

**Review of U.S. Human Space Flight Plans Committee  
Remarks on the background for the Vision for Space Exploration  
Washington, D.C.  
August 5, 2009**

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As the Columbia Accident Investigation Board neared the end of its deliberations in late June 2003, NASA Administrator Sean O'Keefe met with White House officials in a meeting convened by Chief of Staff Andrew Card and distributed materials proposing short, medium and long term options for response. Mr. Card expressed concern about stating a long term vision immediately on receipt of the CAIB report, and set up a group to develop policy recommendations and a path forward. The new group, known internally as "the Rump Group," built on a White House policy group that had been following the CAIB work<sup>\*</sup> and included senior NASA officials. The Rump Group<sup>†</sup> produced a paper sketching six hypothetical scenarios for space exploration. In mid-August Deputy Chief of Staff Harriet Miers convened a meeting of senior White House policy advisors that reviewed the scenarios and posed a number of questions to the cognizant agencies, answers to which would inform the process. Most of the questions were directed to NASA, but input was requested from the Departments of State, Defense, and the intelligence community as well. The subsequent process was carried out under the usual Policy Coordinating Committee (PCC) structure, chaired jointly by the Domestic Policy Advisor Margaret Spellings and the Deputy National Security Advisor Steve Hadley. As a practical matter, Mr. Hadley chaired the meetings of principals, which included the NASA Administrator as well as representatives from the departments mentioned above and the White House policy offices. I participated in all these meetings and maintained close contact with the Rump Group during this period. Out of this process emerged President Bush's address of January 14, 2004 and the accompanying policy document "*A Renewed Spirit of Discovery*."

Two features of this process are noteworthy: First, it took place in an unusually rich information environment. Numerous reports, studies, and commentaries on all aspects of space exploration were available, reaching back to the 1952 Collier's Magazine series by Wernher von Braun, and including the work of two committees in 1987 and 1990 chaired by members of today's incarnation of the "Augustine Committee." A brief summary table of the more important policy-oriented documents among these reports was prepared at the time by OSTP and is attached to this statement. Second, the final policy

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<sup>\*</sup> Called "the Slide Rule Club" this group was led by Cabinet Secretary Brian Montgomery and included Technology Deputy Richard Russell, Brett Alexander, William Jeffrey (OSTP), Gil Klinger (NSC), Marcus Peacock, Dave Radzanowski, Paul Shawcross (OMB), and James Marrs (Office of the Vice President).

<sup>†</sup> The Rump Group consisted of John Schumacher, Steven Isakowicz, and Mary Kiswa from NASA, and Jeffrey, Peacock, Klinger, and Marrs from the earlier White House group.

document was a compromise between contrasting policy perspectives offered by NASA and by the White House policy advisors. In subsequent presentations to Congress and to the public, NASA representatives emphasized the NASA view of the *Vision*, which began to appear even during the policy formation process through leaks to the media serving the space community. In my own presentations, and particularly in two speeches I gave in 2006 and 2008 to the annual Robert H. Goddard Memorial Symposium, I emphasized the White House view. NASA decisions following 2004 tended to diverge from the compromise *Vision* toward greater emphasis on a Mars expedition as a primary objective, and minimizing the features of sustainable, cumulative capabilities and commercial participation that were important parts of the *Vision*. NASA decision-making grew increasingly constrained by real budget shortfalls created in part by larger than estimated return to flight costs for the Shuttle. It would be a mistake to assume that the actual development path for space exploration since 2004 has accurately reflected the overall concept of the *Vision*.

In September 2003, partly in response to the "questions to agencies" mentioned above, I drafted my own version of the policy direction then emerging from the deliberations of the Rump Group. It might be regarded as the policy advisors' position at the outset of the subsequent intense negotiations with NASA, and it remains my own personal preferred option today. It was not entirely dispassionate, as it was intended to influence a policy audience almost completely unfamiliar with its central ideas. I am including it here in its entirety.

### **Response to Deputies Committee Questions on Space Exploration (OSTP)**

1. *What is our vision for future space exploration?*

Our vision is to understand, as far as humanly possible, the universe beyond Earth's immediate vicinity, and to use that knowledge to improve the quality of life, in every aspect, of all people. We will pursue these goals through every means appropriate to the diverse tasks of the enterprise, with due respect for the health and safety of those involved, and in balance with other worthy endeavors.

2. *Why is it important?*

*Within the Earth's orbit*, space exploration has enabled technologies for national security, economic gain, and science. Surveillance, navigation, and communication satellites are now part of our military and civilian infrastructure. Scientific satellites looking deep into space and down at the Earth are changing profoundly our notion of the substance and structure of the universe, and the operation of the Earth environment. These will continue to bring benefits for the foreseeable future. *Beyond Earth's orbit*, we have sent robotic explorers to every other planet in our solar system except for Pluto. Each planet and moon visited has yielded new scientific discoveries and challenged our understanding of planetary formation and the possibility of emerging life.

Imaginative schemes have been proposed for further enhancing our national security, economic strength, and scientific knowledge using objects and phenomena accessible only from space. Those that require large structures beyond Earth's orbit are impractical

today. If such schemes are ever to be realized, the groundwork must be laid far in advance of their implementation. Laying that groundwork is the task of our generation.

3. *What contribution does human space flight make to this vision?*

With one exception, human space flight does not contribute in a tangible way to the immediate task of preparing for large-scale development of space resources. That exception is the understanding of the effects of weightlessness on humans. In the future, humans working with robotic systems will probably be required for large scale development, such as the construction and maintenance of remote facilities (*e.g.* mines, factories, base stations). We do not now, however, possess the knowledge or technical infrastructure necessary to deploy humans safely beyond Earth's immediate neighborhood.

Human space flight does contribute to society in non-tangible, yet compelling ways. It provides lofty goals and promotes human orientation toward and acceptance of our place in the Universe. Human space exploration has inspired an entire generation of Americans to pursue careers in mathematics, science, and engineering. Moreover, U.S. leadership in human space flight serves as a highly visible example of how we can apply advanced technology toward peaceful ends. It provides a vehicle for international cooperation, and a uniquely positive legacy to future generations.

4. *Why is it (human space flight) important?*

Future desirable large scale operations in space, such as resource exploitation, climate control, and solar energy schemes, will probably exceed the capacity of robotic systems for independent operations. Under these circumstances, human participation can be justified and will probably be required. Until the costs and risks of human participation are better understood and controlled, however, the establishment of goals for such large scale operations is a futile exercise. The necessary human-oriented studies, which involve placing humans in a weightless environment, can be carried out simultaneously with continued robotic operations throughout the Solar System.

Most official studies of human space flight conclude that it has value that might be called 'spiritual' or 'existential'. No agreement exists as to what this means, but it is complementary to the value of some kinds of scientific knowledge. We do not study the collisions of galaxies for commercial profit, but understanding such exotic phenomena brings them into the human domain. In the same way, knowing that men and women have visited an exotic world literally 'humanizes' that place. Heroic acts and their importance to society are real, and spiritual motivations are among the strongest that we have. Much anecdotal evidence suggests that space exploration provides a vehicle for these social benefits.

Programmatic Option:

Programmatic options run the gamut from terminating human space flight altogether to announcing an Apollo-like sprint to Mars. The options vary in the degree to which humans participate *directly* (*i.e.*, physically) in space exploration. At one extreme space exploration is entirely robotic. At the other extreme vast resources are invested to maximize human participation.

A balanced approach would prudently build capability for human exploration beyond low Earth orbit, while avoiding premature commitment to specific large scale operations. By careful planning we can make each step a foundation for a range of next steps, so with time our investments mount, costs and risks diminish, and we keep options open to exploit the right one when we are ready to make a big move. As cost and risk are lowered, the case for human presence in space improves, and the variety of plausible missions increases.

We have a vigorous and highly productive program of non-human space operations for scientific, military, and commercial purposes. The philosophy of going step by step, and preparing for the future on a broad front, introduces human capabilities only as appropriate, keeping in mind that the ultimate goal is to permit humans to operate routinely on missions where they are needed.

The quest to enable *all* large scale missions is itself more ambitious than anything yet ventured in space. It includes careful exploration of the moon, for example, and establishment of a base there for *in situ* resource utilization. This should suffice to capture the public imagination.

*Our programmatic vision for human space flight is to bring the successive spheres of every space frontier within our reach, to diminish the daunting cost and risk of every expedition into this new territory. We can embark upon this vision now because every future mission is encumbered with the same impediments of cost and risk.*

*Reducing risk:* Radiation and the effects of low gravity limit the duration for humans to safely live and work in space. The radiation can be simulated here on earth, but to study weightlessness requires a free-fall laboratory. And we have one: the International Space Station. This is the first existing step, and we aim to build upon it with our international partners. The earth-bound and the space-based work together will provide the data and the ideas that we need. They build stepping stones of knowledge about ourselves that we will need to survive in space.

*Reducing cost:* Some strategies are well-known: miniaturize; improve materials; develop better transport systems; and form partnerships with robots and with able nations. Other strategies are technically less mature but offer much greater potential payoff: make heavy parts beyond Earth's deep well of gravity to cut the cost of lifting out to space. Where shall we find the raw materials? *On the Moon.* This requires a Moon-base, robotic, and ultimately human crews for oversight.

*Some consequences of this approach:* It optimizes not for a single mission but for the steady accumulation of technologies and capabilities that provide a base for multiple operations. It emphasizes the role of robotics, of ground-based research, and of system thinking. It places the International Space Station in a larger context – its purpose is specifically to acquire knowledge that allows us to protect humans in space.

*This approach is compatible with a reduction of the current human space flight program.* The current program places humans in space to accomplish missions that with today's robotic technology can be accomplished without them. The result has been to decrease resources available to build the foundation toward future missions for which humans have a more important role to play. We cannot place humans deeper in space for any

length of time without solving the problems of risk and cost. The first order of business is to solve those problems, not to use humans in lieu of robots or animals in the safer low-Earth orbits.

*The approach entails extensive robotic exploration of the Moon, potentially followed by the construction of a permanent lunar base whose objective is resource exploitation possibly for economic gain and to use the material to facilitate further expansion of human exploration deeper into the solar system. This program would be carried out simultaneously with research into the mitigation of human risk factors, and the development of new launch and transport technology.*

Schedule and Budget: The pace of advance will be dictated by the level of resources devoted, but a range of budgets permits continued progress. Close cooperation with, and even reliance on, international partners should be seriously considered. No date should be established for humans to return to the Moon or Mars. The rate of advance away from the Earth should be dominated by budget and technical progress – and by no calendar but the winding of the planets along their eternal paths.

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If I were re-writing this manifesto today, I would add a paragraph on the role and importance of commercial space enterprises, and emphasize the importance of sustained effort. That deficiency was remedied in the final version of the policy, but has been neglected in execution. Let me restate a plea that I made in my 2008 Goddard lecture: *"If the architecture of the exploration phase is not crafted with sustainability in mind, we will look back on a century or more of huge expenditures with nothing more to show for them than a litter of ritual monuments scattered across the planets and their moons."*

In my opinion the all-encompassing scope of the vision we advanced was diminished in the final policy by specific mention of Mars as a target, and the immediate path forward was burdened by deadlines and difficult budget issues. Our view was pragmatic and conservative with respect to human operations, but vast beyond any scenario since von Braun's in its view of a future in which the entire solar system is opened to the service of humanity.

<b>Report</b>	<b>Excerpt</b>	<b>Issue</b>
<p><i>Statement by James C. Hagerty, White House, July 29, 1955</i></p>	<p>...the President has approved plans by this country for going ahead with launching of small unmanned earth-circling satellites as part of the United States participation in the International Geophysical Year which takes place between July 1957 and December 1958. This program will for the first time in history enable scientists throughout the world to make sustained observations in the regions beyond the earth's atmosphere. The President expressed personal gratification that the American program will provide scientists of all nations this important and unique opportunity for the advancement of science.</p>	<ul style="list-style-type: none"> <li>• Foreign policy</li> </ul>
<p><i>A Statement by the President and the Introduction to Outer Space, President's Science Advisory Committee, 26 March 1958</i></p>	<p>It is useful to distinguish among four factors which give importance, urgency, and inevitability to the advancement of space technology. The first of these factors is the compelling urge of man to explore and discover, the thrust of curiosity that leads men to try to go where no one has gone before...Second, there is the defense objective for the development of space technology...Third, there is the factor of national prestige...and create added confidence in our scientific, technological, industrial, and military strength...Fourth, space technology affords new opportunities for scientific observation and experimentation...</p> <p>But if we learned one lesson, it is that research and exploration have a remarkable way of paying off – quite apart from the fact that they demonstrate that man is alive and insatiably curious. And we all feel richer for knowing what explorers and scientists have learned about the universe in which we live.</p>	<ul style="list-style-type: none"> <li>• Existential</li> <li>• National security</li> <li>• Economic</li> <li>• Scientific</li> <li>• Intangible payoff</li> </ul>
<p><i>Report of the Ad Hoc Panel on Man-in-Space, President's Science Advisory Committee, 16 December 1960</i></p>	<p>We have been plunged into a race for the conquest of outer space. As a reason for this undertaking some look to the new and exciting scientific discoveries which are certain to be made. Others feel the challenge to transport man beyond frontiers he scarcely dared dream about until now. But at present the most impelling reason for our effort has been the international political situation which demands that we demonstrate our technological capabilities if we are to maintain our position of leadership. For all of these reasons we have embarked on a complex and costly adventure.</p> <p>Certainly among the major reasons for attending the manned exploration of space are emotional compulsions and national aspirations. These are not subjects which can be discussed on technical grounds. However, it can be asked whether the presence of a man adds to the variety or quality of the observations which can be made from unmanned vehicles, in short whether there is a scientific justification to include man in space vehicles. It is said that an astronaut's judgment, decision-making capability and resourcefulness can increase the probability of successful accomplishment of a space mission and expand the variety and quality of observations performed. On the</p>	<ul style="list-style-type: none"> <li>• National security current driver</li> <li>• Existential main driver for future</li> <li>• Human space flight not justified on scientific grounds – unmanned missions better suited for science return</li> </ul>

	<p>other hand, man's senses can be satisfactorily duplicated at remote locations by the use of available instrumentation and advances in the state of the art are continually increasing the ability to transmit information back to a central receiving point. With such an instrumented system, the decisions requiring man's mental capabilities can be performed by many men in a normal environment and with the aid of elaborate computational aids, where necessary. The following considerations seem pertinent:</p> <ul style="list-style-type: none"> <li>• Information from manned flights is a necessary prerequisite to manned flight.</li> <li>• The degree of reliability that can be accepted in the entire mechanism is very much less for unmanned than for manned vehicles. As the systems become more complex this may make a decisive difference in what one dares to undertake at any given time.</li> <li>• From a purely scientific point of view it should be noted that unmanned flights to a given objective can be undertaken much earlier. Hence repeated observations, changes of objectives and the learning by experience are feasible.</li> </ul> <p>It seems, therefore, to us at the present time that man-in-space cannot be justified on purely scientific grounds, although more thought may show that there are situations for which this is not true. On the other hand, it may be argued that much of the motivation and drive for the scientific exploration of space is derived from the dream of man's getting into space himself.</p>	
<p><i>Recommendations for Our National Space Program: Changes, Policies, Goals</i>, letter from James Webb, NASA Administrator to Vice President Johnson, 8 May 1961</p>	<p>Projects in space may be undertaken for any one of four principal reasons. They may be aimed at gaining scientific knowledge. Some, in the future, will be of commercial or chiefly civilian value. Several current programs are of potential military value for functions such as reconnaissance and early warning. Finally, some space projects may be undertaken chiefly for reasons of national prestige. The U.S. is not behind in the first three categories. Scientifically and militarily we are ahead. We consider our potential in the commercial / civilian area to be superior. The Soviets lead in space spectacles which bestow great prestige...This nation needs to make a positive decision to pursue space projects aimed at enhancing national prestige.</p>	<ul style="list-style-type: none"> <li>• Need space projects aimed at enhancing national prestige</li> </ul>
<p>Letter from Lyndon B. Johnson to the President, 13 May 1963</p>	<p>The space program is not solely a question of prestige, of advancing scientific knowledge, of economic benefit or of military development, although all of these factors are involved. Basically, a much more fundamental issue is at stake – whether a dimension that can well dominate history for the next few centuries will be devoted to the social system of freedom or controlled by the social system of communism. The United States has made clear that it does not seek to “dominate” space and, in fact, has led the way in securing international cooperation in this field. But we cannot close our eyes as to what would happen if we permitted totalitarian systems to dominate the environment</p>	<ul style="list-style-type: none"> <li>• National security – “The future of society is at stake”</li> </ul>

	<p>of the earth itself. For this reason our space program has an overriding urgency that cannot be calculated solely in terms of industrial, scientific, or military development. The future of society is at stake.</p>	
<p><i>Future Goals of the Space Science Program</i>, National Academy of Sciences (Space Science Board), 11 August 1964</p>	<p>The establishment of a goal to focus attention and energies on a readily identifiable target is desirable just as President Kennedy's designation of a manned lunar landing in this decade was...The Board would designate as this goal the exploration of planets with particular emphasis on Mars leading toward eventual manned exploration.</p> <p>Alternatives to the Mars and planetary exploration goal, (i) extensive manned lunar exploration including lunar base construction, and (ii) major manned orbiting space station and laboratory program, are rejected as the primary goal because they have far less scientific significance though both have sufficient merit to warrant smaller programs.</p>	<ul style="list-style-type: none"> <li>• Recommend eventual manned exploration of Mars</li> </ul>
<p><i>The Post-Apollo Space Program: Directions for the Future</i>, Space Task Group, NASA, September 1969</p>	<p>We see a major role for this Nation in proceeding from the initial opening of this frontier to its exploitation for the benefit of mankind, and ultimately to the opening of new regions of space to access by man... We have concluded that a forward-looking space program for the future for this Nation should include continuation of manned space flight activity. Space will continue to provide new challenges to satisfy the innate desire of man to explore the limits of his reach.</p> <p>Therefore, we recommend - That this Nation accept the basic goal of a balanced manned and unmanned space program conducted for the benefit of all mankind... As a focus for the development of new capability, we recommend the United States accept the long-range option or goal of manned planetary exploration with a manned Mars mission before the end of this century as the first target.</p>	<ul style="list-style-type: none"> <li>• Existential benefits</li> <li>• Recommend a manned mission to Mars</li> </ul>
<p>Statement by President Nixon, 5 January 1972</p>	<p>I have decided today that the United States should proceed at once with the development of an entirely new type of space transportation system designed to help transform the space frontier of the 1970's into familiar territory, easily accessible for human endeavor into the 1980's and '90s...</p> <p>However, all these possibilities, and countless others with direct and dramatic bearing on human betterment, can never be more than fractionally realized so long as every single trip from Earth to orbit remains a matter of special effort and staggering expense. This is why commitment to the Space Shuttle program is the right step for America to take, in moving out from our present beach-head in the sky to achieve a real working presence in space – because the Space Shuttle will give us routine access to space by sharply reducing costs in dollars and preparation time.... The continued pre-eminence of America and American industry in the aerospace field will be an important part of the Shuttle's 'payload'.</p>	<ul style="list-style-type: none"> <li>• Shuttle justified on economic grounds</li> <li>• Maintain U.S. industry preeminence</li> <li>• Low cost / easy access will transform space for human endeavor</li> </ul>
<p><i>Report of the</i></p>	<p>...the United States civil space program...has significant actual and potential impact on U.S. policy...The major</p>	<ul style="list-style-type: none"> <li>• Significant benefit from civil space</li> </ul>



<p><i>Transition Team, NASA, December 19, 1980</i></p>	<p>factors are as follows:</p> <ul style="list-style-type: none"> <li>• National Pride and Prestige</li> <li>• Economics and Space Technology</li> <li>• Scientific Knowledge and Inspiration for the Nation’s Youth</li> <li>• Relation to U.S. Foreign Policy</li> </ul> <p>NASA represents an important investment by the United States in aeronautics and space. The agency’s programs have provided, and continue to offer, benefits in science and technology, in national pride and prestige, in foreign policy, and in economic gain. However, in recent years the agency has been underfunded, without purpose or direction. The new administration finds NASA at a crossroads, with possible moves toward either retrenchment or growth.</p> <p>It is recommended...That the purpose and direction of the U.S. space effort be defined, and that a commitment to a viable space program be articulated by the President at a timely opportunity...(N.B. A viable space program could be smaller than, equal to, or larger than the present one, but it must have purpose and direction.)</p>	<p>program – outlines factors</p> <ul style="list-style-type: none"> <li>• Recommends President articulate new purpose and direction for the space program</li> <li>• Notes that a viable new purpose need not cost more money</li> </ul>
<p><i>State of the Union Address, President Reagan, 25 January 1984</i></p>	<p>Our progress in space – taking giant steps for all mankind – is a tribute to American teamwork and excellence. Our finest minds in government, industry, and academia have all pulled together. And we can be proud to say: We are first; we are the best; and we are so because we’re free. America has always been greatest when we dared to be great. We can reach for greatness again. We can follow our dreams to distant stars, living and working in space for peaceful, economic, and scientific gain. Tonight, I am directing NASA to develop a permanently manned space station and to do it within a decade. A space station will permit quantum leaps in our research in science, communications, in metals, and in lifesaving medicines which could be manufactured only in space. We want our friends to help us meet these challenges and share in their benefits. NASA will invite other countries to participate so we can strengthen peace, build prosperity, and expand freedom for all who share our goals.</p>	<ul style="list-style-type: none"> <li>• Space Station announced and justified on science, communications, manufacturing, medicine – international component highlighted</li> </ul>
<p><i>Pioneering the Space Frontier – An Exciting Vision of our Next Fifty Years in Space, Report of the National Commission on Space (“Paine Report”), May 1986</i></p>	<p>To lead the exploration and development of the space frontier, advancing science, technology, and enterprise, and building institutions and systems that make accessible vast new resources and support human settlements beyond Earth orbit, from the highlands of the Moon to the plains of Mars...</p> <p>Now space technology has freed humankind to move outward from Earth as a species destined to expand to other worlds...</p> <p>Historically, wealth has been created when the power of the human intellect combined abundant energy with rich material resources. Now America can create new wealth on the space frontier to benefit entire human community</p>	<ul style="list-style-type: none"> <li>• Pioneering spirit</li> <li>• Potential for creating new wealth</li> <li>• Explore, prospect, and settle the solar system</li> </ul>

	<p>by combining the energy of the Sun with materials left in space during the formation of the Solar System...</p> <p>With America's pioneer heritage, technological preeminence, and economic strength, it is fitting that we should lead the people of this planet into space. Our leadership role should challenge the vision, talents, and energies of young and old alike, and inspire other nations to contribute their best talents to expand humanity's future...</p> <p>The National Commission on Space proposes a future-oriented civilian space agenda with three mutually-supportive thrusts:</p> <ul style="list-style-type: none"> <li>• Advancing our understanding of our Planet, our Solar System, and the Universe;</li> <li>• Exploring, prospecting, and settling the Solar System; and</li> <li>• Stimulating space enterprises for the direct benefit of the people on Earth.</li> </ul>	
<p><i>Leadership and America's Future in Space</i>, NASA (Sally Ride Report, August 1987)</p>	<p>Two fundamental, potentially inconsistent views have emerged. Many people believe that NASA should adopt a major, visionary goal. They argue that this would galvanize support, focus NASA programs, and generate excitement. Many others believe that NASA is already overcommitted in the 1990s; they argue that the space agency will be struggling to operate the Space Shuttle and build the Space Station, and could not handle another major program...</p> <p>Leadership in space does not require that the U.S. be preeminent in all areas of space enterprise. The widening range of space activities and the increasing number of spacefaring nations make it virtually impossible for any country to dominate in this way. It is, therefore, essential for America to move promptly to determine its priorities and to pursue a strategy which would restore and sustain its leadership in the areas deemed important...</p> <p>There is no doubt that exploring, prospecting, and settling Mars should be the ultimate objective of human exploration. But America should not rush headlong toward Mars; we should adopt a strategy to continue an orderly expansion outward from Earth.</p>	<ul style="list-style-type: none"> <li>• Exploring, prospecting, and settling Mars ultimate objective</li> <li>• Adapt a strategy of orderly expansion</li> </ul>
<p><i>Toward a New Era in Space: Realigning Policies to New Realities</i>, ("Stever Commission") National Academy of Sciences, 1988</p>	<p>Partnerships with other nations and organizations can serve to demonstrate leadership, to forge productive relationships, and to broaden the range of available opportunities, but only if international commitments are made carefully and honored fully.</p> <p>The challenge of space can motivate many young Americans to excel in engineering and science and can draw high-quality foreign researchers to U.S. universities and laboratories.</p>	<ul style="list-style-type: none"> <li>• Foreign policy</li> <li>• Attract high tech researchers from around the world</li> <li>• Manned program should not be carried out at expense of other civilian space programs</li> <li>• Returns of manned program are largely</li> </ul>

	<p>It is crucial, however, that the manned program be so designed that it is not carried out at the expense of other important civilian space activities in technology development, science, and applications and that it be paced to be affordable on a sustained basis.</p> <p>The appropriate long-term reason for putting humans into space remains an area of continuing controversy. Given the costs of a manned space flight program, and its role as the most visible segment of the U.S. space effort, the committee believes that the next Administration should address the rationale for a continued manned program directly, recognizing that there are significant disagreements among thoughtful individuals on this question...particularly because a manned program would require a large commitment of U.S. scientific and technological resources, substantial government funding in quest of returns that are largely intangible, and political support that may not be forthcoming.</p> <p>The ultimate decision to undertake further voyages of human exploration and to begin the process of expanding human activities into the solar system must be based on nontechnical factors, and this is appropriately the province of the political process.</p>	<p>intangible</p> <ul style="list-style-type: none"> <li>• Manned program not justified by science – must be based upon nontechnical grounds</li> </ul>
<p>Remarks on the 20<sup>th</sup> Anniversary of the Apollo 11 Moon Landing – Pres. George Bush, July 20, 1989</p>	<p>And there's little question that, in the 21<sup>st</sup> century, humans will again leave their home planet for voyages of discovery and exploration. What was once improbable is now inevitable. The time has come to look beyond brief encounters. We must commit ourselves anew to a sustained program of manned exploration of the solar system and, yes, the permanent settlement of space. We must commit ourselves to a future where Americans and citizens of all nations will live and work in space...</p> <p>And our goal is nothing less than to establish the United States as the preeminent spacefaring nation...</p> <p>In 1961 it took a crisis – the space race – to speed things up. Today we don't have a crisis; we have an opportunity. To seize this opportunity, I'm not proposing a 10-year plan like Apollo; I'm proposing a long-range, continuing commitment...And next, for the new century: Back to the Moon; back to the future. And this time, back to stay. And then a journey into tomorrow, a journey to another planet: a manned mission to Mars. Each mission should and will lay the groundwork for the next.</p>	<ul style="list-style-type: none"> <li>• Announcing Space Exploration Initiative</li> <li>• Back to the Moon and stay</li> <li>• Manned mission to Mars</li> </ul>
<p><i>Report of the Advisory Committee on the Future of the U.S. Space Program, "Augustine Committee", December 1990</i></p>	<p>...the civil space program and its principal agent, the National Aeronautics and Space Administration, are today the subject of considerable criticism. The source of this criticism ranges from concern over technical capability to the complexity of major space projects; from the ability to estimate and control costs to the growth of bureaucracy; and from a perceived lack of an overall space plan to an alleged institutional resistance to new ideas and change...</p>	<ul style="list-style-type: none"> <li>• Lack of goal for the civil space program – though no two individuals agree what it should be</li> <li>• Most important space benefit is intangible</li> <li>• Space science should</li> </ul>

	<p>The first of these [concerns] is the lack of a national consensus as to what would be the goals of the civil space program...It seems that most Americans do support a viable space program for the nation – but no two individuals seem able to agree upon what that space program should be...</p> <p>Yet perhaps the most important space benefit of all is intangible – the uplifting of spirits and human pride in response to truly great accomplishments...Such accomplishments have served to unite our nation, hold our attention, and inspire us all, particularly our youth, as few other events have done in the history of our nation or even the world...</p> <p>It is our belief that the space science program warrants highest priority for funding. It, in our judgment, ranks above space station, aerospace planes, manned missions to the planets, and many other major pursuits which often receive greater visibility...</p> <p>But if there is to be a manned space undertaking, what should it be? ...In this regard, we share the view of the President that the long term magnet for the manned space program is the planet Mars... It needs to be stated straightforwardly that such an undertaking probably must be justified largely on the basis of intangibles – the desire to explore, to learn about one’s surroundings, to challenge the unknown and to find out what is to be found. Surely such an endeavor must be preceded by further unmanned visits, and by taking certain important steps along the way, including returning for extended periods to the Moon...</p> <p>We believe that a program with the ultimate, long term objective of human exploration of Mars should be tailored to respond to the availability of funding, rather than to adhering to a rigid schedule.</p>	<p>be more important than manned missions</p> <ul style="list-style-type: none"> <li>• Ultimate manned objective should be Mars – justified primarily by the intangible benefits</li> </ul>
<p><i>State Department Helps US Space Program Meet Future Challenges, State Dept. Dispatch, 24 December 1990 (primarily quotes from Reginald Bartholomew, Under Secretary for International Security Affairs)</i></p>	<p>The space program plays a positive role in enhancing American influence and prestige, especially with our Pacific and European allies...It also serves to demonstrate America’s continuing commitment to technological, economic, and political leadership.</p> <p>The space program is an excellent vehicle for cooperation with longstanding allies, such as Western Europe and Japan, and for the development of new ties to Eastern Europe and the Soviet Union.</p> <p>Space cooperation with the Soviet Union ... can play a positive foreign policy role by contributing to better East-West relations...</p> <p>If the space station succeeds as a cooperative venture, we can look forward to broader and deeper cooperation with other countries on the ambitious space missions that surely will take place beyond the year 2000...</p>	<ul style="list-style-type: none"> <li>• Foreign policy</li> </ul>

<p><i>America at the Threshold: America's Space Exploration Initiative</i>, Report of the Synthesis Group (Stafford), May 1991</p>	<p>America now stands at a threshold. Our national space program is undergoing intense scrutiny. Many ask questions similar to those voiced in the heyday of Apollo - what is the point of large space ventures? How can we afford the great expenditures? What is the function of a human presence in space? By offering direction and purpose, the Space Exploration Initiative will rejuvenate our sense of challenge, of competitiveness, and of national pride. The Space Exploration Initiative is a positive, social endeavor. In a world of uncertainty, it has the capacity to inspire people, to stimulate them and to cause them to reach deep inside the find the very best they have to offer...Great nations have always explored and profited from new frontiers and territories. . .As Americans, we must ask ourselves what our role will be in the human exploration of the Solar System: to lead, follow, or step aside?</p> <p>National Space Visions:</p> <ul style="list-style-type: none"> <li>• Increase our knowledge of our solar system and beyond</li> <li>• Rejuvenate interest in science and engineering</li> <li>• Refocus U.S. position in world leadership (from military to economic and scientific)</li> <li>• Develop technology with terrestrial application</li> <li>• Facilitate further space exploration and commercialization</li> <li>• Boost the U.S. economy</li> </ul>	<ul style="list-style-type: none"> <li>• SEI based upon existential benefit</li> <li>• Provides multiple "visions" for SEI</li> </ul>
<p><i>Exploring the Moon and Mars: Choices for the Nation</i>, Office of Technology Assessment, July 1991</p>	<p>Politically and technologically, the United States could gain from leading an international cooperative program to advance in space exploration. But for such a space program we will have to learn how to pursue <i>shared</i> goals, which would give the United States less latitude in setting the program objectives...</p> <p>Some proponents of vigorous exploration missions to Mars base their argument on a perception that sending humans to Mars would satisfy a basic human desire to explore, to push beyond known boundaries, to satisfy our curiosity. These arguments appeal to the imagination and are particularly strong in the United States, where the westward expansion of the last century provides ready metaphors... However, as some historians and folklorists have noted, the use of these metaphors, stems from an uncritical view of historical events, and often fail when subjected to analytical scrutiny...</p> <p>Nevertheless, whether because of the inherent danger and challenge, or because of an age-old need to create new heroes, human spaceflight captures our interest and stimulates our imagination. For some, it provides inspiration and hope for the future. Some are drawn by the prospect of exploring, and eventually settling new worlds...</p> <p>However, it is not clear that investments in the</p>	<ul style="list-style-type: none"> <li>• Cautions on international collaborations</li> <li>• Cautions that westward expansion metaphors may not be valid when applied to human spaceflight</li> <li>• Acknowledges human space flight has intangible benefits</li> <li>• Uncertain if manned spaceflight would contribute to U.S. competitiveness</li> </ul>

	<p>technologies to support human exploration, which must be supported primarily by public funds, would necessarily contribute to the U.S. competitive position in advanced technologies...</p> <p>A survey of the literature on human exploration of the solar system reveals that proponents of expanding the presence of humans beyond Earth orbit have generally relied on the sum of several arguments to support their case.</p>	
<p><i>Scientific Prerequisites for The Human Exploration of Space</i>, National Academy of Sciences, 1993</p>	<p>For the past 20 years, the future directions of the U.S. program of human spaceflight have been a matter of discussion, debate, and controversy within and among the government, industry, the scientific community and the public. Many advocates of human space exploration now agree that the next steps in piloted flight after the Space Station Freedom involve returning to the Moon and, eventually, voyaging to Mars. The space science community, however, is agreed that there is no a priori scientific requirement for human exploration of the Moon and Mars...</p> <p>Nor is a Moon/Mars program driven by any demands for scientific discovery...</p> <p>A rational approach is to use robots until we can define objectives for which humans are essential. We could also conduct experiments to determine the contribution to field exploration that is gained by having humans in situ. No compelling case has yet been made that human exploration is necessary to accomplish the goals of lunar and martian science or, for that matter, any other goal except the "human imperative" to explore. The report of the Synthesis Group gives five visions other than science. However laudable these other visions are, there has been no cost-benefit analysis to show that human exploration is the best way of achieving them...</p> <p>Given that a program of human exploration is undertaken primarily for reasons other than scientific research, humans can make significant contributions to scientific activities through their ability to conduct scientific field work and by using their capabilities to emplace and attend scientific facilities on planetary bodies.</p>	<ul style="list-style-type: none"> <li>• Space science community in agreement that there is no a priori scientific requirement for human exploration of the Moon and Mars</li> <li>• Rational approach is to use robots until objectives for humans become essential</li> <li>• No compelling case has yet been made that human exploration is necessary to accomplish the goals of lunar and martian science</li> <li>• No cost-benefit analysis done on visions for human space flight</li> <li>• If human spaceflight continues, then humans can enhance science return</li> </ul>
<p><i>National Space Policy</i>, 1996</p>	<p>The goals of the U.S. space program are to:</p> <ul style="list-style-type: none"> <li>(a) Enhance knowledge of the Earth, the solar system and the universe through human and robotic exploration;</li> <li>(b) Strengthen and maintain the national security of the United States;</li> <li>(c) Enhance the economic competitiveness, and scientific and technical capabilities of the United States;</li> <li>(d) Encourage State, local and private sector investments in, and use of, space technologies;</li> <li>(e) Promote international cooperation to further U.S. domestic, national security, and foreign policies.</li> </ul>	<ul style="list-style-type: none"> <li>• The ISS will support future decisions on the feasibility and desirability of conducting further human exploration activities</li> </ul>

	<p>NASA, in coordination with other departments and agencies as appropriate, will focus its research and development efforts in: space science to enhance knowledge of the solar system, the universe, and fundamental natural and physical sciences; Earth observation to better understand global change and the effect of natural and human influences on the environment; human space flight to conduct scientific, commercial, and exploration activities; and space technologies and applications to develop new technologies in support of U.S. Government needs and our economic competitiveness.</p> <p>To enable these activities, NASA will:</p> <p>(a) Develop and operate the International Space Station to support activities requiring the unique attributes of humans in space and establish a permanent human presence in Earth orbit. The International Space Station will support future decisions on the feasibility and desirability of conducting further human exploration activities.</p>	
<p><i>Final Report on the Commission on the Future of the United States Aerospace Industry</i>, “Walker Commission”, 2002</p>	<p>Recommendation #3: The Commission recommends that the United States create a space imperative. The Department of Defense, the National Aeronautics and Space Administration and industry must partner in innovative aerospace technologies, especially in the areas of propulsion and power. These innovations will enhance our national security, provide major spin-offs to our economy, accelerate the exploration of the near and distant universe with both human and robotic missions, and open up new opportunities for public space travel and commercial space endeavors in the 21<sup>st</sup> century.</p>	<ul style="list-style-type: none"> <li>• Recommends national space imperative</li> </ul>
<p><i>Joint Statement on U.S. – Russian Cooperation in Space</i>, by President George W. Bush and President Vladimir Putin, 1 June 2003</p>	<p>The loss of the Space Shuttle Columbia has underscored the historic role of the United States and Russia as partners in space exploration, who have persevered despite tragedy and adversity. During this challenging time, our partnership has deepened and the International Space Station (ISS) program remains strong. The extraordinary efforts of our countries continue. The United States is committed to safely returning the Space Shuttle to flight, and the Russian Federation is committed to meeting the ISS crew transport and logistics resupply requirements necessary to maintain our joint American astronaut and Russian cosmonaut teams on board the ISS until the Space Shuttle returns to flight.</p> <p>We confirm our mutual aspiration to ensure the continued assembly and viability of the International Space Station as a world-class research facility, relying on our unprecedented experience of bilateral and multilateral interaction in space. We reaffirm our commitment to the mission of human space flight and are prepared to take energetic steps to enhance our cooperation in the application of space technology and techniques.</p>	<ul style="list-style-type: none"> <li>• Aspiration to continue assembly and viability of ISS</li> <li>• Foreign policy</li> </ul>