

**AMERICAN SPACE PROGRAMME AND AUGUSTINE  
REPORT : AN APPRAISAL**

*Dissertation submitted to the Jawaharlal Nehru University  
in partial fulfilment of the requirements  
for the award of the Degree of  
MASTER OF PHILOSOPHY*

**DEEPAK KANAN**

**CENTRE FOR AMERICAN AND WEST EUROPEAN STUDIES  
SCHOOL OF INTERNATIONAL STUDIES  
JAWAHARLAL NEHRU UNIVERSITY  
NEW DELHI-110067,  
INDIA  
1994**



जवाहरलाल नेहरु विश्वविद्यालय  
JAWAHARLAL NEHRU UNIVERSITY  
NEW DELHI - 110067

CENTRE FOR AMERICAN & WEST EUROPEAN STUDIES  
SCHOOL OF INTERNATIONAL STUDIES

21st July, 1994

CERTIFICATE

This is to certify that this dissertation entitled "AMERICAN SPACE PROGRAMME AND AUGUSTINE REPORT: AN APPRAISAL", submitted by Deepak Kanan in partial fulfilment of the requirements for the award of the degree of Master of Philosophy of this University, is his own work and has not been previously submitted for any degree of this or any other University.

We recommend that this dissertation may be placed before the examiners for evaluation.

Dr. CHRISTOPHER S. RAJ  
Supervisor

Dr. B. VIVEKANANDAN  
Chairperson

## **ACKNOWLEDGEMENTS**

Few human efforts succeed without the cooperation of fellow human beings. And so in this exercise, I am indebted to many. I feel, it is high time to appreciate and acknowledge them.

First of all, I, in all my sincerity, would like to record my sense of gratitude towards my supervisor Dr. Christopher S. Raj. His affectionate and affable guidance and constructive criticisms have gone long way, in writing and shaping my dissertation. Undoubtedly, his keen insight on the subject helped me to explore many difficult ideas during my research work. Above all, in the process of learning, his constant counselling has saved me from committing many errors, which otherwise, I might have committed. I am again especially thankful to him for all that he made many important suggestions during my work.

I also owe my thanks to all the library staff of Jawaharlal Nehru University, New Delhi, the American Center Library, New Delhi and Parliament Library, New Delhi. All of them gratefully helped me in collecting the valuable

research materials on my topic.

I am also thankful to all those who helped me whenever I needed them most. Vinoo, Bauaji, Chunnu, Pakia, Sanjiv Ranjan, Sanjeev Shukla, Sanjeev Kumar, Dogra, Navneet, Amitabh, J.D., Manoj, Buchi... they all deserve special mention.

And finally, I also thank Mr. Tiwari and Mr. Om Prakash, who carefully and with all sincerity typed this dissertation and without whom this work would not have been complete.

  
DEEPAK KANAN

## CONTENTS

### Pages

#### ACKNOWLEDGEMENTS

CHAPTER 1	- INTRODUCTION	1 - 11
CHAPTER 2	- AMERICAN SPACE PROGRAMME: IN RETROSPECT	12 - 35
CHAPTER 3	- AUGUSTINE REPORT: FINDINGS & RECOMMENDATIONS	36 - 68
CHAPTER 4	- REFLECTIONS ON THE REPORT	69 - 91
CHAPTER 5	- CONCLUSION	92 - 100
ANNEXURE I	CHRONOLOGY	101 - 103
ANNEXURE II	LIST OF WITNESSES	104 - 110
BIBLIOGRAPHY		111 - 118

## CHAPTER 1

### INTRODUCTION

"Earlier in this century, American forests gave way to the heavens as our new frontier, and like our forebears, we Americans took to the skies, and later to space with an optimism, energy and ingenuity that Turner<sup>1</sup> would have recognized from the earlier generations he studied".

Donald R. Beall<sup>2</sup>

With this statement one is reminded of the manifest psychology of the Americans, who firmly believe that to live without a frontier is not only un-American, it is inhuman.<sup>3</sup> Every generation has had its world to explore. Human beings have never possessed a technology for travel that they have refused to use. First there was the world beyond the tribal

- 
1. Frederick Jackson Turner first set forth his ideas on the frontier's role in shaping American democracy in "The significance of the frontier in American History", an address delivered at an 1893 meeting of the American Historical Association in Chicago.
  2. U.S.A. Today, 9 June 1993.
  3. Daniel S. Goldin, "The Light of a New Age", Vital Speeches of the Day, 1 October, 1992, Vol.LVIII, No.2, pp.741-42.

village, then the continent, then the oceans, then the North Pole and South Pole. Then into the air through the sound barrier, and on to the Moon. This theory of expansion of frontier has always compelled America to go for exploring new frontiers in order to prove its technological sophistication, which further got impetus during the cold war era by the Soviet Union's taking cue in this unattended field. Since then "the deepest problem", for Amitai Etzioni, "arising from this endeavor has not been social, or political or administrative, but spiritual",<sup>4</sup> since it was the child of the cold war requirements.

But the large scale changes sweeping across the world in the last few years, resulting in the collapse of Soviet Union and her Communist allies in the Eastern Europe have in a sense replaced the validity of the concept of "Mutual Assured Destruction" with the concept of "Mutual Assured

---

4. A. Etzioni, Moon Doggle: Domestic and International Implications of the Space Race, (Garden City, New York: Doubleday, 1964).

Protection"<sup>5</sup> as well as "Mutual Cooperation". This unique development has substantial effect on the U.S. led military alliances and its subsequent policies. The effect of this catastrophic change has been felt by every constituent unit of the world system, in terms of its external as well as internal behaviour, as we find that in the final analysis its every move was guided by the "Soviet Factor".<sup>6</sup>

So has happened in the case of American space programme, which was rather hurriedly formulated some three and half decades ago on the heels of the successful launch of the Soviet Sputnik. Since then, almost a dozen humans have been placed on the Moon and safely returned to Earth, seven of the eight planets of the solar system have been viewed at close range, including the soft landing of two robot spacecrafts on Mars, and a variety of significant astronomical and other scientific observations have been accomplished. Closer to Earth, a network of communication satellites has

---

5. R. Jastraw, & Max M. Kampelman, "Why We Still Need SDI", Commentary, Washington, November 1992, Vol.94, No.5, p.23.

6. Ibid., 5, p.26.



been established, weather and ocean conditions are now monitored and reported as they occur, and the Earth's surface is observed from space to study natural resources and detect sources of pollution.

Now, with the Clinton administration's recent announcement in early April that NASA would collaborate with Russia in the Space Station Project,<sup>7</sup> the competitive spirit has been totally replaced by the co-operative spirit. Although numerous technical and political uncertainties surround such a proposition, this step has the potential to further reduce the space-station's cost through the use of Russian hardware like the Mir Space Station and the 20-story Energia Rocket.<sup>8</sup>

U.S.-Russian co-operation on the station could also

- 
7. Among the major statements are: a position paper released by the Clinton campaign in the summer of 1992 (Summer Policy Statement); chapters in the Clinton-Gore version of putting people First, and a speech by Senator Gore at NASA's Goddard Space Flight Centre on 19 October 1992 (the "Goddard Speech").
  8. Marcia S. Smith, "Prospects for the Post-Soviet Space Programme", (Washington) 1992, Congressional Research Service Report: The Library of Congress, 92-123, Science Policy Research Division, p.6.

represent a paradigm shift<sup>9</sup> in the way the world conducts its space activities, with the two largest space faring nations finally putting aside political differences to pool their resources.<sup>10</sup>

Despite the plans to redesign<sup>11</sup> or the new partnership with Russia, some on Capitol Hill say the station will still be unaffordable, and they question the benefits of a permanent U.S. presence in space (on 23 June, 1993 the House came within one vote of canceling the station program). A greater appreciation of the dangers of piloted space flight in the wake of the 1986 Challenger accident has compounded doubts<sup>12</sup> about NASA's future.

- 
9. David Callahan, "Space programme for the future", Technology Review, New York, August-September 1993, p.60.
  10. P. Mann, "U.S.-Russia Draft Historic Space Pact (Unified Space Station based on Freedom & Mir)", Aviation Week and Space Technology, New York, 6 September, 1993, vol.139, pp. 22-3.
  11. P. Mann, "Station Redesign Was A Good Decision", Aviation Week & Space Technology, New York, 28 June, 1993, vol.138, p.66.
  12. P. Mann, "Report of the Advisory Committee on the Future of the U.S. Space Programm", December 1990, p.5.

However, despite these problems, there remains a determined commitment in many quarters to continuing a high profile piloted program.<sup>13</sup> At the grass-roots level, legions of "space-buffs" believe fervently in America's destiny to explore space. In Washington, space funding is vigorously promoted by the powerful aerospace lobby, legislators, whose constituents benefit from space spending, and NASA itself. Despite recent efforts by NASA to close its credibility and relevance gap through various cost-saving measures,<sup>14</sup> it may no longer be possible to avoid hard choices among major space policy priorities.

Having visualized recent trends in American space programme, two distinct paths are clearly discernible.<sup>15</sup>

Under one, piloted space exploration in close co-

- 
13. J. Zuckman, "Space Station Is Safe For Now, but Funding Fight goes On", Congressional Quarterly Weekly Report, Washington D.C., vol.50:2177, 25 July, 1992.
  14. J.R. Asker, "NASA Details New Station Plans (Alpha Station)", Aviation Week & Space Technology, New York, 23 August, 1993, vol.139, pp.24-5.
  15. David, Callahan, "Space Programme For the Future", Technology Review, New York, August-September, 1993, p.60.

operation with Russia would reign as NASA's top priority and the space station would serve as the flagship of this effort. But according to General Accounting Office (GAO) analyses, pursuing this vision - even assuming significant savings from the redesign of the space station and a partnership with Russia - would probably drain funds from a range of important space science projects.

Under the alternative path, NASA would engage in a far-reaching retrenchment and curtail its piloted space-exploration plans. While few analysts have spelled out what the U.S. space program might look like without a major piloted component, several changes would seem inevitable. The space station would be cancelled, shuttle flights would be scaled back, and NASA would defer indefinitely the long-standing dream of placing human beings permanently in space and sending them to Mars and beyond. In the years ahead, NASA would continue its popular space science programmes while giving new prominence to programmes for studying global environment problems and to search efforts in tech-

nology with commercial applications. Instead of selling itself as the agency that is spearheading human kinds exploration of the heavens, NASA would play up its role in improving life on planet earth and enhancing U.S. industrial competitiveness.

Given the policy directions announced by Clinton administration for "smaller and cheaper space station",<sup>16</sup> NASA is bound to face the funding crunch, which will ultimately decide the future of American space programme. Present dissertation is an attempt to find out the direction in which American civil space programme is going against the background of two major developments such as financial crunch in the domestic sphere and collapse of the Soviet Union, the only space faring nation apart from the U.S.A., in the international sphere.

Moreover, it would be hard to name a year worse than

---

16. P. Mann, "Clinton backs smaller, cheaper space station", Aviation Week & Space Technology, New York, 21 June 1993, vol.138, pp.20-21.

1993 for big science projects<sup>17</sup> - Congress killed the superconducting super collider and the space station squeaked through the House by just one vote. This year, space station advocates won't rest easier. They face changing dynamics of congressional support, new appropriations pressures and the burden of being the last remaining big ticket item in the budget. This crisis ridden situation further requires thoughtful scrutiny of the future of U.S. civil space programme, and so a serious attempt has been made to thoroughly investigate the causes of the problems faced by the U.S. civil space programme, recommendations suggested by the U.S. Advisory Committee on the future of the U.S. space program popularly known as the Augustine Report, Congressional opinions as well as the public opinions generated after the Report was tabled and then finally the analysis and conclusion in the last chapter.

Following this, the next Chapter II will deal with the

---

17. J. Ponessa, "Space Stations Fate Hangs on NASA Budget Debate", Congressional Quarterly Weekly Report, Washington D.C., 7 May, 1994, pp.1113-4.

historical account of the U.S. civil space programme, leading to such unprecedented crisis which ultimately resulted in the constitution of the U.S. Advisory Committee on the future of the U.S. Space programme (Augustine Report).

Chapter III deals with the findings and recommendations of the Augustine Report, grouping of all the recommendations in subheadings using certain common denominators.

Chapter IV deals with the congressional view on the Report in which the opinions of the Senators and Representatives inside the House of the Congress as well as outside will be discussed in brief.

Same chapter allows the discussion to bring out of the legislative barracks and brings it before the general public, American academic, scientific, diplomatic and media circles in which The resultant opinions and comments have made one thing very clear that all were expecting a new direction to be given to the multi-billion dollar sucking U.S. civil space programme.

The last chapter contains some concluding observations that having been arrived at through the expressed perceptions and assumptions of American Congressmen, Senators, Policy elite and academics, on the US space programme and the Augustine Report.



## CHAPTER 2

### AMERICAN SPACE PROGRAMME: IN RETROSPECT

#### 2.1 Origin

The United States launched its space programme on a modest scale in the mid-1950's as part of its contribution to the International Geophysical Year (see Annexure I). President Dwight D. Eisenhower announced on 29th July, 1955, that the country would launch "small, unmanned Earth-circling satellites" during the observance, scheduled to run from July 1957 through December 1958.

But the turning point came in 4 October, 1957, when the Soviets shot the satellite Sputnik I into an elliptical orbit around the Earth. Circling the globe every 96.2 minutes, the 184 pound sphere reminded Americans for three months that Moscow had scored first in the race to conquer the new frontier. The Soviets followed on 3 November, 1957, with Sputnik II, which weighed 1,120 pounds and carried a dog into orbit, further embarrassing the United States.

Thus in a bid to record a space feat of its own, the first U.S. attempt ended in failure in 5 December 1957. It was not until the following 3 January 1958 that the United States placed its first satellite Explorer I in orbit. Explorer I made important scientific discoveries, including the existence of radiation belts (the Van Allen Belts) surrounding the Earth.<sup>1</sup> Vanguard I, launched less than two months later, showed that the Earth is slightly pearshaped rather than round.

Congress meanwhile approved the National Aeronautics and Space Act of 1958 which created a new civilian agency, National Aeronautics and Space Administrations (NASA) to direct the nations scientific activities relating to all non-military aspects of outer space. At the time of its formation in 1958, NASA was assigned responsibilities extending well beyond the conduct of individual space missing.

---

1. The belts were named for James A. Van Allen the U.S. astrophysicist who was the first to interpret the data gathered by Explorer I's instruments.

These responsibilities included enhancing the technical competitiveness of the U.S. in space-related industries, and the transfer of space-derived technologies into all appropriate elements of American industry.

The direct application of space technology to the public good and to the economic benefits of the nation's industries began almost at the outset of the space Age when Tiros I, the first weather satellite, and Echo I, the first communication satellite, were launched in 1960. The communication satellite industry rapidly became an important commercial commodity in the international market place.

Moreover, early achievements like the discovery of the Van Allen Belts prompted government's spokesmen to claim that the U.S. space programme was more sophisticated than the Soviet Union's, notwithstanding Soviet supremacy in rocketry.

In the first four years of the space age, the United States sent more satellites (55) into space than the Soviet Union (16). But the Soviet Union had launched the first

satellite, were the first to send an unmanned vehicle to the moon and on 12 April 1961, sent the first human being Cosmonaut Yuri Gagarin, into orbit, a feat the United States was unable to match until 20 February 1962, when astronaut John H. Glenn circled the Earth three times.<sup>2</sup>

President John F. Kennedy, stung by the Soviet successes, told Congress on 25 May 1961, that the time has come for the United States to "take a clearly leading role in space achievement" and urged a national commitment to a manned landing on the moon by 1970. Congress consented to Kennedy's proposal and offered generous funding for the space effort.

Since then, the United States had embarked on what has been called the largest single engineering feat ever attempted in peacetime. During 1965-66, the United States conducted 10 successful Gemini flights without a single Soviet manned flight in the same period. During this period

---

2. Glenn was preceded into space by another U.S. astronaut Alan B. Shepard Jr. who made a 15-minutes sub-orbital flight on 5 May 1961.

Congress doubled NASA's appropriation for 1962 and nearly doubled it again in 1963, following with big increases for 1964 and 1965.

## **2.2 Tragedies and Triumph:**

By the time of the successful Gemini flights, however, public criticism of the space race was building. Critics worried that the contest was too expensive for what would be basically a propaganda victory. Columbia University sociologist Amitai Etzioni feared that the moon project would distort the development of science and focus on the wrong priorities. In his 1964 book "The Moon-Doggle" Etzioni said the nation was "using the space race to escape our painful problems on Earth".<sup>3</sup> And he added, in an attack that had been echoed frequently in subsequent years, "The deepest problem arising from our infatuation with the moon is not social, or political or administrative, but spiritual. We are all prisoners of an age of technology and mate-

---

3. Amitai Etzioni, Moon-Doggle: Domestic and International Implications of the Space-Race (Garden City, New York: Doubleday, 1964).

rialism".

Before men could reach the Moon, tragedy struck both the U.S. and Soviet space programs. Fire flashed through the oxygen - enriched atmosphere of an Apollo capsule during pre-flight tests at the Kennedy Space Flight Centre on 24 January, 1967. Three astronauts on Virgil I, Gus Grissom, Edward H. White and Roger B. Chaffe were killed. Less than three months later, cosmonaut Vladimir Komarov was killed while returning from a space flight when parachute lines on his Soyuz Craft tangled and the capsule slammed into the ground. These accidents set back both nation's space programmes by almost two years.

In the United States, the tragic fire set off a series of investigations and put NASA through a stormy period. Manned flights were suspended and investigators criticised many aspects of the programme, leading to personnel and engineering changes. But the agency survived intact, and in 1968 the Apollo program got back on track.

On 20 July 1969, the goal that Kennedy set eight years earlier was achieved: Neil A. Armstrong stepped from the Apollo II lunar landing vehicle onto the Moon's Sea of Tranquility. Other manned Moon landings followed in the next few years but the grand event of the U.S. space program had already been achieved and no subsequent goal or event in space exploration and research captured popular attention so fully.

### 2.3 Nixon's Space Policy

President Richard M. Nixon's era witnessed a cool atmosphere as far as the space programme was concerned. Although his administration's approach to space was bold and balanced, when he remarked on 7 March 1970, "By no means should we allow our space programme to stagnate. But with the entire future and the universe before us, we should not try to do everything at once".

The matter rested there until 5 January 1972, when Nixon declared that the United States "should proceed at once" with the development of a reusable space shuttle that

would "take the astronomical costs out of astronautics". The shuttle and Skylab, an experimental orbiting laboratory that had been authorized earlier, were left as the nation's only manned space programmes for the post-Apollo era.

#### **2.4 The Shuttle Era**

With the passage of years, the intense space rivalry between the super powers mellowed somewhat. In the 1975 Apollo-Soyuz Test Project, for example, the U.S. astronauts docked with Soviet cosmonauts for two days of joint experimentation in Earth Orbit. The United States then suspended all manned space activities until the first shuttle flight in 1981.

For the first three years of the shuttle era, the U.S. space programme basically marked in place. Then in 1984, recognizing the growing importance of satellites and other possible commercial space products and services to the nation's competitive position, the Administration and the Congress expanded the scope of the space Act to require that



NASA, together with its previously assigned duties regarding the development and transfer of space technologies, now additionally "seek and encourage to the maximum extent possible the fullest commercial use of space." The agency was thus charged with actively fostering a commercial space industry in much the same way as its predecessor NACA promoted the nation's broadly successful aviation industry. President Ronald Reagan directed NASA "to develop a permanently manned space station, and to do it within a decade". Outlining his plan in his state of the Union address to Congress President Reagan said that the space station "will permit quantum leaps in our research in science, communications and in metals and life-saving medicines which can be manufactured only in space". NASA, he added, would "invite other countries to participate so we can strengthen peace, build prosperity and expand freedom for all who share our goals".

## **2.5 Challenger Explosion**

Before the space station could advance beyond the

drawing board, however, NASA experienced the worst disaster in its existence. Only 73 seconds after liftoff from Cape Canaveral on 28 January 1986, the shuttle challenger blew apart in a powerful explosion, killing all seven persons aboard. The shuttle programme remained in mothballs for 32 months after the challenger disaster. The fallow period lasted until 29 September 1988, when the shuttle Discovery roared into space with a five-person crew. The same day witnessed another milestone in the U.S. space programme. After lengthy negotiations, representatives of Canada, Japan, the United States and member nations of the European Space Agency signed agreements in Washington to build a permanently manned space station. Its principal missions were to serve as a laboratory for research in microgravity conditions and as a point of departure for further exploration of the solar system.

TH-6988



## 2.6 Bush Administration's New Goals for Space Programme

George Bush's election as President in 1988 seemed to herald a new era of achievement for the space programme. In



N9

a speech marking the 20th anniversary of the first manned landing on the Moon, Bush said, "we must commit ourselves anew to a sustained programme 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",<sup>4</sup> thereby initiating what came to be called the Space Exploration Initiative (SEI). In his remarks, the President recognized the Apollo programme and all those who contributed to it, but also noted the transient nature of that programme and the necessity not to be constrained to "brief encounters" in the future space exploration activities. The Space Exploration Initiative consisted of robotic missions to the Moon and Mars, as well as the establishment of permanent outposts (not necessarily continuously inhabited) on the Moon and, later, human exploration of Mars.

To reach this goal, the President proposed three inter-related projects: an Earth-orbiting space station, a perma-

---

4. Address at the Air and Space Museum, Washington D.C., July 20, 1989.

ment colony on the Moon and finally, a manned mission to Mars. In a commencement address nearly a year later, he suggested a rough time-table for going to the red planet. "Before Apollo celebrates the 50th anniversary of its (first) landing on the Moon", he said, "the American flag should be planted on Mars".<sup>5</sup>

But with the disappearance of the Soviet Union as a potential strategic threat as well as a competitor in the space technology, plethora of United States policies, which previously had depended on the cold war requirements are being increasingly questioned on the ground of their relevance in the new world order.

#### **2.6 NASA's Current Challenges:**

NASA's long list of achievements over more than three decades was marred by failures during the late 1980's and early 1990's, being repeatedly highlighted in the media.

---

5. Speech at Texas A&I University; Kingsville, Texas, May 11, 1990.

Space activities by their nature are high-risk, and there have been mistakes, failures, and tragedies since the first vanguard rocket crashed in flames in 1957, including the 1967 deaths of three Apollo astronauts. Still, NASA had a reputation for excellence. Beginning with the 1986 Challenger tragedy, however, which took the lives of seven astronauts, NASA's image was tarnished with successive problems both with major systems such as the space shuttle and individual spacecraft such as the Hubble Space Telescope (which was unable to see distant, faint objects - its main purpose - because the mirror was built improperly). These problems hit NASA at a time when the agency was expected to justify its activities in a broader national context than simply "exploration of space" because of tight federal budget constraints. Of most concern in the space community was how to balance funding among the myriad activities NASA supported given fiscal constraints.

Finally and perhaps most troubling, the civil space programme seemed to lack direction. President Bush had proclaimed in July 1989, the twentieth anniversary of the

U.S. manned landing on the Moon that the nation should establish a Lunar base and send a human mission to Mars over the next 30 years. However, Congress, though sensitive to the huge budget deficit, the weakening domestic economy, and unmet needs at home, declined to appropriate any money for the new venture.

Many doubted that NASA could lead the way, complaints about the space agency were legion.<sup>6</sup> It had become fossilised, overcautious and bureaucratic. Its workforce was too old and had lost capacity for innovation. It was not equipped to manage large, complex programme or to argue creditably for the space agenda on Capital Hill. Scientists charged that NASA had become addicted to big ticket, manned projects at the expense of what should be its primary missions, - scientific advancement and technology development.

The uncertainty over the goals for space and the criti-

---

6. Herbert E. Krugman, "Public Attitudes Toward the Apollo Program, 1965-1975", Journal of Communication, New York, Vol.27 (Autumn), pp.87-93.

cisms of NASA, coincided with the gearing up of the National Space Council, established in 1989,<sup>7</sup> and headed by Vice-President Quale being at the top of the structure of the civil space programme outside NASA in the Executive Branch. It was established along the lines of an earlier version set up in 1958 by the space Act but abolished by President Nixon in 1973. The Council has as members of the secretaries of State, Defense, Treasury, Transportation, Commerce, and Energy, the Director of Office of Management and Budget (OMB), the President's chief of staff, and presidential advisors for national security and science, the Central Intelligence Agency director and the NASA administrator.

Presently, the Council oversees the entire U.S. space programme, both civil and military, and views them as closely interrelated policy and administration of major elements of military space, such as the strategic Defense Initiative

---

7. National Space Council was created by law (the Financial year 1989 NASA authorization act, P.L. 100-685), which directs that it be chaired by the Vice President. Proposals have been made recently to disband the Space council and move its functions to a broader group such as a Technology Policy Council. While the President could abolish the Council (as did President Nixon in 1973), it would require congressional concurrence.

and reconnaissance satellites, have important impacts on civil space activities.

The Council has been active in several policy areas, including saving the Landsat programme from the axe of the OMB, getting Department of Defense (DoD) and NASA to work together on a new heavy lift launcher, promoting human exploration of Mars, and fostering policy favourably to the emerging commercial space industry.

## **2.7 Other Federal Agencies**

In addition to the Council, several federal agencies have civil space roles, these include the Department of Commerce (DoC), National Oceanic and Atmospheric Agency (NOAA), which operates the nation's weather satellites, and through contract, the Landsat remote sensing satellites. DoC also promotes and regulates U.S. space commerce, except launches.

The Department of Transformation promotes and regulates the nation's commercial launch industry; the Department of



Energy supports research on nuclear space propulsion; the National Science Foundation sponsors astronomy projects; the Environmental Protection Agency monitors and does research on threats to the Earth's environment, including handles international agreements on space matters; and the U.S. Trade Representative is active in issues affecting international space commerce.

The Department of Defense is also heavily involved in civil space through joint activities with NASA, such as shuttle missions, a new launch system, and earth observing and tracking networks.

According to an account in the Washington Post, the idea for a committee to look at the space programme had its origins during a meeting aboard a plane carrying Quale back from the July 1990, economic summit in Texas.

## **2.8 Composition of the Committee**

The Augustine Committee comprised of 12 individuals selected for their knowledge and space activities and man-

agement expertise.<sup>8</sup> For instance,

- Norman R. Augustine, Chairman of the Committee was the Chairman and Chief Executive Officer of Martin Marietta. He had also held, in the past, high-level government positions, including under secretary of the Army.

The other members of the panel came from science, industries, universities and the military. Those included were:

- Laurel L. Wilkening (Vice-Chairperson), who was the provost of the University of Washington and former member of the National Commission on Space. She also served as Director of the Lunar and Planetary Laboratory from 1981-1983. As a planetary scientist, her areas of research were meteorites, asteroids and comets.

- Edward C. "Pete" Aldridge, Jr., President of the McDonnell Douglas Electronics System Corporation and former

---

8. Advisory Committee on the Future of the U.S. Space Programme, Washington, D.C., 17 December 1990, p.53.

Secretary of the Air Force from 1986-1988. He was in astronaut training before the challenger accident. As the Under Secretary of the Air Force in 1981, one of his key responsibilities was coordinating the Air Force and national security space activities.

- Joseph P. Allen, the President Space Industries, Inc., in Hunston, Texas, formerly an astronaut with NASA, has additionally served as a ground support crewman and CAPCOM for Apollo 15, Apollo 17 and STS-1. He flew as a prime crew member on STS-5, the first shuttle flight to deploy cargo in space and on STS 51-A, the first space flight to salvage equipment from space.

- D. James Baker, the President of Joint Oceanographic Institution, Inc. in Washington, D.C., and Distinguished Visiting Scientist at the Jet propulsion Laboratory. Also a member of the National Research Council Committee on Global change and the Ocean Studies Board and an officer of the International Joint Scientific Committee for the World Climate Research Programme.

- Edward P. Boland, former Democrat House member from Massachusetts from 1953 to 1988, chaired the Committee that oversees NASA's budget (Committee on Appropriations) and was a member of the Independent Offices (now the VA, HUD and Independent Agencies) Subcommittee.

- Daniel J. Fink, a retired senior Vice-President of General Electric Company, former Deputy Director in the Department of Defense, he also served on the Defense Science Board and was a former Chairman of the NASA Advisory Council.

- Don Fuqua, President and General Manager of the Aerospace Industries Association served as the leading spokesperson for the U.S. aerospace industry. He was also the Democrat House Member. He was also a member of the NASA's Advisory Council and a founding member of the Challenger Center for Space Science Education.

- Robert T. Herres, a retired Air Force General and former Commander of the Air Force Space Command, Commander-

in-Chief of North American Aerospace Defense Command, and Commander-in-Chief of U.S. Space Command, he was also the chief of the Flight Crew Division for the Manned Orbiting Laboratory Programme subsequent to completing the Air Force's Test Pilot School.

- Louis J. Lanzerotti, AT&T Bell Laboratories scientist and Chairman of the Space Studies Board of the National Research Council, his principal research interest includes space plasmas, geophysics and engineering problems related to the impact of space processes on space and terrestrial technologies. He was a co-investigator and principal investigator on NASA missions and conducted extensive ground based and laboratory research on space related topics.

- David T. Kearns, Chairman of Xerox Corporation, was also a member of the President's Education Policy Advisory Committee, the Business Council and the Policy on Foreign Relations.

- Thomas O. Paine, former NASA Administrator from 1968

through 1970, he was also the former Chairman of the National Commission on space.

Given the background of the members of the panel, questions about the objectivity of the panel, especially its Chairman, were raised in the Congress<sup>9</sup> because through his private employment, he had interests in the aerospace community and, consequently, the activities of NASA. This factor was taken into serious consideration when they were appointed to the Committee and, pursuant to applicable laws, it was determined that the need for the individuals' services outweighed the potential for a conflict of interest. It was the further determination of the appointing authority that the private interests of the individuals appointed to the Committee were not so paramount as to impede their objectivity or integrity as members of the Committee. These determinations were made by the appointing authority only after coordinating with the Office of the Government Ethics

---

9. Arthur L. Levine, "The Future of the U.S. Space Programme: A Public Administration Critique", Public Administration Review, Washington, D.C., March/April 1992, Vol.52, No.2, p.184.

to ensure full compliance with existing laws and regulations regarding the avoidance of conflicts of interests. A government attorney sat in on all sessions of the Committee at the request of the Committee Chairman, Norman Augustine.

In addition, the members of the Committee, recognizing there was an important concern as to avoiding even the mere appearance of a conflict of interest, endeavoured throughout their Committee's activities to minimise, wherever possible, any such possible appearance.

In this regard, because of his role as Chairman of the Committee and his position as a senior executive with an aerospace company, the Chairman of the Committee elected to disqualify himself from any decision as to whether and how the Committee would address the issue of a new launch system, the deliberations and decisions as to this matter were handled by the Vice-Chairperson.

However, despite all these precautions taken against any undue benefits being given directly or indirectly to the

members of the Committee, one can hardly expect the impossibility of the same. But after its work was done, the consensus was that the Committee had conducted a fair review.<sup>10</sup> Chairman Augustine did not participate in discussions in which there could be a conflict of interest and all formal meetings were open to the public (the panel originally planned to hold closed executive sessions until challenged by a Ralph Nader public interest group).

---

10. Ibid., p.184.



## CHAPTER 3

### AUGUSTINE REPORT: FINDINGS & RECOMMENDATIONS<sup>1</sup>

#### 3.1 Purpose

The purpose of the Advisory Committee on the future of the U.S. space program was to advise the NASA Administrator on overall approaches NASA management could use to implement the U.S. space program for the coming decades which had a broad charter to:

- \* Review the future of the civil space program, including both management issues and program content.
- \* Assess alternative approaches and make recommendations for implementing future civil space goals, including such factors as:
  - Appropriateness of planned activities.
  - Organizational balance and structure.
  - Adequacy of overall skill base of workforce.

---

1. Advisory Committee on the Future of the U.S. Space Programme, Washing, D.C., 17 December, 1990, pp.23-48.

- Balance between roles of government & private sector.
- Possible contributions by other government agencies.
- The need to maintain a strong R&D capability.
- Assurance of mission success.

The Augustine Committee Report points out that there is a lack of national consensus on the goal of space programme and how will be accomplished. The Report also goes to the extent of pointing out that the Americans have the same view on the the nature of space programme. They note that there is an extensive debate among the witnesses on the question of manned and unmanned missions. The majority found that there is a limited risk in unmanned mission not to fulfil the assigned tasks.

The Committee was aware of the resource constraint and therefore the Committee finally focused on cost-effective programmes and unmanned mission projects. They also emphasized the important aspects of NASA being aware of the available technology base which would be an effective building block, what they called an "enabler" of major NASA

missions.

The Committee was strongly of the opinion that somehow NASA's space programmes were extensively dependent on the space shuttles. It conceded that space shuttle thus offered a significant capability to carry human mission on number of occasion, but had not fulfilled the target. Nonetheless, the Committee believes, in hindsight that it was, for example, inappropriate in the case of Challenger to risk the lives of seven astronauts and nearly one-fourth of NASA's launch assets to place in orbit a communication satellite. Therefore, the Committee increasingly viewed to give low priority to shuttle programmes and upgrade the unmanned missions.

The Committee found itself confronted with various problems while spelling out the U.S. space programme. It was aware that space programme touched many aspects of American life ranging from improving education to enhancing standard of living and assuring national security and strengthening communication among people of the world. It

also took into account the aspect of the space programme produced technology that enhanced American competitiveness. The Committee was convinced that all these advantages and more would be realised through a "balanced space programme".

The Committee was convinced that there is a need for space laboratory station. The space station was a critical to next step if U.S. planned a future manned mission besides the committee felt that the station was essential as a life science laboratory as no other similar earth-bound substitute existed. They were also of the opinion that space station was important for microgravity research and for practical experience in manufacturing under low gravity condition. Such research, the Committee felt, would be also economic competitiveness programme.

The Augustine Committee diagnosed that the major success of any future space programme will depend on initiating immediately new main rocket engine -- the muscle of any space pursuit. It noted that for almost two decades no new rocket engine had been initiated. The U.S. Congress too had

not allocated any fund for the development for new rocket, neither the Executive had given any attention to it. Therefore the Committee was strongly of the opinion that this lapse should be corrected.

The Report also speculated on the ideal space programme. It noted that the U.S. had progressed a long way in space since the initial shock of Sputnik. A broad space programme has evolved over time, and space organization structure has emerged which included governmental, industrial and academic segments. There has been a significant change in international environment and also in the domestic environment. The Augustine Committee Report observed that a new ingredients were needed in U.S. space programmes. Therefore the Report pointed out that the new ideal space programme should broadly comprise the following attributes:

- . a challenging set of space missions, strongly supported by the American people over extended periods because it contributes to the nation's well-being and is affordable;

- . a set of space programme building blocks and technology achievements that can be clearly related to the overall mission and affordability levels;
- . a programme that receives stable, multi-year funding, is relatively intensive to technology setbacks or even an occasional failure while routinely delivering useful, incremental technological developments, including the occasional "breakthrough";
- . an organization that continually attracts and retains its share of the nation's best talent; and
- . an effort that yields visible and significant results, so that the American taxpayer can justifiably believe that the organization is accomplishing its mission efficiently, effectively, and in a fiscally responsible manner while contributing to our pursuit of knowledge, the quality of life here on Ear, and to the inspiration of all people.

The Augustine Committee also went into the question of overcommitment of NASA. It observed that NASA was over

subscribed in terms of the project's it was pursuing, given the financial and personnel resources at the time allotted to pursue them. It went into the question, how this has happened. It found the answer to be two fold. First, projects have on occasion tended to grow in complexity and size as they have evolved, thereby demanding more resources than originally foreseen. Second, the initial estimates of required resources too often have been understated particularly in relation to cost. The only solution to resolve this problem, the Committee noted, would be that all future American space programme must provide at the outset, realistic estimates of needed resources and a management approach compatible with the uncertainty therein.

The Committee also examined the question of institutional aging. It noted that NASA was already a third of century old and no longer operates under relatively more flexible policies and regulations. It observed that NASA suffers from the same ill that all American mature institutions, particularly those institutions which have no direct, and immediate competition to stimulate change. In fact the

Augustine Committee brought out one of the major drawbacks of NASA's functioning; projects being tailored to help perpetuate the workforce rather than the workforce having been tailored to meet the needs of the project. The by-product of such practice of NASA had been the Committee Report was "to maximise" the number of organizations and nooks and crannies.

### **3.2 The Findings:**

Each of the major issues addressed by the Committee is examined in this chapter and, where appropriate, recommendations are offered it is recorded.

#### **Goals and Affordability:**

**Goals:** The National Aeronautics and Space Act of 1958, as amended, has served this America and served to establish the fundamentals of America's space program. Much of the mission statement contained therein, despite its origin over 30 years ago, is appears to valid to this day. These aspects include:



- \* "...it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of mankind".
- \* "...NASA (should) seek and encourage to the maximum extent possible the fullest commercial use of space".
- \* "... (the program should seek) expansion of human knowledge of the Earth and of phenomena in the atmosphere and space".
- \* "... (an objective is) the preservation of the role of the United States as a leader in aeronautical and space science and technology...".
- \* "... (there should be) cooperation by the United States with other nations and groups of nations in work done pursuant to this Act...".

The American Space Act clearly sets forth the basic rationale for today's space program. However, the original national space effort was to a considerable extent founded on the need to assure national security. The revelation of the advanced state of Soviet technology, reflected in Sput-

nik, and the development of intercontinental ballistic missiles propelled America's space and advanced military technology efforts for many years. Fortunately, the current world situation is in stark contrast to that which existed in the late 1950s and 1960s. This change is punctuated by events in the Soviet Union and Eastern Europe, arms control initiatives, and improving international relations in many (but not all) parts of the world.

However, other concerns are replacing the primary military threat to American national well being. These new threats are economic and ecological, and are closely tied to other important issues such as education and energy. From an economic viewpoint, many nations around the world threaten U.S. technological leadership and competitiveness. Deputy Secretary of Commerce Thomas J. Murrin, in testimony before the Committee, summarized the situation, stating: "While space missions may uplift our spirits and enhance our prestige, it is economic competition which will ultimately determine our standard of living, the jobs that we and our

children hold and, to a large extent, our national security and our international influence. The potential for space activities to enhance our economic progress will directly affect this nation's ability - and its will - to continue to be a permanent leader in the world". In these changing times, American space program clearly must be increasingly responsive to its future economic needs.

Another emerging threat that has been perceived by American foreign policy elite and environmentalist has been the deterioration of American quality of life as a result of abuse of its nature, environment, and failure to implement effective and economical solutions to environmental problems. Observations from space of its changing exosphere and environ would greatly assist to attempt actions that would save the deteriorating environment.

The report emphasised that the basic "imperatives" of today's American civil space effort should be to:

- \* sustain American heritage to learn, explore, and discover;

- \* maintain American technological competitiveness in global markets; and
- \* enhance the quality of life for all people on Earth.

In addition, the civil space program should continue to contribute to the national security and foreign policy objectives of the United States.

**Affordability:**

The Report point out that the affordability of these space goals would be a major concern, particularly in the current fiscal environment. Furthermore, the report recognised that there existed a major uncertainty to determine the precise cost of certain long-term future space endeavors - particularly the more costly ones. Uncertainties of yet-to-be-demonstrated technologies alone preclude precision in estimating costs. Nevertheless, the report emphasised the need to undertake long-range programmes and long-range funding commitments. Indeed the history of the American Space programme indicated that such had been the case in

the past where substantial sums were devoted over reasonably long periods to civil space projects - as indicated in the following table:

**Table 1**

Program	Program Development Cost (billions of 1990 \$)	Total Program Cost as per cent of 1967 GNP*
Apollo	\$94.07	2.38
shuttle	27.77	0.61
Skylab	9.23	0.22
Viking	2.94	0.07
Hubble Space Telescope	2.08	0.04
Galileo	1.27	0.03

\* Constant dollars in peak funding year.

During the peak funding years of Apollo in the mid-1960s (well before the lunar landings), an emerging basis for space program affordability was being established, at least for that time, consisting of approximately 0.8 per cent of the Gross National Product, 4.5 per cent of the federal budget and about 6 per cent of total federal discretionary spending.

Since the sixth and last Apollo landing on the Moon,

the NASA budget has declined by each of the above measures. For the past 25 years, it has hovered in the vicinity of 0.2 per cent of the GNP, 1.0 per cent of the federal budget, and 2.5 per cent of total federal discretionary spending.

A number of studies have outlined vigorous space programmes, many quite similar to the President's recent initiative. While these programmes differ somewhat in content and schedule, they are surprisingly consistent regarding the near-term level of funding required. Therefore the Augustine report did not call for any reduction of funds for space programme but in fact expressed the need that a reinvigorated space program will require real growth in the NASA budget of approximately 10 per cent per year (through the year 2000) reaching a peak spending level of about \$30 billion per year (in constant 1990 dollars) by about the year 2000. The report believed that such a level of expenditure would result in creating a credible space programme such as:

\* providing for the basic infrastructure to operate NASA,

the recommended Science program, the recommended and expanded Technology program, a Mission to Planet Earth, a new start on a phased and evolutionary heavy lift launch vehicle and a reconfigured Space Station; and

\* providing sufficient funds to begin laying the foundation for lunar and Mars missions on a schedule that will permit real progress and significant periodic technical achievements leading to a manned Mars mission in approximately 30 years, i.e., Mission from Planet Earth.

While the report broadly envisages the above programme it also noted certain observations for the effective implementation. It pointed out that the underlying basis for the concern of the research community has been that the strategies, goals, objectives, and programmatic requirements of the research program have not been adequately distinguished from the parallel national objective of placing humans in space.

### **3.3 Recommendations**

The report specifically pointed out the need for effective use of human resources and technical community. It strongly recommended that mechanisms were needed which would alleviate the more serious of these problems so that the talents and capabilities of America's space researchers, both inside and outside of NASA, could be focused on substantive future opportunities. I strongly affirmed the central role of research in the U.S. civil space program, hence-

#### **Recommendation 1:**

That the civil space science program should have first priority for NASA resources, and continue to be funded at approximately the same percentage of the NASA budget as at present (about 20 percent).

#### **Recommendation 2:**

That, with respect to program content, the existing strategic plan for science and applications research pro-



posed by NASA with input from the science community be funded and executed.

**Recommendation 3:**

That the multi-decade set of projects known as Mission to Planet Earth be conducted as a continually evolving program rather than as a mission whose design is frozen in time. A combination of different size space-craft appears to be most appropriate to meet the needs of simultaneity, accuracy, continuity and robustness. NASA also should re-establish research and development in support of environmental satellites to meet NOAA-stated requirements for its part, must budget adequately to finance the operational costs of space-craft and instruments, as well as related day-to-day support activities.

**Recommendation 4:**

That the Mission from Planet Earth be established with the long-term goal of human exploration of Mars, underpinned by an effort to produce significant advances in space trans-

portation and space life sciences.

**Recommendation 5:**

That the Mission from Planet Earth be configured to an open-ended schedule, tailored to match the availability of funds.

**Recommendation 6:**

The NASA, in concert with its international partners, reconfigure and reschedule the Space Station Freedom with only two missions in mind: first, life sciences experimentation (including the accrual of operational experience on very long duration human activities in space) and, second, micro-gravity research and applications. In so doing, steps should be taken to reduce the station's size and complexity, permit greater end-to-end testing prior to launch, reduce transportation requirements, reduce extra-vehicular assembly and maintenance, and, where it can be done without affecting safety, reduce cost. The planned ninety days may prove an inadequate period of time to conduct so significant a reas-

essment. Such time as is required should be taken.

**Recommendation 8:**

That NASA, in concert with the Office of Management and Budget and appropriate Congressional committees, establish an augmented and reasonably stable share of NASA's total budget that is allocated to advanced technology development. A two-to-three-fold enhancement of the current modest budget seems not unreasonable. In addition, we recommend that an agency-wide technology plan to developed with inputs from the Associate Administrators responsible for the major development programmes, and that NASA utilize an expert, outside review process, managed from headquarters, to assist in the allocation of technology funds.

**Recommendation 9:**

That the Administration promptly establish and fund a firm programme for development of an evolutionary, unmanned but man-rateable, heavy lift launch vehicle. This system should reach operational capability in time to support all

but the initial phase of the Space Station deployment.

**Recommendation 10:**

The Committee recommended that the procurement of an additional Space Shuttle orbiter, for a five-orbiter fleet operation, not be undertaken at this time, but spares procurement should continue. If an orbiter is lost in the relatively near future, the decision on whether to procure another orbiter should be made in the context of the availability of the new heavy lift launch vehicle and the demands on the remaining orbiter fleet.

**Recommendation 11:**

The NASA initiate design effort so that manned activity in the Space Station could be supported in the absence of the Space Shuttle. Crew recovery capability must be available immediately, and provision made for the relatively rapid introduction of a two-way personnel transport module on a selected expendable launch vehicle.

**Recommendation 12:**

That a Space Council Executive Committee, chaired by the Vice President and consisting of the Administrator of NASA, the Directors of the Office of Management and Budget and the Office of Science and Technology Policy, the Secretary of Defence and the Director of Central Intelligence, be institutionalized. Other Space Council principals should participate in the Space Executive Committee meetings when appropriate, at the invitation of the Chairman. Major issues would continue to be addressed by the Space Council as a whole.

**Recommendation 13:**

That NASA management review the mission of each center and consolidate and refocus centers of excellence in currently relevant fields of science and technology with minimum overlap between centers. An appropriate balance between in-house and external activity also should be developed.

**Recommendation 14:**

That NASA should be designated a "path finding" agency for the implementation of an advanced personnel management system. Under this system the current legislative package would be expanded to include "pay for performance"; more flexibility in senior executive hiring, evaluation and removal; additional cost reimbursement for relocation; and a capability for handling extended temporary duty costs. NASA management should propose to OPM the personnel package it deems appropriate in the above regards.

**Recommendation 15:**

That the Office of Personnel Management provide NASA the full flexibility permitted by law regarding dual compensation waivers, and that OMB allocate to NASA a significant portion of the 800 now approved "world-class" positions. NASA also should fully utilize the authority granted by the Space Act and fill all 425 "critical" personnel positions, thus helping redress locality pay inequities that will not be alleviated quickly enough by pay reform. New legislation

should authorize NASA broad authority to establish, set the pay of, and fill up to 10 per cent of its positions with "critical skills" appointments. In the event that recent and planned civil service reforms do not promptly alleviate the shortcomings of the NASA personnel system then, NASA should initiate the process of selectively phasing additional centers into the Jet Propulsion Laboratory mode; that is, affiliate them with a university as Federally Funded Research and Development Centres.

Augustine Report openly relies upon cultural and life-cycle theory to diagnose NASA's underlying difficulties. To reverse what the Report perceived is NASA's decline, it recommended a cultural shift.

Without defining the meaning of cultural shift, the members of Augustine Committee recommended for improving NASA's performance certain characteristics of culture of performance within NASA that consists of following beliefs and assumptions:

- "The success of the mission is more important than the immediate role of a given individual, centre, or character" (p.16). It takes precedence over the cost of the mission and deadlines established in the past.

- Space flight requires wide-open communications, in which "people are actively encouraged to disclose even minor anomalies, to put problems squarely on the table" (p.16).

- Space exploration is an inherently risky behaviour. The space programme cannot make progress in an environment in which it is "more advantageous to avoid failures than to achieve successes" (p.17).

- NASA employees inherited a tradition in which agency employees performed "a great deal of work in-house when they did turn work over to contractors, as in the fabrication of space-crafts, they maintained close control over the contractors. This became NASA's "characteristic management style" (p.40).



### 3.4 Principal Recommendations

The Report offered specific recommendations pertaining to civil space goals and programme contents as well as suggestions relating to internal NASA management. These are summarized below in four primary groupings. In order to fully implement these recommendations and suggestions, the support of both the Executive Branch and Legislative Branch were needed, and of NASA itself.

#### Principal Recommendations Concerning Space Goals

The Report recommended that the 'United States' future civil space programme should consist of a balanced set of five principal elements:

- \* a science program, which enjoys highest priority within the civil space program, and is maintained at or above the current fraction of the NASA budget (Recommendations 1 and 2);
- \* a Mission to Planet Earth (MTPE) focusing on environmental measurements (Recommendation 3);

- \* a Mission from Planet Earth (MFPE), with the long-term goal of human exploration of Mars, preceded by a modified Space Station which emphasizes life sciences and exploration base on the Moon, and robotic precursors to Mars (Recommendations 4,5,6 and 7);
- \* a significantly expanded technology development activity, closely coupled to space mission objectives, with particular attention devoted to engines (Recommendation 8);
- \* a robust space transportation system (Recommendation 9).

#### **Principal Recommendations Concerning Programs**

With regard to program content, the report's recommendations were:

- \* the strategic plan for science currently under consideration be implemented;
- \* a revitalized technology plan be prepared with strong input from the mission offices, and that it be funded;
- \* Space Shuttle missions be phased over to a new unmanned

(heavy lift) launch vehicle except for missions where human involvement is essential or other critical national needs dictate;

- \* Space Station Freedom be revamped to emphasize life sciences and human space operations, and include microgravity research as appropriate. It should be reconfigured to reduce cost and complexity; and the current 90 day time limit on redesign should be extended if a thorough reassessment is not possible in that period;
- \* a personnel module be provided, as planned, for emergency return from Space Station Freedom, and that initial provisions be made for two-way missions in the event of unavailability of the Space Shuttle.

**Principal Recommendations Concerning Affordability:**

The Report recommended that the NASA programme be structured in scope so as not to exceed a funding profile containing approximately 10 per cent real growth per year throughout the remainder of the decade and then remaining at

that level, including but not limited to the following actions:

- \* redesign and reschedule the Space Station Freedom to reduce cost and complexity;
- \* defer or eliminate the planned purchase of another orbiter;
- \* place the Mission from Planet Earth on a "go-as-you-pay" basis, i.e., tailoring the schedule to match the availability of funds.

**Principal Recommendations Concerning Management:**

With regard to management of the civil space programme,

Report recommended that:

- \* an Executive Committee of the Space Council be established which includes the Administrator of NASA;
- \* major reforms be made in the civil service regulations as they apply to specialty skills; or, if that is not possible, exemptions be granted to NASA for at least 10 per cent of its employees to operate under a tailored

personnel system; or, as a final alternative, that NASA begin selectively converting at least some of its centers into university affiliated Federally Funded Research and Development Centers;

- \* NASA management review the mission of each centre to consolidate and refocus centers of excellence in currently relevant fields with minimum overlap among centers.

It was considered by the Committee that the internal organization of any institution should be the province of, and at the discretion of, those bearing ultimate responsibility for the performance of that institution. Hence, the following possible internal structural changes were offered for the consideration of the NASA Administrator:

- \* That the current headquarters structure be revamped, disestablishing the positions of certain existing Associate Administrators in order that:

- an Associate Administrator for Human Resources be established, whose responsibilities include making

NASA a "path-finding" agency in acquisition and retention of the highest quality personnel for the Federal Government (Item K);

- an Associate Administrator for Exploration be established, whose responsibilities include robotic and manned exploration of the Moon and Mars (Item C);

- an Associate Administrator for Space Flight Operations be established, whose responsibilities include Space Shuttle operations, existing expendable launch vehicle operations, and tracking and data functions (Item E);

- an Associate Administrator for Space Flight Development be established, whose responsibilities include Space Station Freedom and other development projects such as the Advanced Solid Rocket Motor and the new Heavy Lift Launch Vehicle (Item D);

- \* an exceptionally well-qualified independent cost analysis group be attached to headquarters with ultimate responsibility for all top-level cost estimating in-

cluding cost estimates provided outside of NASA (Item B);

- \* a systems concept and analysis group reporting to the Administrator of NASA, established as a Federally Funded Research and Development Center (Item A);
- \* multi-centre projects be avoided wherever possible, but when this is not practical, a strong and independent project office reporting to headquarters be established near the centre having the principal share of the work for that project; and that this project office have a systems engineering staff and full budget authority (ideally industrial funding, - i.e., funding allocations related specifically to end goals) (Item G).

### 3.5 Observation:

In response to the public administration issues raised by the Report, NASA has made some internal changes: it created a systems concepts and analysis office, named associate administrators for human resources development and exploration, and separated the management of the space shut-

tle from the space station by naming associate administrators for space flight operations and space systems development. Changes have been made in some programmes, particularly in space sciences, to reduce overlap among centers.

In line with the tone of the Augustine Report, NASA is considering canceling some of its largest multi-billion dollar science satellites in favour of smaller and less costly space-crafts. The space agency has also moved to improve its procurement management by creating a single financial information system that can track more accurately the agency's billions of dollars in contracts.

However, significant action has not been taken on several central public administration issues. These include strengthening headquarters direction of the centers and providing for independent cost analysis and cost estimates.

Further, Presidential leadership, vital to a revival of the civil space programme needs to be stronger. Congressional leadership, which has also been lacking, would pro-



vide greater impetus. Leadership from both the executive and legislative branches is needed to help define specific intermediate civil space objectives (as well as long term goals) and to provide support for NASA's strengthening of headquarters vis-a-vis centers. Both branches can also help by removing burdensome procurement and personnel restrictions and by authorizing multi-year funding of long term missions and multi-year procurement.

The revolutionary changes in the former Soviet Union are providing new opportunities for international cooperation, as the republics seek to reduce space programme costs and raise cash from rental and even sale of their space facilities and hardware. NASA and the administration must be ready to broaden approaches to international co-operation.

## CHAPTER 4

### REFLECTIONS ON THE REPORT

The tabling of the Augustine Report generated, widespread interest and reactions in the American academic, scientific, diplomatic, congressional and media circles. The resultant opinions and comments made one thing very clear that all were expecting a new direction to be given to the multi-billion dollar sucking U.S. space programme. The opinions that follow emphasize the report's considerable strengths and its relatively few weaknesses.

#### 4.1 Public Opinion:

For instance, Jay M. Shafritz, an eminent academician of the University of Pittsburgh, while agreeing with the Report that NASA does not attract talent it needs, suffers from drawbacks of similar federal agencies. He pointed out that initially NASA attracted the best talent but by 1970s and 1980s the sense of patriotism which was present in the

early period was almost absent. He noted that another major factor which affected the NASA staffing, was the new federal ethics regulation which effectively forbid technical experts working for NASA from working in the speciality for at least two years after leaving government service. Specifically he noted that because of the dual problem of inadequate pay and post-employment restrictions greatly affected NASA's performance record. Nevertheless, he pointed out NASA's overall personnel and staff contribution was not inferior to any American federal agency, what was lacking which the Report should have recording to Jay M. Shafritz that higher standards that is needed for space exploration was never demanded. He also suggested that NASA should have been outside regular civil service for better performance record. Professor Shafritz pointed out that the Augustine Report suggesting that NASA should be merely a funding agency or holding company for R&D centres operated by major universities is not new.<sup>1</sup> Such suggestions were made by even mem-

---

1. Jay M. Shafritz, Jay M., "An Indictment of NASA's Merit System", Public Administration Review, Washington, D.C., March/April 1992, vol.52, no.2, pp.186-189.

bers of Congress. He was of the opinion that NASA should develop model similar to Jet Propulsion Laboratory in Pasadena, which is run by the California Institute of Technology.

Likewise, Howard E. McCurdy, a professor of Public Administration in the School of Public Affairs at the American University noted that the Augustine Committee Report relied strongly on cultural and life cycle theory to diagnose NASA's underlying difficulties. To reverse what they recommended a "cultural shift".<sup>2</sup>

Prof. McCurdy noted that it is easier to state a cultural shift rather than attempt. He points out that it is possible that the Augustine Committee was more influenced by Japanese cultural pattern when it was noted that Japanese culture contributed to exceptional performance of Japanese businessmen. He agrees with scholars like Schein that

---

2. Howard E. McCurdy, "NASA's Organizational Culture", Public Administration Review, Washington, D.C., March-April, 1992, vol.52, no.2, pp.189-191.

culture helps to unify organization that might otherwise fall apart. The studies of Thomas Peters and Robert Waterman entitled In Search of Excellence (1982) has attributed high performance of Disney Productions and IBM to the development of distinct corporate culture.

Drawing from all these studies Prof. McCurdy noted that the Augustine Report points out the need for NASA to maintain "ethos of excellence".<sup>3</sup> This, McCurdy observes a favourite cultural term. This phrase is so overused, from university mission statements to television commercial that it was lost its meaning. It is hard to see what it means in the Augustine Report as well. McCurdy is not convinced by the suggestion of Augustine Report that doubling the NASA budget by 2000 A.D. would produce the desired result advocated by the Report. He comments that rapid growth may be traditional prescriptions for organizational aging, but it is a prescription that is hard to fit.

---

3. Ibid., p.189.

Even the Aviation Week and Space Technology in its 17 December, 1990, issue's editorial comment described the Report as a "solid beginning"<sup>4</sup> which called for increased emphasis on space science activities, reduced dependence on the space shuttle in favour of developing a new unmanned heavy life booster and redesign of NASA's Freedom Space station. It wrote that the Augustine committee's valiant effort had produced a solid blue print in which the call for a balanced scientific/manned exploration approach and concerted efforts on both mission "to" Earth and Mission "from" Earth programs offered a sensible framework in which to set specific goals.<sup>5</sup>

In an article that appeared in The Economist, 15 December, 1990, the Report had been criticized on the grounds that it did not describe in detail what sort of new rocket it thought would be best. It opined that the Report

---

4. Howard E. McCurdy, "The Augustine Report: A Solid Beginning", Aviation Week and Space Technology, New York, 17 December 1990.

5. Ibid.

was, in places, quite flattering about NASA; it was also clear, if diplomatic, about the agency's problems.<sup>6</sup> However, the article also praised the Report as being refreshingly free of visionary pronouncements as it concentrated on pragmatic solutions.<sup>7</sup> Further, the article went on to explore the possibility of an improved NASA, if the Report's ideas were implemented.

The article noted that the panel was not interested only in implementing the suggestions to improve NASA's hardware, it had an eye for the rickety parts of its organisation, too. It recommended that NASA find ways to manoeuvre around civil-service rules and pay gifted employees more, if necessary by getting outside contractors to run its research centres. The idea of yielding control over the research centres is unlikely to be popular back at NASA's headquarters. Nor are the panel's tactful suggestions about rearranging the top management structure in Washington,

---

6. "The Wisdom of Augustine", The Economist, New York, 15 December, 1990, vol.317, no.7685, pp.81-82.

7. Ibid.

which could reverse some of the changes that the present administrator, Admiral Richard Truly has made during his two years in office.

Analysing what the centres actually do, the panel found too much duplication. It suggested that things might be better if every centre had its own clearly recognised fields of excellence, so that different centres would not compete unnecessarily for the same work, and projects could not be dived up simply in order to spread the money around. Of that unhappiest of compromises, the space station, the panel said less than might have been expected. The article further observed that like Congress, the Augustine Committee was also in favour of a smaller and cheaper station, concentrated more on biology, thus providing information about how people, rather than materials, respond to weightlessness.

Arthur L. Levine, a professor of public administration at Baruch College, city University of New York, underlined the Reports observations that many of the NASA field cen-



ters had become unfocused and overlapped one another, but asked why the committee did not flatly recommend stronger central management to prevent the severe damage to present and future space programs likely to be caused by NASA's internal fragmentation.<sup>8</sup> The structure of the civil space program both within NASA and at the Executive Branch level was of deep concern to the Augustine Committee. The Report cited a clear need to strengthen NASA headquarters, to refocus the work of the NASA centers so that each could become a center of excellence in specialized fields, to reduce overlap and the splitting of projects, to establish firm headquarters directions over multi-center projects and to balance in house and contractor activity. He opined that while the Report recognized the problems caused by overlap and poor coordination among the centers, it was "hesitant to make firm recommendations on changes in NASA's headquarters

---

8. Arthur L. Levine, "NASA's Organizational Structure: The Price of Decentralization", Public Administration Review, Washington, D.C., March-April 1992, vol.52, no.2, pp.198-202.

and field-center structures".<sup>9</sup> Hence, the Report made only "proposals for consideration" by NASA management. He further held the view that by not insisting that NASA confront the structural issue head on, the committee decreased emphasis on a grave deficiency which had caused great damage to the civil space program and which, if not corrected, would imperil the mammoth undertakings for the 1990s and beyond.<sup>10</sup>

Even Bill Nelson in an essay in Scientific American, February 1991 criticized the Report because of its recommendations to slow down space research. This he found unacceptable as it would dull America's technological edge, which is an essential element of the nation's standing in the world. However, he appreciated its other recommendations such as; more research oriented NASA, founded on more stable funding; a scaled back space station, a new heavy lift launch vehicle for unmanned payloads, and a space shuttle that emphasized

---

9. Ibid., p.200.

10. Ibid.

scientific studies. These are solid suggestions<sup>11</sup> to guide America's space future.

"As a more solid set of goals, priorities and funding levels will shore up the nation's reputation as a reliable partner in international research. A predicted programme will be a clear sign to future engineers and scientists that jobs in high technology exist, if they choose a career in the sciences."<sup>12</sup>

At a time when the percentage of students who are pursuing a science degree has dropped from 11.5% in 1966 to 5.6% in 1988, some visible encouragement is needed. The current predictions point to a shortage of 675,000 scientists and engineers by the year 2000. Ongoing efforts to attract more students into these fields must be substantiated with the assurance that a robust scientific community will exist when they graduate. A strong space programme

---

11. Bill Nelson, "The Risks in Cutting Funds for Space Programs", Scientific American, February, 1991, p.144.

12. Ibid.

does attract students to careers in technology and research.

Likewise, a professor of Political Science and Public Administration of the Maxwell School, Syracuse University, Prof. W.H. Lambright finds recommendations of Augustine Committee that while it is critical and constructive, there is a gap in its discussion -- the need for presidential leadership in support of NASA and the space programme. He points out that one of the major failure of NASA have been no direct involvement of President.

The Augustine Committee had suggested Vice-President as Chairman of the National Space Council, but this arrangement. He points out that one of the major failure of NASA have been no direct involvement of President.<sup>13</sup> He raises very pertinent question in order to emphasise the point that presidential leadership problem of NASA, the question raised

---

13. W. Henry Lambright, "The Augustine Report, NASA and the Leadership Problem", Public Administration Review, Washington D.C., March-April 1992, vol.52, no.2, pp.192-195.

are "what is the presidential role in space policy?", "how has it been played?", "how should it be played in the future?". History shows that NASA's largest projects require presidential decision making at various stages of the development process. It also shows that the quality of presidential support (its presence, absence or ambivalence) is probably the "single most important factor in programme success or failure".<sup>14</sup>

Another major point for Prof. Lambright is that it does not explain how NASA can get the resource to carry out the proposed space programme.

On the other hand, Prof. Logsdon pointed out that the major limitation of the Augustine report was its failure to give attention to America's international relations in space activities. He specifically pointed out that out of 300 individuals who gave witness to the working committee (Annexure II), there was no professional representation from any other spacefaring country. He strongly felt that a

---

14. Ibid.

major investigation should always include at least, professional representation from the American allies to have a reasonable space programme. He affirmed by stating "there can be no escape from the often uncomfortable reality that any future U.S. space programme will, to a greater or lesser degree, be international in character."<sup>15</sup>

Prof Logsdon noted that all that Augustine Report points out is that U.S. should give high priority to using cooperative project with its partners, as a means of exercising leadership in space and thereby sharing the leadership and control. He points out in a word, where the U.S. is increasingly emerging as unreliable partner any effect on insisting space dominance and leadership would contribute to difficulties and success of space programme. Moreover, he points out the committee's report, stressing the need for cooperation in some areas of space activities, such as

---

15. John M. Logsdon, "International Relationships and the US Space Program: The Missing Element", Public Administration Review, Washington D.C., March-April 1992, vol.52, no.2, pp.196-198.

environmental monitoring and weather prediction. Even these cooperation, Prof. Logsdon views are from the perspective of managing control in all situation, which would not be acceptable to political partners.

Prof. Logsdon even knows that such American policy of leadership and control of space programme would result in isolation from major trends in space development and that U.S. would have to spend its own funds to obtain capabilities and data previously available to cooperative projects.

#### **4.2 Congressional Opinion**

Key members of the House and Senate who overran NASA praised the redirection recommended by the Augustine Committee. Although some members of the Congress believed that the station redesign recommended by the Committee would delay deployment until the late 1990s or early 21st century but keeping into consideration the economic situation at the domestic front and the urgent need to reprioritize the NASA's activities, this step was necessary. So the overall

arguments for and against the redesign was oscillating between practical to mystical.

However, the opinion of the Congress was not totalling in favour of accepting the recommendations of Augustine Committee. Sometimes the Congress went against the recommendation which had proposed to scale-down the space station. The House Appropriation Committee went to vote for killing the planned space station ignoring the White House veto threat. At that time, giving full support to the committees recommendation, Bush Administration emphatically told Congress that scuttling the space station freedom could have serious economic and diplomatic results and could deprive nation's youth of major source of inspiration.

Accepting the recommendation Vice-President Dan Quale told NASA and congressional leaders, who were opposed to the space station that Bush Administration backed NASA plan to build scaled down space station; and cited project's importance to furthering American space leadership as it would give more prestige to the sophisticated technology of



the U.S. So, despite few scathing criticisms of the Report by the Congress, Bush Administration vowed to keep alive its plan to act according to the recommendations of the committee and thereby building orbiting space station as centre-piece of manned space programme. Similarly, the Vice-President who headed the National Space Council said that House Subcommittee's effort to vote for killing beleaguered project was "totally unacceptable".<sup>16</sup>

However, it came as a surprise when on 15 May 1991 the House Appropriation Subcommittee that controlled the NASA's budget voted to abandon the space station which was the centrepiece of the agency's ambition for this decade and the next century. So the agency launched a counterattack the following week, flooding the Capital Hill with promotional packets warning that the nation's demise would not only impede the advantage of knowledge but would also hurt the

---

16. The New York Times, 17 May 1991.

congressional districts.<sup>17</sup> "Cancellation of 'freedom' would signal the end of future U.S. manned exploration of space", proclaimed a summary page, which overlooked the fact that shuttles would still be flying.<sup>18</sup>

Committee's recommendation of a "Mission from Planet Earth" also got wide acceptance by the NASA supporters in the Congress when they opined that the public was bored with the U.S. space programme and frustratingly said that after two decades man still had not reached beyond the Moon. So they vigorously advocated for further congressional support for these space activities which the committee termed as "Space Exploration Initiative".

In 6 June 1991, just after much hue and cry had been made over the Augustine Committee's recommendations, finally House voted 240-173 to give President Bush \$1.9 billion that

---

17. The outpost had a "procurement constituency" of more than 2000 businesses in 40 states.

18. In fact freedom funding provided Research and Construction contract reaching 37 states and 151 congressional districts. Congressional Quarterly Weekly Report, 1 August 1992.

NASA had requested for its planned space station because of the legislators' "constituent interests"<sup>19</sup> in saving the space station. However, the House approved that the money would be taken mostly from other programmes of space agency. This House vote to fund space station at the expense of National Aeronautics and Space Administration space science project merely set the stage for potentially bitter fight between supporters of manned and unmanned space programmes, as it was also ignoring the Committee's recommendation, which had proposed to put more emphasis on the space science project.

The House Subcommittee's decision to cancel the station project against the committee's recommendation was at odds with earlier congressional actions. The House passed a \$15.3 billion NASA authorization bill in the early June 1991 that provided full funding for the station. The Senate Commerce, Transportation and Science Committee also provided full funding in its version of a \$15.3 billion NASA authori-

---

19. Ibid.

zation.

Though NASA officials, Truly and Thompson met with members of the House Appropriation Committee, which was expected to act on the recommendations of its subcommittee the Administration's strategy was to focus efforts on the Senate.

An editorial column in the New York Times in its 6 June, 1991 issue commented that House should vote to eliminate any future spending on NASA's proposed space station. It even criticised the House effort to scaling down of the project which could have resulted in the "station's inability to offer anything".<sup>20</sup>

So, the congressional mood on the Report's several recommendations was quite uncertain partly because of the legislators' constituent interests in the space programme and partly because of uncertainty over the future space activities after the cold war. The "post-Soviet" space

---

20. The New York Times, 6 June 1991.

programme was still expected to be a factor in future space activities, because how much funding the Commonwealth of Independent States (CIS) planned to invest in space, remained to be seen and analysed.

Constrained budgets throughout the world had already pushed countries increasingly into cooperative agreements for many space activities, which fitted well into the committee's recommendation for "international pursuits". That trend could be expected to continue and thus the Congress was watching to see what opportunities would arise.

#### **4.3 International Opinion**

Even the reactions of the America's international partners in the space programme were not in favour of rejecting the Augustine Committee's recommendations. For instance, Japanese Government angered that its participation in the proposed space station was threatened by congressional budget cuts, issued unusually blunt and direct warning that it might refuse to contribute billions of dollars to American led "big science" projects in coming years unless

plans to build vast outpost in space remained intact.

In view of this eminent danger, the Administration started focusing on the Senate, where there was a considerable support for the space station because the favourable Senate position on station would have prevailed in a conference between the two chambers because of its international character.

The reaction of European Space Agency (ESA) was also swift to the news of the House action to cancel the station project. ESA Director General Jean Marie Luton wrote a strong worded letter to the Vice-President Quale, stressing that the station had long been the cornerstone of ESA's long-term space plan. "Major progress and investment, [have] already been made in providing the European contribution," he said. All of this should have been clear to members of Congress and other authorities involved in funding decision, Luton said in the May 21 letter, copies of which went to Secretary of State James A. Baker and Truly, the NASA Administrator.

Augustine Committee's recommendations were fully supported by Luton, who told Quale that the station "commands importance at the highest political levels in Europe, and any dilution of the recommendations would amount to breach of faith among international partners in space activities. That the fate of single highest research and development component of the American space programme was threatened "at this last stage" was difficult to understand, he said.

Furthermore, Luton said that ESA was firmly committed to the project and urged Quale to every effort to ensure that funding was obtained to achieve the bold "but necessary goal of achieving a permanent manned infrastructure in space", and so the need was to follow the recommendations of the Committee's Report at least the part which proposed for a state funding. Any fluctuation on the funding would adversely affect the international cooperative commitment.

All these accounts indicated that Augustine Committee's Report received wide acceptance from various quarters wheth-

er it be the press, or the Congress or the international partners of U.S. space programme. Despite certain moves to cancel the space station, the major recommendation of the Report prevailed upon the congressional decision, which resulted in the scaled down space station. The resultant opinions on the Report clearly emphasised upon the need to restructure and revitalise NASA and accept other recommendations as well.



## CHAPTER 5

### CONCLUSION

The civil space programme, one of the most highly visible activities of the United States government, was in crisis in the Summer of 1990 due to a rash of serious problems. The space shuttle, which had not flown for nearly three years after the 1986 Challenger disaster that took the lives of seven astronauts, was grounded anew due to a rash of unexplained fuel leaks. The \$1.6 billion Hubble Space Telescope, launched with great fanfare in the Spring, was unable to function properly due to a flaw in its primary mirrors. Finally, and perhaps most troubling, critics had argued that the civil space programme seemed to lack direction with the result that Congress, sensitive to the huge budget deficit, the weakening domestic economy, and unmet needs at home, declined to appropriate any money for the new venture. The civil space, NASA was being criticised as a fossilized, overcautious and bureaucratic organization. That, it was not equipped to manage large, complex pro-

grammes or to argue creditably for the space agenda on Capital Hill.

These scathing criticisms prompted the appointment of a blue-ribbon White House panel, headed by Norman Augustine, the Chairman and chief executive officer of Martin Marietta, to prescribe remedies for what was perceived to be a faltering U.S. space capability.

By proposing several recommendations to improve NASA's internal functioning and to redirect its emphasis on space science project, the Committee proved to bring a fresh lease of life for the U.S. civil space agency, NASA which earnestly needed a fresh package of official patronage and opportunities for its revival.

In the changed international scenario, the Committees's recommendations had a far reaching effect on the America's relationships with other nations in the space-activities. This effect was reflected in the Report's most dramatic recommendations for eventually phasing out the space shuttle

and downsizing the space station. The Committee also dealt with the issues concerned with human resources management, organizational culture and structure, especially headquarters field relationships, systems management capabilities, procurement and contract administration, and the balance between big and small projects.

The recommendations were largely seen as an effort to reorient NASA's activities towards its primary mission -- scientific advancement and technology development. In order to do that the Committee recommended for a more research oriented NASA, founded on more stable funding, a scaled back space station, a new heavy-lift launch vehicle for unmanned payloads and a space shuttle that emphasised scientific studies.

Despite charges being levelled against the Augustine Committee Report as being "a report by the friends of NASA" or "a cover-up bid", the report had been sometimes critical of NASA's certain wasteful expenditure such as in the space-shuttle programme. For that the Committee recommended the

eventual phase-out of the shuttle because of its high risk factor and high cost.

Other criticisms levelled against the Report included its inability to describe in detail what sort of new rocket it thought would be best. Similarly the Report had been criticised because of its relative neglect of the importance of Presidential leadership in promoting NASA's objectives because history shows that NASA's largest projects requires presidential decision making at various stages of the development process. It is also evident that the quality of Presidential support (its presence, absence or ambivalence) is probably the "single most important factor in programmes success or failure". Critics also point out that the Report does not explain how NASA can get the resources to carry out the proposed space programme. The Report was, however, also criticised on the ground to America's international relations in space activities.

However, the Committee's most laudable recommendations was to go for a perfectly balanced space programme where

equal emphasis should be given to the "Mission to Planet Earth" which consisted of better living conditions for the human being, environmental protection, and developmental use of space technologies, as well as to the "Mission from Planet Earth" consisting of mainly manned exploration of extra-terrestrial bodies such as Moon or Mars, also termed as Space Exploration Initiative.

Within these parameters we find that the Augustine Committee Report has proved to be a major effort to revitalize NASA, reorient its priorities and redirect its activities in a completely different national and international milieu.

**New Space Policy:**

Although during the presidential campaign, Clinton & Gore pledged to push ahead with the space station, NASA's redesign of the station may actually erode support for the program since a smaller and less capable station will be harder to justify on medical and scientific grounds. Some observers have suggested that the White House's real aim in

ordering the redesign was to set the stage for killing the station.

Whether or not this is true, a softening of White House support could be fatal to the station's prospects. Given Clinton's direct campaign pledge to keep the station and now Russia's involvement in the project, it is unlikely that the White House itself would axe the space station program.

However, based on campaign statements alone, no dramatic changes seem likely in the space program from the new Clinton-Gore Administration. So the major differences appear to be a de-emphasis of military space programs, support for the Advanced Solid Rocket Motor for the space shuttle rejection of the National Launch System, and diminished enthusiasm for the Space Exploration Initiative (the Mars/Moon program). continued support for space science and environmental satellite programs like Mission to Planet Earth seems assured. The key will be how space programs, especially civilian space activities factor into overall Clinton-Gore priorities such as technological competitive-

ness and environmental issues. Even the draft of a new high-level U.S. policy report calls for the redefinition of the U.S. concept of leadership in space, reduction in secrecy surrounding certain military space programmes and a rationalisation of the Government structure that oversees space activities. The report was prepared by a task force created in August 1992 to conduct a broad review of U.S. national space policy after the Cold war.

The group's work followed two studies released in November 1992 on assessments of U.S. industrial base and space launch issues. All of the reports were prepared for the Vice-President's Space Policy Advisory Board.

One of the draft study's recommendations was that the U.S. should rethink its concepts of space leadership.

"The attitude should be changed to one of the U.S. earning leadership rather than proclaiming it."

Another of the report's recommendations is for an overhaul of the government structure overseeing U.S. space

programmes.

How the Clinton-Gore Administration chooses to use space programme will make a significant difference in its future prospects.

### **Future**

The future of U.S. space policy would look fundamentally different in the absence of plans to deploy the station. Since the late 1960s, space analysts have worried that without an inspirational piloted component, the whole space program could be in jeopardy. Yet this fear may be exaggerated. Even without a human presence, NASA would continue to pursue ambitious space science projects that fire the public's imagination by producing new information about the solar system and the universe. A U.S. space policy without a major piloted component could also be harnessed to at least two ideas that are central to the Clinton's administration's long term thinking : technological competitiveness and environmental protection.



Emphasizing NASA's environmental mission can do even more to safeguard the agency's future. During a Senate hearing two years ago, Vice-President Gore argued that the agency's political future will hinge on whether it can help humankind deal with global environmental degradation. If the space station were canceled, the environmental mission would become NASA's most expensive and visible undertaking. Mission to Planet Earth could serve as a sturdy cornerstone for the space program into the next century. And a "green" NASA could continue to inspire scientific interest among young people. NASA's most glamorous days might have passed, but its greatest contribution to life on earth could be made in the years to come, as James A. Michener, a well known author has put it this way in testimony to a House Committee in April 1992.

The space programme...is the one colossal achievement which may well define our culture much in the way, that the pyramids do that of ancient Egypt. We risk great peril if we kill off this spirit of adventure, for we cannot predict how and in what seemingly unrelated fields it will manifest itself.

## ANNEXURE I

### CHRONOLOGY

**1950s** Badly upstaged by the Soviet Union, the United States struggles to establish its space program.

**Oct. 4, 1957**

The Soviet Union launches a 184-pound, unmanned space satellite called Sputnik 1.

**July 29, 1958**

President Dwight D. Eisenhower signs the National Aeronautics and Space Act, creating the National Aeronautics and Space Administration (NASA).

**1960s** U.S.-Soviet rivalry in manned space flight intensifies.

**May 25, 1961**

President John F. Kennedy proposes that the United States commit itself to landing astronauts on the moon before the end of the decade.

**April 12, 1961**

Soviet cosmonaut Yuri Gagarin becomes the first human to fly in space.

**Feb. 20, 1962**

U.S. astronaut John H. Glenn helps narrow the Soviet lead in manned space flight by circling the Earth three times.

**Jan. 24, 1967**

A test model of the Apollo lunar capsule explodes and burns at the Kennedy Space Flight Center, killing astronauts Virgil I. "Gus" Grisson, Edward H. White and Roger B. Chaffee.

**July 20, 1969**

Two astronauts from Apollo II land safely on the moon and return to Earth, fulfilling the mission envisioned eight years earlier by Kennedy.

**July 1969**

Vice President Spiro Agnew proposes that the nation set a goal of making a successful manned mission to the planet Mars by the end of the century.

**1970s** Having met Kennedy's deadline for landing men on the moon, NASA has difficulty finding a new long-range goal in space

**March 7, 1970**

President Richard M. Nixon declares that the U.S. "should not try to do everything at once in space". Alluding to Agnew's July 1969 remarks, he says only that "we will eventually send men to explore the planet Mars".

**1980s** Despite strong support by two presidents, the U.S. space program suffers a serious setback after its worst disaster.

**Jan. 25, 1984**

In his State of the Union address, President Ronald Reagan says he has directed NASA "to develop a permanently manned space station, and to do it within a decade".

**Jan. 28, 1986**

The space shuttle Challenger explodes shortly after liftoff from Cape Canaveral, killing all seven crew members.

**Sept. 29, 1988**

Canada, Japan and the member countries of the European Space Agency sign agreements with the United States to help finance and build the space station proposed by Reagan.

**July 20, 1989**

In a speech marking the 20th anniversary of the first manned landing on the moon, President George Bush says, "We must commit ourselves anew to a sustained program of manned exploration of the solar system - and yes - the permanent settlement of space".

**1990s Budget constraints and the end of the Cold War make NASA increasingly vulnerable to critics of the space program.**

**Dec. 17, 1990**

In its final report, the Advisory Committee on the Future of the U.S. Space Program says NASA "is currently over-committed in terms of program obligations relative to resources available in short, it is trying to do too much, and allowing too little margin for the unexpected".

**Aug. 21, 1993**

Ground controllers at NASA's Jet Propulsion Laboratory lose radio contact with the Mars Observer just as the space craft is due to go into orbit around the planet.

**Dec. 13, 1993**

Astronauts aboard the space shuttle Endeavour return to the Earth after successfully completing their mission to repair the malfunctioning Hubble Space Telescope.

## ANNEXURE II

### List of Witnesses

(Individuals Appearing Before Advisory Committee on the Future of the U.S. Space Program and its Working Groups).

John Aaron	George Abbey	James A. Abrahamsom
Brant Adams	Larry Adams	Clyde Albertgottie
March Albrecht	Arnold D. Aldrich	Buzz Aldrin
Ron Alexander	La Tonya Alexander	Lew Allen
Harold Ammond	Sam Araki	Hugh Arif
Sam Armstrong	Jack Arrison	F. Ron Bailey
Randy Baggett	Brad Baker	Willaim F. Ballhau
Peter M. Banks	Richard W. Barnwell	David Barrett
Reginald Bartholomew	James E. Bartlett	Jeffrey E. Bauer
Robert C. Baumann	Brian Beckman	James Beggs
Joyce Bergstrom	William E. Berry	Mark Bethea
Vincent J. Bilardo	Nancy F. Bingham	David Black
Erich Bloch	Charles	Bofferding
Albert Boggess	Daniel Boorstin	Carl O. Bostrom
Roland L. Bowles	Jeffrey S. Brady	Peter Bracken

Howard Branch	David Brannon	Porter Bridwell
Robert C. Bruce	James O. Bryant	Richard Bunevitch
Bonnie Buratti	Linwood G. Burcher	Peter T. Burr
Antonio Busalacchi	Lucinda Byrne	Gregory H. Canavan
Sandra Cargil	John Casani	Gerhard Casper
Frank J. Cepollina	Norm Chaffee	Moustafa Chahine
Elaine L. Chao	Charles R. Chappell	Michael Chilicki
Ronald Chinnapongse	A. Chutjian	Harlan Cleveland
Thomas Cochran	Aaron Cohen	Ray S. Colloday
James E. Colvard	Michael Comberiate	Dale L. Compton
Davis S. Coombs	Robert S. Cooper	John J. Cox
Harry Craft	Donald Cromer	Ray Cronise
A.P. Croonquist	Philip E. Culbertson	Frank Curran
Richard Darman	Charles R. Darwin	C. Calvin Davis
Rick Davis	Kirk Dawson	Clyde Dease
Hugh Dilion	Duane Dipprey	Peter Doms
Martin J. Donohoe	Regina Dorsey	Jeffrey c. Dozier
Robert E. Eddy	Charles Elachi	Donald Engen
George English	Roy S. Estess	Thomas Everhart
Maxime Faget	Dale L. Fahnestock	David. T. Fahringer

Christine M. Falsetti	James W. Frenbert	Harry B. Finger
Lennard A. Fisk	George Fleming	James C. Fletcher
Charles T. Force	Stuart Fordyce	David Francisco
Rosemary C. Frochlich	Robert Frosch	Cynthia Fry
Michael Fry	Robert Frye	L.L. Fue
Ann Fulton	Randy Furnas	Daryal Gant
Lori Garver	Steven W. Gayle	Riccardo Giacconi
Dawn Gifford	Stan Gill	Otto K. Goetz
William Goldsby	Robert E. Grady	Daniel Gregory
Jerry Grey	Angelo Gus Gustaferra	Denton Hanford
Peggy W. Harmon	Roy V. Harris	Steven A. Hawley
Norman Haynes	Donald P. Hearth	Buzz Hello
Arthur Henderson	Franciso J. Hernandez	John Townsend
Noel Hinnars	Jane Liu	S. Paul Pao
Wendy Holladay	John Logsdon	Sidney F. Pauls
Harry C. Holloway	Rebecca J. Lowe	Vicki Pendergrass
Paul. F. Holloway	William R. Lucas	C. Perigaud
Richard B. Holt	Henry Lum, Jr.	Richard H. Peterson
Stephen S. Holt	Valerie Lyons	Victor L. Peterson
Jay Honeycutt	Christopheher P. Mackay	James Phillips

Ralph M. Hoodless	Robert Mackin	David R. Picasso
W. Ray Hook	Jeremiah J. Madden	Andy Pickett
Thomas J. Horvath	Gray Marsee	Sisi Pillay
Thomas R. Huber	Rebecca McCaleb	Kevin Plank
Kenneth R. Human	Forrest McCarney	Alexander Pline
Carolyn L. Huntoon	Roslyn L. McCreary	Don Polac
Dale Hupp	Helen McConnaughey	Sam Pollard
Willim F. Huseonica	John H. McElroy	Lamont R. Poole
Jeffery C. Hyle	Joseph T. McGoogan	Fred Povinelli
Rene Ingersoll	John L. McLucas	Lonnie Reid
Thomas Irvine	Ann Merwarth	Kerry Remp
Martin H. Israel	James F. Meyers	Leonard Ricks
Roger L. Jenkin	Roger Meyers	William E. Robbins
Linda M. Jensen	Lon F. Miller	Linda Robeck
Michael Johnson	Royce E. Mitchell	Ralph H. Robinson
Stephen Jung	Herbert Mittelman	Neal Rodgers
Said Kaki	Tom Moore	Thomas F. Roges
Samuel W. Keller	David Moore	James T. Rose
Cynthia Kelly	James R. Morrison	Lawrence J. Ross
Eugene L. Kelsey	Walter E. Morrow	Joseph H. Rothenberg



Satish Khanna	George Morrow	C.T. Russell
George H. Kidwell	Bruce Murray	Stephen M. Ruffin
Jenny S. Kishiyama	Thomas J. Murrin	George Russell
Ray Kline	Dale D. Myres	Kurt Sacksteder
John M. Klineberg	Roger Myers	Carl Sagan
Martin A. Knutson	Joyce Neighbors	Vincent V. Salomonson
Chester Koblisky	Norman F. Ness	Stanley Sander
John Koudelka	William C. Nettles	Neal Sanders
Robert Kozar	James C. Newman, Jr.	Stephen P. Sandford
Michael Krainak	Jerry R. Newsom	Pat Scheuermann
Martin P. Kress	Thomas F. Noll	Harrison H. Schmitt
S.M. Krimigis	Jerry R. Newsom	Pat Scheuermann
Donald J. Kutyna	Edward O'Connor	Christopher J. Scolese
Alan Ladwig	Michael O'Neal	John P. Scully
Cynthia C. Lee	Michael Oben	Robert C. Seamans Jr.
Robert B. Lee, III	Arthur F. Obenschain	Michael G. Shafto
Thomas J. Lee	James B. Odom	Willis H. Shapley
Byron P. Leonard	O.J. Orient	Kirk Sharp
Gale Lewis	Angel Otero	Brewster Shaw
LeNoir Lewis	Thomas O. Paine	Joe Shaw

Morris L. Lile	Don Palac	Bruce D. Little
Joshph Shea	James H. Trainor	Thomas A. Shull
Paivi Tripp	Richard J. Siebels	Richard H. Truly
Robert Sieck	Susan Turner	Bill Sikora
Daniel Tweedt	Allan Silver	Donald Urasek
Louis E. Simmons	James A. Van Allen	J.A. Simpson
Joan Vernikos	Joel R. Sitz	Edgar G. Waggoner
James Slavin	Carrie K. Walker	Nancy E. Slavin
Jerry Wall	Mike Smiles	Joayce Wanhainen
L. Dennis Smith	Sandy R. Webb	Gerald Smith
Mark Weislogel	Richard Smith	Martin Weisskopf
Michael D. Smock	Ven Weyers	D. Thomas Snyder
Douglas W. Whipple	Robert Snyder	David R. Whilte
Kenneth A. Souza	John White	Roy Spencer
Lynne White	Joel Sperans	David Whitten
Suzanne Spitz	Alan W. Wilhite	Russ Springham
C. Wayne Williams	Robert Staehle	Charles Williams
Anne K. St. Clair	Keith Wilson	Thomas Stafford
Murray J. Wilson	Angela Stewart	Fred S. Wojtalik
Andrew Stofan	Lowell Wood	Edward C. Stone

Jerry Wood	Anthony Strazisar	Timothy G. Wood
William Strobl	William H. Wood	Robert L. Swain
James Wood	Clarence Cy Syvertson	
John F. Yardley	Steve Szabo	John Yin
Michael E. Tall	Tom Young	John Taylor
V.Zlotnicki	William F. Taylor	Henry N. Zumbrun
Thomas D. Taylor	Samuel M. Tennant	Charles E. Thienel
A.S.W. Thomas	Gene Thomas	Ron Thomas
Walter Thomas	John D. Thompson	J.R. Thompson, Jr.
Marco Toral	Carmen O. Torres-Nisber	

## BIBLIOGRAPHY

- Advisory Committee on the Future of U.S. Space Program,  
Report of the Advisory Committee on the  
Future of the U.S. Space Program,  
(Washington D.C., Government Printing  
Office, 1990).
- Bush, George, "Remarks on the 20th Anniversary of the  
Apollo Moon Landing", Weekly Compilation  
of Presidential Documents, 20 July,  
1989, pp.1128-30.
- Byerly, Radford, Jr. (ed.), Space Policy Reconsidered,  
(Boulder, Co: Westview Press, 1989).
- Carey, John, "The Super Collider Is Science, The Space  
Station is Pork", Business Week, 13  
September, 1993.
- Clarke, I.F., "From Space to Time: Footprints in the Sands  
of Time", Future(Eng.), 25 June, 1990,  
vol.22, pp.515-525.
- \_\_\_\_\_, "From Space the Time: Space, Time and Humankind :  
More A Meditation than A Thesis", Future  
(Eng.), March, 1990, vol.22, pp.181-90.
- Clery, Daniel, "U.S. Space Scientists Look to Europe",  
Science, Washington, D.C., 30 July,  
1993, p.542.

- Callahan, David, "Space Policy for the Future", Technology Review, New York, August-September 1993, pp.60-67.
- Covault, Craig, "NASA Faces Personnel Crisis Long Term Funding Shortage", Aviation Week and Space Technology, New York, 30 February, 1989.
- Dyke, Vernon Van, Pride and Power: The Rationale of the Space Program, (Urbana, IL: University of Illinois Press, 1964).
- Etzioni, A., Moon - Doggle: Domestic and International Implications of the Space Race (Garden City, New York: Doubleday, 1964).
- Giacconi, Paul, Big Democracy (New York: Alfred A. Knopf, 1945).
- Goldin, Daniel S., "The Light of a New Age", Vital Speches of the Day, 1 October, 1992, vol.LVIII, no.24, pp.741-742.
- Hamilton, David, "Space Program: Blueprint for Ambiguity", Science, Washington D.C., 21 December 1990, Vol.250.
- Isbell, Douglas, "Major Shake up of Agency's Field Centers Urged", Space News, 12-18 November, 1990.

Jastraw, R. and Kampelman, Max. M., "Why we still need SDI",  
Commentary, 12 November, vol.94, no.5,  
p.23.

Katz, J.L., "Space Station, Selective Service Spared by  
Senate Panel", Congressional Quarterly  
Weekly Report, 11 September, 1993,  
vol.51, pp.2391-3.

\_\_\_\_\_, "Cloud Over Space Station Lifts; Selective  
Service Salso Saved", Congr. Quarterly  
Weekly Report, 25 September, 1993,  
vol.51, pp.2560-1.

Kanter, Rosabeth Maso, When Giants Learn to Dance, (New  
York: Simon and Schuster, 1989).

Kloman, Erasams H., NASA: The Vision and the Reality (Wash-  
ington, D.C.: National Academy of Public  
Administration, 1986).

Lambright, W. Henry, "Applying Space Technology to Planet  
Earth: A Problem in Developr - User  
Relations", presented at the American  
Society for Public Administration 52nd  
National Conference, in Washington, D.C.  
23-27 March, 1991.

\_\_\_\_\_, "The Augustine Report, NASA, and the Leadership  
Problem", Publica Administration Review,  
Washington D.C., March/April, 1992,  
Vol.52, No.2, pp.192-195.

Levine, Arnold, Managing NASA in the Apollo Era, (Washington: NASA, 1982).

Levine, Arthur L., The Future of U.S. Space Program, (New York: Praeger, 1975).

Levine, Arthur L., "NASA's Organizational Structure: The Price of Decentralization", Public Administration Review, Washington, D.C., March-April 1992, vol.52, no.2, pp.198-203.

\_\_\_\_\_, "the Future of the U.S. Space Program: A Public Administration Critique", Public Administration Review, Washington, D.C., March-April 1992, vol.52, no.2, pp.183-186.

Longsdon, John M., "The Space Shuttle Program: A Policy Failure?", Science, Washington D.C., 30 May, 1986, p.1099.

\_\_\_\_\_, 1988, "Leading through Cooperation", Issues in Science and Technology, Vol.IV (Summer), 1980, pp.43-37.

Mann, P. and Asker, J.R., "Clinton Backs Smaller, Cheaper Space Station", Aviation Week and Space Technology, New York, 21 June, 1993.

\_\_\_\_\_, "NASA Details New Station Plans (Alpha Station)", Aviation Week and Space Technology, New York, 23 August, 1993, vol.139, pp.24-5.

\_\_\_\_\_, "Station Redesign Was a good Decision", Aviation Week and Space Technology, New York, 28 June, 1993, vol.138, p.66.

\_\_\_\_\_, "U.S. Russia Draft History Space Pact (Unified Space Station Based on Freedom & Mir)", Aviation Week and Space Technology, New York, 6 September, 1993, vol.139, pp.22-3.

\_\_\_\_\_, "Supporters of Space Station Endorse U.S.-Russian Effort", Congr. Quarterly Weekly Report, 4 December, 1993, vol.51, p.3310.

Mark, Haw, The Space Station : A Personal Journey, (Durham, North Carolina: Duke University Press, 1987).

Mills, M., "House Still Debating Space Budget", Congr. Quarterly Weekly Report, 24 July, 1993, vol.51, p.1954.

\_\_\_\_\_, "In the End, Space Station's Jobs May Be the Strongest Card", Congressional Quarterly Weekly Report, 6 March, 1993, p.507.

McCurdy, Howard, E., The Space Station Decision: Incremental Politics and Technological Choice, (Baltimore: John Hopkins University Press, 1990).

\_\_\_\_\_, "The Decision to Build the Space Station: Too Weak a Commitment?", Space Policy, November 1988, pp.301-302.



McDougal, Walter A., The Heavens and the Earth (New York: Basic Books, 1985).

Nye, Joseph S. Jr., and James A. Schear (ed.); Seeking Stability in Space, (University press of America, 1987):

NASA Advisory Council, Task Force on International Relations in Space, 12 October, 1987, International Space Policy for the 1990s and Beyond.

NASA, "NASA Contract NASW-4248", July 1990.

Peters, Thomas R., Robert H. Miles, and associates, The Organisational Life Cycle (San Fransisco: Jossey - Bass Publishers, 1987).

Pendick, D., "Clinton Backs Scaled Down Space Station", Science News, 26 June, 1993.

Report of the U.S. Presidential Commission to Investigate the Space-Shuttle Accident, 1986 (Washington, D.C.: USGPO).

Ride, Sally K., Leadership and America's Future in Space : A Report to the Administrator, (Washington: NASA, 1987).

Rosholt, Robert L., An Administrative History of NASA 1958, (Washington: U.S. Government Printing Office, 1966).

Rubin, A.J., "House Panel Cuts NASA Budget. But OKs Space Station Funds", Congr. Quarterly Weekly Report, 18 May, 1991, vol.49, pp.1289-90.

\_\_\_\_\_, "Space Station in Trouble Agrain After Redesign is Attacked", Congr. Quarterly Weekly Report, 18 May, 1991, vol.49, pp.1289-90.

\_\_\_\_\_, Final Report to the Congress, Washington, D.C., 1955.

Sagduv, R. and Nacht, Michael, "Space Policy is Foreign Policy", The New York Times, 26 June, 1993, p.A19.

Saywer, Kathy L., "Can One More Committee Fix the Space Program", The Washington Post, 4 September, 1991, p.417.

Seidman, Harold, 1970, 4th ed., with Robert Gilmour, Politics, Position and Power (New York: Oxford University Press, 1986).

Smith, Maria, S., "Prospects for the Post-Soviet Space Program", CRS (Washington), 1992, 123 SPR, p.6

\_\_\_\_\_, "Prospects for the Post-Soviet Space Program", CRS Report, Washington, 1992, 123 SPR.

- Smith, Garcid S., "Clinton-Gore Space Policy: What to Expect", CRS Report, Washington, 1992, 903 SPR.
- Stevens, William K., "NASA Plans a 'Mission To Planet Earth", New York Times, 25 July, 1992, p. c1.
- Travis, John, "Mars Observer's costly Solitude", Science Washington, D.C., September, 1993, p.1264.
- Van Allen, James, A., "Space Science, Space Technlogy and the Space Station", Scientific American, New York, January, 1986, vol.254, no.1.
- Young, John D., 1986, "James E. Webb and NASA", The Bureaucrat, vol.15, no.3, Fall, 1986.
- Zuckman, J., "Space Station Is Safe for Now, But Finding Fight Goes On", Congr. quarterly Weekly Report, 25 July, 1992, vol.50, p.2177.