to prove to Intelsat that their activities will not cause "substantial economic harm" to Intelsat. Because of this, the Pan Am Satellite Corporation, a private American firm, suffered years of delays negotiating with Intelsat before it could launch in 1988 a telecommunications satellite servicing North America, Central America, and much of South America.

**Private Insurers.** Under the 1967 Outer Space Treaty and the 1972 Liability Convention attached to this treaty, governments are liable for damages caused by space-related activities originating from their territory. Thus, the U.S. government places strict regulations on private launchers, arguing that, after all, the government would have to pay the damages for any international accidents. But the case of rockets is little different in principle from airlines. Air carriers secure private insurance to cover crash and other damages. Regulation of the American launch industry could be reduced if the government got out of the launch insurance business. The 1988 Amendments to the Commercial Space Launch Act of 1984 provided some relief for industry. But this relief does not establish a private liability and a private insurance market.

Advocates of a direct government role in commercial space activities often maintain that because foreign governments subsidize their own launch industries, American firms are at a disadvantage and therefore require American government subsidies. Yet before the shuttle disaster NASA itself was the world's largest launch subsidizer. The U.S. Trade Representative currently is conducting talks with the Europeans to deal with subsidies and other trade problem. Launch services offered by the non-market the Soviet Union and China pose a special problem. Without market prices, it is difficult even to determine the true amount of the subsidies. The U.S. has negotiated an *ad hoc* agreement allowing the Chinese to sell a limited number of launches of American satellites at a set price. But this sort of managed trade deal is no substitute for a comprehensive free trade arrangement that eliminates all government subsidies.

## RECOMMENDATIONS

America's space policy from the start should have assigned defense and security matters to the government and left other activities in private sector hands. Instead, the government became directly involved in exploration, space science research, and such commercial activities as launch services. While NASA has made

many major scientific discoveries, for example, with its probes to the planets, it also has wasted extraordinary sums of money and has hindered the development of an American private sector for launches and space station services.

The goal of American policy makers should be to return as many civilian space activities as possible to the private sector and to ensure that NASA stops blocking such progress. Where this is not fully possible, policy makers must carefully assess federal space programs to determine whether these activities are worthwhile. If they are, policy makers should determine how these programs might be privatized in the future.

To these ends, the Bush Administration and the National Space Council should consider the following reforms:

**1) Cancel the government space station, and let the private sector meet commercial or scientific needs.**

The planned space station Freedom is not salvageable. It was ill-conceived, and NASA's attempts to redesign it to meet budget constraints have accomplished little. The Space Council should instruct government agencies that are willing to pay for projects on a space station to contract with private suppliers and to cover the costs of such services from their agencies' budgets.

**2) Phase out the shuttle program and evaluate whether a new generation of launch vehicles is needed in light of a more limited government role in space and an expanded private role.**

The shuttle is a costly system which has hindered the development of a private launch sector and made the U.S. government as well as private firms and researchers too reliant on an unreliable system. To phase out the shuttle, NASA should budget only four flights each year rather than the current eight. If NASA is not building the space station, four flights annually should be enough to meet all NASA needs. The Administration then should consider whether a new launch system is necessary to provide defense or other government needs and, if so, what sort of system. Because downsizing or eliminating the space station and phasing out the shuttle have not been considered seriously until recently, there has been little serious public and governmental discussion on future systems. After announcing a cutback in scheduled shuttle launches, the Space Council should begin a public dialogue on the need for a new launch system.

**3) End NASA's direct role in the Mission to Planet Earth project to study this planet's weather and environment, and transfer to a more appropriate government agency the planning and operations of the mission.**

This project now is the shared responsibility of a number of agencies including NASA and National Oceanic and Atmospheric Administration (NOAA). But because this project does not directly concern space exploration, it should be turned over entirely to another agency, perhaps NOAA or the Department of Energy. If this agency wishes to contract with NASA necessary project technology, it should be allowed to do so only if no private laboratories can meet its needs.

- 4) Completely reorganize NASA, returning it to its original science and exploration functions, or close NASA entirely, turning over its legitimate functions to the private sector or other government agencies.**

Exploration and basic scientific research, the original goals of NASA, should be the only tasks of government space efforts. Experience proves that it is not enough simply to redefine on paper NASA's goal and then order the agency to act accordingly. With NASA's thousands of employees, billion-dollar budget and the hundreds of private contractors dependent on it for business, NASA would be impossible to control. In light of its new goals, NASA should be reorganized thoroughly, with divisions eliminated or transferred to other agencies, such as the Jet Propulsion Laboratory. Institutional reforms should insure that most NASA projects and launches not requiring the shuttle are performed on contract to private firms that win competitive bids. Cost-plus pricing, with NASA mandating the specifications of every nut and bolt must be abandoned. If it is found that NASA's functions can be performed entirely by other agencies or by the private sector, it should be shut entirely.

- 5) Postpone NASA plans to return to the Moon and go to Mars and instead identify private sector alternatives, or consider a limited government role promoting the so-called "enabling" technologies needed for such missions.**

A return to the Moon or mission to Mars could be programs that drive up spending and obscure other priorities. As the space program is reevaluated and NASA reorganized, these programs should be put on hold. If a return to the Moon is judged a national priority, the federal government should offer a prize and long-term tenant contract to any private firm or consortia that could provide a permanently manned Moon base. The job of setting up the base should not be assigned to NASA. If a Mars mission is judged a national priority, a similar private sector approach should be considered. While the need for government support for enabling technologies for a Mars mission has not been established, such an approach might be explored, especially if there are military needs that might be served as well.

- 6) Assign the National Space Council the task of closely monitoring reforms to make certain they are carried out.**

The efforts of the Commerce Department under Ronald Reagan to privatize space activities were frustrated by opposition from NASA and other government agencies and departments. The National Space Council was created to overcome such problems. Bush and Congress should give it the support it will need to implement a radical reform plan.

- 7) Establish an Enterprise Zone in space, in which government anti-trust, tax laws and other regulations that hamper private commercial activity would be suspended.**

To allow private American firms fully to exploit the economic potential of space and to be in a strong position to face foreign competition, the U.S. must maintain a flexible, regulatory environment conducive to risk. A Space Enterprise Zone would be a designated volume of space in "near Earth orbit," that is, between 50

and 50,000 miles above the Earth. This Zone would be exempt from federal government regulations such as anti-trust laws that hinder commercial space activities.

**8) Begin negotiations for an international Space Trade Community<sup>14</sup> which would establish free trade in space services and eliminate government subsidies and rules that discriminate against private enterprise in space.**

An international agreement is needed between spacefaring countries to eliminate government subsidies for launch services and hardware, and to lift restrictions on free market activities in space. A Space Trade Community, similar to the Free Trade Area that the U.S. is phasing in with Canada, would help unleash the energy and creativity of the private entrepreneurs in the space sector. This would allow them to cut the costs of launches, develop small private space stations and find new uses for space not dreamt of today. While negotiating with individual countries on specific, limited issues might yield some benefits, it could be a better strategy to negotiate a general agreement with all countries involved. By linking progress in one area to that in others, there is a greater chance that no one interest group or country could block progress.

## CONCLUSION

Americans justifiably are proud of the great technological and scientific achievements of the federal space program. With the rest of the world, Americans see man's move into space as a great human achievement, part of the continual realization of man's goal to explore and to understand the universe around him. The inherent problems of the government conducting civilian space activities in recent decades has led to wasted funds, misplaced priorities, and a crippled private launch sector. The limits of the government's role now are clear. Most observers, including the Augustine Committee and the National Space Council, see the need to change dramatically America's space program.

The federal government's space effort is at a point where incremental changes no longer will make it an efficient vehicle with which America can reach its goals in space. Fundamental reorganization is needed. The market system time and again has proved the best means to advance a country's material and technological progress. It is time for George Bush and the Space Council, with the support of Congress, to begin to make space ventures, like civil aviation, part of the private sector.

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<sup>14</sup> This plan is discussed in detail by James Bennett in "Creating Competitive Space Trade: A Common Market for Space Enterprise," Reason Foundation Study 123, August 1990, Santa Monica, California.