Exchange Mail

DATE-TIME 5/21/98 11:21:14 AM

FROM Hamel, Michael A.

CLASSIFICATION UNCLASSIFIED

SUBJECT NPOES agreement [UNCLASSIFIED]

TO vonLipsey, Roderick K.

CARBON_COPY

TEXT_BODY

Rod - Your NPOES memo is very good -- I have a couple suggested edits
for you on the atch docs (I hope these are the edited versions).
I have passed this in for Leon to review and clear. I hope to get this back to you soonest.

Thanks - Mike

TRANSLATED_ATTACHMENT

3602Cover1.doc

May 20, 1998

MEMORANDUM FOR SAMUEL BERGER
KERRI-ANN JONES

THROUGH: NSC/ROBERT BELL
OSTP/DUNCAN MOORE

FROM: NSC/ROD VON LIPSEY
OSTP/JEFFERSON HOFGARD

SUBJECT: Presidential Determination on PDD/NSTC-2 Data Denial Requirement

Purpose
The enclosed memorandum recommends that the President make a determination
regarding the data deniability language in a pending NOAA/EUMETSAT agreement.
PDD/NSTC-2, Convergence of U.S. Polar Orbiting Operational

Environmental
Satellites, requires that the United States "ensure" its ability to deny, in
times of crisis or war, certain meteorological satellite data to unauthorized
users.

Background
PDD/NSTC-2 directed DoD and NOAA to establish a single weather satellite system
to fulfill civil and national security requirements, and accommodate international cooperation. Since 1992, DoD and NOAA have negotiated an agreement
for the cooperative development and operation of such a system with the
17-members of the European Organization for the Exploitation of Meteorological
Satellites (EUMETSAT). This agreement formalizes Europe's role, fills a near
term need for NOAA, and completes the DoD-NASA National Polar Orbiting
Operational Environmental Satellite System (NPOESS) three-satellite constellation, by including a European-financed satellite.

The European satellite provides a low cost way to meet U.S. satellite data
requirements. The USG budgeted to procure, launch, and operate only two of the
three-satellite NPOESS; EUMETSAT will provide the third satellite.

PDD/NSTC-2 states that the NPOESS program shall be conducted in accordance with
the principle that "the United States will ensure [emphasis added] its ability to
selectively deny critical environmental data to an adversary during crisis or war
yet ensure the use of such data by U.S. and Allied military forces." Thus, the USG must certify that the EUMETSAT agreement meets the principle of
PDD/NSTC-2, that data denial will be ensured.

Data denial is addressed in an Annex to the EUMETSAT agreement. Under this
annex, during a time of crisis or war, the USG would request that the Director of
EUMETSAT selectively deny data from U.S. instruments on the European satellite;
the EUMETSAT Director would, in turn, authorize implementation of data denial
modalities. This is the crux of a Presidential determination: Does this

provision meet the PDD/NSTC-2 requirement?

Analysis

* State has raised questions about our ability to "ensure" the EUMETSAT Director will comply with the US request. State is, however, prepared to concur if OSTP/NSC determine that the provisions for data denial are consistent with the requirements that the program "shall be conducted in accordance with" the principle that "the United States will ensure its ability to selectively deny critical environmental data to an adversary during crisis or war yet ensure the use of such data by U.S. and Allied military forces."
* DoD believes the Director of EUMETSAT will act as requested by the USG, and will do so in every instance. As the principal author of the PDD's data denial language, DOD and JCS believe that the agreement is consistent with the PDD and fully satisfies the national security interests at stake.
* NOAA believes that if legal certainty is required by the PDD, it is not obtainable; the USG has advanced the EUMETSAT negotiations as far as they can on this point.
* EXCOM, the Under Secretary-level Executive Committee composed of representatives from Commerce, DOD, and NASA established by the PDD "to ensure that both civil and national security requirements are satisfied in the converged program" are satisfied that national security requirements will be met.
* NATO's Military Committee has formally endorsed NPOESS, the data denial provision, and the EUMETSAT role. Twelve of the seventeen members of EUMETSAT (and all of the major financial backers) are NATO members. Any future conflict or crisis that would require NPOESS and EUMETSAT data denial would almost certainly involve some or all of our NATO Allies.

Additionally, DOD is satisfied that the Annex does not set a precedent that will restrict our ability to satisfy national security requirements in future negotiations. As a practical matter, both State and DOD agree that

EUMETSAT
would comply with U.S. requests to deny data to adversaries during crisis or war.

NSC and OSTP note that while the PDD appears to contemplate legal certainty, the
agreement provides practical confidence that the principal of data denial
requirement would be carried out as intended.

Recommendation

That you sign the attached memorandum to the President finding that the Annex to
the NOAA-EUMETSAT Agreement sufficiently meets the PDD/NSTC-2 requirement to
ensure data denial.

_____Agree _____Disagree

Concurrence by: OVP/Fuerth

Attachments
Tab I Memorandum for the President
Tab A Annex to NOAA-EUMETSAT Agreement
3

3602

TRANSLATED_ATTACHMENT 3602I1.doc

ACTION

MEMORANDUM FOR THE PRESIDENT

FROM: SAMUEL BERGER

KERRI-ANN JONES

SUBJECT: Presidential Determination on PDD/NSTC-2 Data Denial Requirement

PURPOSE

To determine that the data denial provisions in a pending NOAA/EUMETSAT agreement meets the PDD/NSTC-2 requirement that the United States "ensure" its ability to deny, in times of crisis or war, certain meteorological satellite data to unauthorized users.

BACKGROUND

PDD/NSTC-2 directed NOAA and the DoD to converge their meteorological satellite systems. Their plan links two U.S.-owned satellites with a third owned and operated by EUMETSAT, a consortium of 17 European states. The EUMETSAT satellite will carry U.S. instruments whose environmental data, during crisis or conflict, will be particularly important.

The conditions of EUMETSAT's participation are covered in a bilateral agreement negotiated by NOAA. The agreement's Annex defines those conditions under which data from U.S. instruments on their satellite would be selectively denied in response to a PDD/NSTC-2 provision that, "The U.S. will ensure its ability to selectively deny critical environmental data to an adversary during crisis or war."

STATE questions whether the EUMETSAT Annex sufficient meets the requirement to "ensure" data denial. DOD believes the Annex is sufficient and meets the PDD intent; thus STATE and NOAA have requested a White House determination. Since the requirement for data denial stems from a Presidential Directive, we advise a formal Presidential determination on the suitability of the data denial language in the agreement with EUMETSAT.

In terms of legal certainty, it is not clear that the language in this Annex
ensures data denial, because the physical action must be carried out by EUMETSAT
after a U.S. request to its Director. As a matter of policy, however, all agencies agree that the current language meets the intent of the PDD.

We believe it is appropriate for you to affirmatively find that the current
language in the EUMETSAT Agreement Annex is sufficient with respect to the PDD's
principle of ensuring our ability to deny data to adversaries.

RECOMMENDATION

That you approve the Annex language is sufficient to meet the data denial
requirements set forth in PDD/NSTC-2.

Approve _____

Disapprove _____

Attachment
Tab A Incoming Correspondence

2

3602

cc: Vice President
Chief of Staff

Exchange Mail

DATE-TIME 12/24/2000 7:07:38 AM

FROM Black, Steven K. (VP)

CLASSIFICATION UNCLASSIFIED

SUBJECT Final Report on Space [UNCLASSIFIED]

TO Alexander, Bretton S. (OSTP)
Villhard, Victor J. (OSTP)

CARBON_COPY

TEXT_BODY

Brett,
Don't know if this will work. I did it twice on Friday afternoon, and Systems and I gave up after an hour of trying to reconstruct my file. If this doesn't work, I'll have to give you a paper copy of changes on pages 6, 28, 29 and 30.

TRANSLATED_ATTACHMENT

Final Report - OVP comments.doc

CLINTON ADMINISTRATION ACCOMPLISHMENTS IN SPACE

A Final Report to the President on
U.S. Activities in Space

Office of Science and Technology Policy
National Security Council

Executive Office of the President
January 2001

Contents

SPACE ON THE NATIONAL AGENDA

"For over three decades, the United States has led the world in the exploration and use of outer space. Our achievements in space have inspired a generation of Americans and people throughout the world. We will maintain this leadership role by supporting a strong, stable and balanced national space program that serves our goals in national security, foreign policy, economic growth, environmental stewardship and scientific and technical excellence."

¾ National Space Policy, September 16, 1996

Shortly after taking office in 1993, President Clinton was faced with a major decision of profound consequence for the future of the Nation's space program: the fate of Space Station Freedom. Over budget, behind schedule, and still on the ground, Space Station Freedom survived Congressional attempts to kill it by only one vote. It was clear that it would not survive without drastic changes.

The space station program was an international partnership, whose failure would have stark consequences not only for the future of space exploration, but also for U.S. technological leadership and credibility as a global partner. At the same time, the Cold War had just ended, our competitor in the Space Race, the Soviet Union, was no more; its vast, highly accomplished space program was adrift.

In a series of bold steps, President Clinton reinvigorated the space station program, establishing stringent design and cost goals. Under Vice President Gore's leadership, the President welcomed Russia into the 13-nation partnership; a constructive emblem of cooperation, not competition.

Over the next five years, seven of our astronauts would spend a total of 919 days aboard the Russian space station Mir, gaining invaluable experience in international space operations while reducing health and safety risks for future astronauts. At the end of this Administration, the International Space Station¾the largest international scientific cooperative project in history¾is

under assembly on orbit, having begun a new era of a permanent human presence in space.

Importance to the Nation

Our Nation's activities in space improve the quality of our lives, each and every day. Weather forecasting is vital to agriculture and to mitigating the costly, often deadly effects of serious weather. America's space telecommunications infrastructure is vital to our economy, enabling the use of pagers, bank ATMs, and credit cards virtually anywhere. Space technology is also central to efforts to understand the impact of human activity on the global climate. At the same time, our Nation's space program is also a cornerstone of our national security, providing information superiority to our leaders and our troops around the world.

Recognizing the importance of space to the Nation was only the start. This Administration's real accomplishments in space are embedded in the meaningful and realistic goals and priorities established by the President's National Space Policy, the effective implementation of these policy priorities through real programs and initiatives, and the real budgets fought for and attained to enable these activities in support of our Nation's goals.

Clear Goals, Priorities, and Program Direction

Every President since Dwight D. Eisenhower has recognized the importance of our Nation's activities in space and issued a National Space Policy. During the first term of the Clinton Administration, the President established a series of Presidential Decision Directives (PDDs) addressing space-related matters, including an overarching National Space Policy. (See Appendix.) Based on the cumulative experience of the United States in space, these Presidential policies establish clear national-level goals, priorities, and direction for U.S. space activities, addressing a broader range of topics in a more comprehensive manner than any that have come before.

Significantly, the Administration's space policies are the first in our nation's history to have been built without the Cold War providing the monolithic international backdrop. The post-Cold War era has brought opportunity, but added complexity as well. Recognizing the cross-cutting nature of space technology, these policies encourage cooperation among the civil, military, intelligence, and commercial space sectors while also encouraging international cooperation. Several directives provide direction and establish agency roles for specific capabilities like space transportation and remote sensing, and individual programs such as the Global Positioning System (GPS).

In addition, national space policy presents a bold vision for NASA to advance the

exploration, use, and development of space and our understanding of the Earth, the solar system, and the universe.

Fiscal Responsibility and an Agency Transformed

The achievements of the past eight years have come in an era of severe budgetary pressure. In fiscal year 1992, the Federal budget deficit peaked at $290 billion, with far-reaching implications for government spending on discretionary programs. Following eight consecutive years of fiscal discipline instituted by this Administration, the Federal budget had a surplus of $237 billion for fiscal year 2000, representing a significant improvement in our Nation's financial health.

In 1992, the National Aeronautics and Space Administration (NASA) budget request for fiscal year 1993 was $15 billion and its budget plan assumed growth to $21 billion by fiscal year 1998. In an effort to get our Nation's fiscal house in order, however, budget increases in discretionary programs, including NASA, were unrealistic.

Today, NASA is better poised to accomplish its vision than at any time since the Apollo era. Under the leadership of Administrator Daniel Goldin, NASA has proven that a government agency can do more with less. Working within stable budgets of between $13 and $14 billion, NASA has reduced the cost of operating the Space Shuttle by more than one billion dollars a year, while at the same time improving safety. Instituting the "faster, better, cheaper" philosophy throughout its activities, NASA is now launching an average of eight scientific spacecraft per year, versus two in 1991, while developing them at one-third the cost and in half the time. NASA has accomplished these significant changes while continuing to focus on its primary objective of operating both the Space Shuttle and the International Space Station safely and reliably.

U.S. leadership in space has been strengthened over the past eight years. NASA has regained its "can-do" spirit; the International Space Station has begun a new era of permanent human presence in space; space activities are more integrated across sector boundaries; and our national security is enhanced through our space infrastructure. The breadth and depth of the Administration's national space policies are the foundation for a strong, stable, and balanced national space program that serves our broader national goals. The foundation has been established for our Nation's exciting future in space.

ACCESSING SPACE

"Assuring reliable and affordable access to space through U.S. space transportation capabilities is a fundamental goal of the U.S. space program."

¾ National Space Transportation Policy, August 5, 1994

The space station was not the only troubled component of our space program at the beginning of the Clinton Administration. Seven years after the Challenger accident, our Nation was still having difficulty implementing its strategy for the development of new launch capabilities critical to our civil, commercial, and national security access to space.

A common joke among space aficionados in the early 1990s was that seventy percent of the Earth's surface was covered by water, and the rest was covered by launch studies. Since the Challenger accident, a number of attempts were made at "clean sheet" development of new expendable launch vehicles. More than $500 million worth of technology demonstrations were conducted in support of the Advanced Launch System (ALS), a joint NASA-Department of Defense (DoD) effort to develop a new, heavy-lift family of launch vehicles. Designed to deploy the massive space segment of President Ronald Reagan's Strategic Defense Initiative, ALS was projected to cost more than $15 billion to develop.

In 1989, under President George Bush, the effort was renamed "NLS," though DoD and NASA differed as to whether this stood for "National" or "New" Launch System. The name change reflected a shift in requirement following President Bush's announcement of a Space Exploration Initiative to send humans to Mars. NLS would also fall victim to conflicting requirements and a high price tag, with the Bush Administration recommending a new development effort, dubbed "Spacelifter." The Nation's strategy for access to space was adrift as the Spacelifter program, too, succumbed to budget pressures.

Evolution and Revolution

In August 1994, President Clinton issued the National Space Transportation Policy (PDD/NSTC-4), providing clear direction for the future of U.S. access to space and bridging the needs of the civil, national security, and commercial space sectors. The National Space Transportation Policy appointed DoD the lead agency for improvement and evolution of the current expendable launch vehicle (ELV) fleet. NASA became the lead agency for technology development and demonstration of next-generation reusable launch vehicles (RLVs), which promise revolutionary improvements in operability and reliability at far lower cost.

As a result of this policy, DoD initiated the Evolved Expendable Launch Vehicle (EELV) program to modernize our Nation's ELV capabilities while lowering costs by

at least 25 percent. Instead of the three major expendable launch vehicles in operation¾Delta, Atlas, and Titan¾only one EELV family of vehicles would be developed at a cost of only $2 billion. As development got underway, the commercial satellite launch market underwent significant growth; launches to geostationary orbit (GEO) jumped from an average of 13 per year from 1991 to 1995, to an average of 21 from 1996 to 1999, and a market demanding launches to low Earth orbit (LEO) emerged for communications constellations.

With a much larger commercial market, both the Department of Defense and U.S. industry favored a new acquisition strategy to develop two new competing EELV families. The Boeing Company is developing the Delta 4, based on a new first stage engine. The RS-68 is the first new significant rocket engine to be developed in the United States since the Space Shuttle Main Engine in the 1970s and has undergone a series of test firings in preparation for the first Delta 4 launch in November 2001. Lockheed Martin is developing the Atlas 5 based on its commercially developed Atlas 3, the first U.S. launch vehicle to incorporate a Russian engine, the RD-180. In a unique, post-Cold War partnership, Pratt & Whitney teamed with Russia's NPO Energomash to develop the RD-180, a half-thrust version of their RD-170 engine, capitalizing on Russia's advanced rocket engine technologies.

Because of the growth in commercial launches, DoD's revised EELV strategy requires the Government to invest only half as much as planned, $1 billion, while industry is investing more than $2 billion of its own resources. Instead of owning and operating launch vehicles, the Government will procure launch services in a commercial-like manner, further reducing the role of Government in launch operations. By improving operability and capacity while reducing cost, EELV is a partnership that benefits both the Federal Government and the commercial sector.

In 1999, the Administration began a focused examination of the ability of the U.S. space launch bases and ranges to effectively meet the Nation's launch needs in light of the larger than anticipated commercial demand. As a result of this assessment, the President approved a national strategy and near-term recommendations to enhance the public-private partnership in the management and use of the two major launch ranges, Cape Canaveral in Florida and Vandenberg in California. The Administration recognized that, for the foreseeable future, there continues to be significant national interest in U.S. Government ownership and operation of the U.S. space launch bases and ranges. This is necessary to preserve access to space for national security, civil, and ballistic missile-related test and evaluation missions and to ensure public safety.

However, the significant shift from government-dominated use of the bases and ranges toward increasing commercial activity, and the growing interdependence of the U.S. government and commercial sectors, necessitate an increased role for the civil and commercial sectors and State-sponsored spaceports in the management of the ranges.

At the same time, NASA, in cooperation with industry, has aggressively pursued technology development and demonstration programs for next-generation reusable launch vehicles, investing more than $1 billion in RLV technology. The goal set by NASA for future RLVs was to achieve a reduction in launch costs by a factor of ten within ten years. These efforts, however, have had mixed results.

NASA's flagship RLV technology demonstration effort, X-33, is more than two years behind schedule. Unveiled in 1996, X-33 was designed to develop and flight test single-stage-to-orbit technologies, including a linear aerospike engine and composite liquid hydrogen tanks. While the linear aerospike engine has been successfully tested on the ground, the composite liquid hydrogen tank failed during a pressure test in 1999, significantly delaying the program. The smaller X-34 was initiated to provide a low-cost, technology test bed to flight test RLV technologies in hypersonic flight regimes. While significant progress has been made on X-34¾including a series of captive carry and tow tests¾the overall management and operations philosophy of the program is being reassessed. Designed to demonstrate a streamlined management approach with a rapid development schedule and limited testing, recent lessons learned from the failed Mars missions and unmanned aerial vehicle programs have prompted a reexamination of the program risks.

Both of these programs are high-risk technology development efforts we have pursued, not in spite of their technical risks, but with full knowledge that they were risky. Only by squarely addressing these risks will we be able to achieve major breakthroughs in reducing the cost of access to space.

The 1994 National Space Transportation Policy asked for a decision "by the end of this decade" on whether to develop a second-generation RLV. In light of the progress still to be made on the X-33 and X-34 programs, the Administration recognized that both Government and industry are not yet ready to proceed with full-scale development of an operational vehicle. Rather, we must continue to reduce technology risks before deciding to develop an operational system. To enable such a decision, the Administration is pursuing the Space Launch Initiative (SLI), a five-year, $4.5 billion investment in technical and business risk reduction activities to enable full-scale development of commercially

competitive, privately owned and operated RLVs by 2005, with operations commencing by 2010. The goal of the Space Launch Initiative is to enable NASA to buy commercial launch services to meet all its access to space needs more safely and economically, including crew and cargo to and from the International Space Station.

In assuring reliable and affordable access to space, the Clinton Administration has set realistic policy goals, created real programs, and backed them with real dollars. The Department of Defense's Evolved Expendable Launch Vehicle program will modernize our Nation's fleet of expendable launch vehicles, reducing launch costs for the Government and making our industry more commercially competitive. In seeking a revolutionary breakthrough in access to space, the President and NASA have established a bold course to address the technical risks necessary to achieve the goal of dramatic reductions in the cost of access to space.

Operating and Improving the Space Shuttle

While efforts were underway to develop new space transportation capabilities, NASA and its space flight operations contractor, United Space Alliance, have significantly improved the Space Shuttle system. Through a series of technical and process improvements, NASA has increased the Shuttle's performance by almost a third, cut ground processing time nearly in half, and reduced operating costs by more than a third, adjusting for inflation. As a result, the cost per pound of payload delivered to orbit has been reduced by half. At the same time, safety has been improved by more than 80 percent according to probabilistic models and the average number of in-flight anomalies has been reduced by a factor of three since 1992.

These process improvements are critical to NASA's support for operation of the International Space Station. Launch windows have been reduced from hours to only two-and-a-half minutes, making on-time launch essential for rendezvous with the Station. The increased performance is also required in order to efficiently re-supply the Station in its high-inclination orbit. Under the Administration's Integrated Space Transportation Program (ISTP), NASA will invest almost $2 billion over the next five years in Space Shuttle improvements to address safety and obsolescence.

A PERMANENT OUTPOST IN SPACE

"The International Space Station represents an important investment in America's

long-term future in science and technology. . . . It also heralds a new era in space cooperation as sixteen nations come together to advance the cause of humankind in the peaceful expanse of space."

¾ Vice President Al Gore, July 26, 2000

One of the first decisions President Clinton made in 1993 was to affirm the Nation's commitment to the International Space Station program, a project of truly historic proportions, involving 16 nations in one of the most exciting and ambitious tasks ever undertaken. At that point in time-almost ten years after the program's inception-$10 billion had already been spent, but not a single pound of flight hardware had been built. Congress came within one vote of canceling the program, and the President could easily have ended it.

Instead, at a time when he had brokered tough spending caps on domestic discretionary programs, the President made the difficult decision to commit $2.1 billion per year to fund its development. President Clinton saw the significant value that could come from converting our Cold War competitors into cooperating partners. To save the space station, President Clinton and Vice President Gore personally intervened with members of Congress and foreign heads of state, on the premise that the International Space Station would involve thousands of Russian scientists and engineers in a program of mutual interest and benefit to the United States and Russia, as well as the station's international partners in Europe, Canada, Japan, and Brazil.

Shuttle-Mir

The first phase of the International Space Station program, and the first step toward full cooperation between the U.S. and Russia in this monumental project, was the Shuttle-Mir program. As the Mercury and Gemini programs prepared the United States for the Apollo missions to the Moon, the five-year Shuttle-Mir program prepared us for one of the most complex projects ever undertaken. In fact, the Shuttle-Mir experience was a dress rehearsal for the more challenging tasks ahead.

Less than three years after agreeing to cooperate in this program, the Space Shuttle Atlantis rendezvoused in orbit with Mir in June 1995. By the end of the ninth Shuttle mission to Mir in June 1998, U.S. astronauts had accumulated a total of 804 days of uninterrupted presence in space and spent a total of 919 days in space aboard Mir, exceeding by almost five months the total time accumulated during more than 100 flights since the beginning of the Shuttle program in 1981. By then, 101 people had visited Mir in orbit-39 Russians (most

for long stays), 45 Americans (most for short stays), and 17 guests from other nations.

During the course of this cooperation, several serious incidents occurred-multiple losses of electrical power and guidance, a fire in February 1997, and a June 1997 collision in space that ruptured the hull of one of Mir's modules-and each led to important and valuable lessons for the International Space Station. These incidents reinforced the idea that the risks of long-duration spaceflight are different than those associated with flying the Shuttle. Perhaps most importantly, the U.S. and Russian space programs came together in an unprecedented show of integration and teamwork.

Challenges Met

As work progressed toward developing the first major elements of the International Space Station, both the U.S. and Russian partners experienced significant difficulties, delays, and cost overruns. Such problems were not completely unanticipated among those who had experience with very large, challenging, and technically complex programs, but they did lead to negative publicity and growing concern about the International Space Station program. The first two elements of the International Space Station-the U.S.-funded, Russian built Zvezda (Star) Control Module and the U.S. Unity Node-were launched and joined together in late 1998. The next element, the Russian Zarya (Sunrise) Service Module, arrived 19 months later in July 2000.

As a result of these delays, some in Congress criticized the Administration for including Russia in the program as a partner, citing Russia's inability to fund the development of its elements as the leading source of delay and added cost for the United States. Sadly, even without these highly publicized delays-due primarily to Russia's economic crisis-the program still may not have been able to progress much faster. While construction in orbit was on hold waiting for Russia to deliver the Zarya Service Module, NASA and its contractors on the U.S. side were using this extra time wisely to find and fix a variety of technical problems it had encountered in building and testing its elements to be sure they would work properly when joined together in orbit.

At the same time, the Administration developed and pursued a contingency strategy to mitigate risks associated with potential Russian shortfalls in delivering its promised elements and servicing missions required to maintain the International Space Station in orbit. Elements of this contingency strategy included developing the Interim Control Module, modifying Space Shuttle orbiters to reboost the International Space Station's orbit, and developing a U.S. propulsion module as

an additional long-term backup capability. Most importantly, the President and the Vice President took every opportunity to engage the leadership of the Government of Russia in focused discussions regarding the importance of delivering the Service Module in a timely fashion, safely deorbiting Mir, and providing the crew and logistics support as promised for the International Space Station.

A Permanent Human Presence in Space

In the seven years since the President's final redesign decision in 1993-in spite of the highly-publicized delays-more than half of the million-pound International Space Station has been built, tested, and is either already operating in orbit or ready for launch in the next few years. The peak funding years are behind us, and more than 90% of development is complete. The U.S. and Russian elements were never brought within 10,000 miles of each other on Earth, but they have been joined and are operating nearly flawlessly in space-a dramatic achievement with much more than symbolic meaning. During the two terms of this Administration, the International Space Station has progressed literally from the drawing board to a fully functional world-class scientific research laboratory with a permanent international crew in space. And the permanent crew arrived in November 2000-three years sooner than had been planned before the Russians were invited to join the program in 1993.

As a result of this progress, we are now entering what is likely to be the busiest period ever in NASA's history. Over the next six years, more than 30 Space Shuttle missions and almost 2,000 astronaut-hours during 160 spacewalks will be required to complete assembly and outfitting of this monumental project. That's more than three times the number of spacewalks that have been performed in the entire 43-year history of human activity in space. With that phenomenal amount of activity and complexity, NASA recognizes the International Space Station as its most challenging adventure ever, including the Apollo program.

The International Space Station represents a quantum leap in our ability to do research in orbit. It will serve as a laboratory for exploring questions in a variety of disciplines, a platform for commercial research, and a springboard for exploration. This capability promises new treatments for diseases, improved proteins and realistic human tissue for medical research, improved powerplants and refineries on Earth, and observations to monitor global change. We are creating the environment for breakthrough discoveries in space and we have pursued policies to make the station available for commercial activities and research. We don't know exactly what we will find, but we can be sure it will

expand our perception and understanding of ourselves, the world, and the universe.

GLOBAL CHANGE, GLOBAL WATCH

"The greater our awareness and understanding of Earth becomes, the better able we are to preserve and strengthen our home planet."

¾ NASA Administrator Dan Goldin, September 14, 2000

At no other time in human history has our ability to impact our surroundings been as great; and at no other time has our ability to understand this impact been as important as it is today. Over the past five years, El Niño and La Niña wreaked havoc with weather patterns throughout the Western hemisphere; is this merely a cyclical weather pattern, or is global climate change to blame? What is the extent and pace of global climate change and the role society plays in that change? How can the negative effects of climate change be counteracted? Space offers a unique vantage point from which to explore these questions. Indeed, it is the only way to truly understand all the factors that contribute to climate change. Obtaining objective, scientific information on a global basis will enable NASA to develop a comprehensive understanding of how the Earth functions as a unified system. This improved understanding, combined with more sophisticated predictive Earth system models, will provide the Government and the public with the information needed to make informed decisions regarding policy on global climate change.

Understanding Our Planet

Under the Clinton Administration, NASA has completely restructured the Earth Observing System (EOS), the centerpiece of NASA's global environmental monitoring program. Through a series of polar-orbiting and low-inclination satellites, EOS conducts long-term global observations of the Earth's surface, atmosphere, and oceans, enabling a vastly improved understanding of the Earth as an integrated system. What once was a single spacecraft with 22 instruments aboard has become a fleet of nine U.S. spacecraft, three international missions, and a series of 10 smaller spacecraft utilizing the latest technological advances as they develop. The result is a dynamic, flexible system with far lower risk.

The spacecraft that comprise the Earth Observing System will provide insight into the atmospheric, oceanic, and environmental processes in greater detail than

previously imagined. The flagship EOS spacecraft, Terra, launched in December 1999, measures the balance of solar energy received by the Earth and the energy reflected and emitted back into space. At any given time, parts of the Earth absorb more energy, such as the tropics, and some absorb less, such as the polar regions; this action drives the circulation of the Earth's atmosphere and oceans. Terra is also creating detailed maps of land surface temperature, emissivity, reflectance, and elevation, and even measures the photosynthetic activity of marine plants, such as phytoplankton, which can help predict the onset of El Niño.

The balance of the Earth Observing System will be launched within the next three years. Companion missions to Terra, like Aura and Aqua, will provide greater understanding of the chemistry and dynamics of the Earth's atmosphere. Aura will provide global surveys of atmospheric constituents from both natural sources, such as biological activity and volcanoes, and man-made sources, such as biomass burning. Aqua will measure atmospheric temperature and humidity profiles, and provide a detailed accounting of water content in clouds, precipitation, sea ice, and soil moisture. Both missions will contribute to vast improvements in weather prediction.

Already, scientists are using these new tools to gain a greater understanding of the complexities of our environment, and the changes it is undergoing. We now understand the mechanics behind the formation of El Niño and La Niña events, allowing forecasters to predict their onset. EOS instruments have precisely measured land surface deformation in the Los Angeles basin and may lead to more accurate earthquake prediction methods. For the first time ever, scientists have completed an approximation of the Earth's energy budget, including an estimate of how much energy is reflected, scattered, absorbed and emitted through the Earth's atmosphere. Today's explorations of the Earth from space are also yielding new tools to enhance agriculture, forestry, fisheries and natural resource management, and urban and transportation planning.

The major changes that affect Earth happen on a global scale. The only way to truly understand all the factors that contribute to climate change is to look at the entire globe at once. Placing world-class remote sensing instruments in space, the Earth Observing System is developing this global view in incredible detail, promising dramatic improvements in our ability to predict weather, react to natural disasters, and understand the Earth's ecosystem and how it is changed by natural and human activities.

EXTENDING HUMANITY'S REACH

"When it comes to exploring space and the unknown, the word 'impossible' is not in our vocabulary. We have always recognized the limitless possibilities of seemingly impossible challenges."

¾ President William Jefferson Clinton, March 5, 1998

Each of us at some point in our lives has probably been taken aback by a spectacular view of the night sky, causing us to marvel at the vastness of the universe as we contemplate our own connection to it. NASA's space science activities seek answers to enduring questions that have captivated humanity since time immemorial. Questions that go straight to the heart of what it means to extend humanity's understanding and reach into the Universe that is so visible and compelling in the night sky; questions like: Are we alone? How did life originate and evolve on Earth? How did our own Solar System develop? Where else might humanity be able to live in the Solar System?

"Faster, Better, Cheaper"

In response to direction from the Clinton-Gore Administration, NASA has revolutionized space exploration by replacing large, complex spacecraft with smaller, more frequent missions. This "faster, better, cheaper" approach to space exploration has allowed NASA to cut average development costs by more than half while nearly quadrupling the number and frequency of scientific missions in space. The Administration's commitment to extending humanity's reach into the solar system and universe is underscored by a doubling of the fraction of NASA's budget devoted to the sciences and technology over the past eight years.

Making the changes to pursue this new approach has not proven to be easy or without peril. There have been high-profile failures along the way, particularly as we've sought to explore Mars-a planet that has continued to surprise, intrigue, and amaze. The losses of the Mars Climate Orbiter, Mars Polar Lander, and Deep Space-2 probes in 1998 and 1999 were disappointing consequences of pushing the envelope in pursuit of the "faster, better, cheaper" approach. While losses such as these are never dismissed, these failures contrast clearly with the loss of the billion-dollar Mars Observer spacecraft in 1993 whose instruments constituted the Nation's entire Mars exploration program. Following these recent failures, NASA adjusted its approach to spacecraft development to account for these painfully-learned lessons. Today, NASA is committed anew to pursuing an even more robust and challenging program of exploration with renewed confidence

and vigor.

"Follow the Water"

There is still excitement and active scientific debate over the announcement in 1996 that a meteorite found in Antarctica may contain fossilized evidence of ancient microbial life on Mars. The Clinton-Gore Administration has made the robotic exploration of the solar system a national priority. The United States had no Mars missions in the works before President Clinton committed to a regular and sustained program of robotic exploration of Mars, with visits planned at every 26-month opportunity. On the 4th of July in 1997, NASA's Mars Pathfinder spectacularly landed on Mars-the first landing on Mars in more than 20 years. The public excitement over NASA's little Sojourner rover drew more visits to this mission's internet website than any other event in history-more than 750 million hits.

NASA's search for life beyond Earth has been aptly described as "follow the water," under the theory that evidence of life elsewhere in the Solar System is most likely to exist where water exists or was present in the past. In June and December 2000, scientists analyzing photographic evidence gathered by the Mars Global Surveyor spacecraft announced two astounding discoveries relating to water on Mars: compelling evidence suggesting recent water flows near the surface of Mars, and the presence of sedimentary rock layers in many locations on Mars, indicating the presence of lakes and seas in the past. Following the Mars mission failures in 1998 and 1999, NASA devised an incrementally more aggressive program to send orbiters and landers to Mars in a science-driven program that allows each subsequent mission to take into account dramatic and surprising discoveries like these, as we continue to "follow the water" in our search for signs of life in the Solar System.

The Administration has also sustained a strong commitment to NASA's exciting series of missions to explore the solar system. NASA's Lunar Prospector detected evidence to suggest the presence of ice on the moon. Other missions, including Galileo and Cassini are treating us to astonishing discoveries about the moons of Jupiter and Saturn, including evidence to suggest there may be an ocean of liquid water under the icy surface of Jupiter's moons Europa and Ganymede. Other missions, like NEAR-Shoemaker and Stardust, are returning astonishing images and new discoveries about asteroids and comets.

Looking Beyond the Vast Reaches

Beyond the solar system, the Hubble Space Telescope and Chandra X-ray observatory astound and amaze the world with stunning images of the universe. Americans and

people the world over are inspired by a beautiful succession of photos that deepen and challenge our understanding of the universe in ways we could not have imagined even ten years ago. Scientists have been rewriting textbooks as a result of the discoveries made possible by the Hubble repairs in 1993 and subsequent servicing missions this Administration has pursued and funded.
The 1996 National Space Policy directs NASA for the first time to identify and characterize planetary bodies in orbit around other stars, where scientists already have found more than 40 planets. The Administration's Origins program includes plans for powerful new space telescopes to discover whether planets orbiting other stars harbor signs of life beyond Earth. Many people point to the Earth-rise image taken by the Apollo astronauts as the most important picture of the 20th century. The most important picture of the 21st century may be of a planet like Earth in orbit around another star. That picture will be taken because of investments this Administration has made.

ENSURING OUR SECURITY
"Space power is as important to the Nation as land, sea, and air power."

¾ Secretary of Defense William S. Cohen, 2000
More than a decade after the end of the Cold War, the United States is the only nation on Earth that retains true global superpower status. Our space capabilities continue to be a cornerstone of our national security, providing information superiority to our leaders and our troops around the world. As we enter the 21st century, the United States has no peer in our ability to use space to enhance our national security.
New Era, New Focus
Over the past eight years, our Nation's national security space program has undergone a dramatic transformation. Since the dawn of the space age, the use of intelligence gathered from space was limited to so-called "national" purposes, i.e., assessing and monitoring the strategic nuclear threat from the former Soviet Union for our national leadership. Today, space-based assets routinely provide communications, imagery, positioning, and battlefield awareness directly to our troops on the ground.
The integration of space capabilities into operations and decision-making during Operation Desert Storm was a watershed event in the military's use of space. The operational utility of space assets to the warfighter¾i.e., the commanders and

soldiers in the field¾was central to our victory against a larger foe on its home territory. Since Desert Storm, direct support for the warfighter has become a priority in the use of our Nation's national security space assets.

The shift from strategic to military use of space also recognizes the changed geopolitical framework of the post-Cold War era¾the United States now faces a variety of threats rather than a single, monolithic adversary. In an environment of sustained military operations around the globe, providing information superiority to the field allows greater flexibility for military commanders to respond to changing events on the ground as they occur, increasing the security of our troops.

The results of this transformation were dramatically demonstrated during NATO's 1999 Operation Allied Force air campaign to stop Slobodan Milosevic's "ethnic cleansing" in Yugoslavia. U.S. aircraft flew about 60 percent of the 38,000 NATO missions over Kosovo, relying heavily on signals from Global Positioning System (GPS) satellites for precise timing and guidance for munitions to accurately attack targets and minimize collateral damage. During Desert Storm, only nine percent of the munitions used were precision guided; by contrast, over 98 percent of the munitions used in Bosnia were precision guided. The United States brought sophisticated space-based capabilities to bear throughout these operations, including high-resolution imagery for targeting, planning, and damage assessment; various types of intelligence regarding enemy forces and defenses; and command, control and communications-particularly back to the United States-to speed the analysis of targeting and assessment information collected during battle.

Leveraging Resources and Capabilities

The redirection of our national security space assets toward supporting the warfighter has occurred at the same time that this Administration has brought fiscal discipline to the Federal budget. To achieve greater efficiency and effectiveness in our Nation's space program, we have eliminated barriers to cooperation among the U.S. military, intelligence, civil, and commercial space sectors. Over the past eight years, we have sought to leverage commercial and civil space capabilities that have utility for military and intelligence applications.

As the commercial use of space has grown dramatically over the past decade, the Administration has leveraged commercial satellite capabilities to help meet our national security needs. Today, commercial telecommunications satellites routinely provide much of our military's communications capacity, adding flexibility and surge capacity to meet rapidly changing requirements. During the

Kosovo campaign, for instance, commercial satellites carried 80 percent of U.S. military communications traffic.

The Administration is also moving to take advantage of the rapidly developing commercial remote sensing industry. In 1994, the Clinton Administration authorized the commercial sale of high-resolution satellite imagery, opening a market to the private sector for what had once been solely the domain of the national security community. The Administration's decision permitted the sale of imagery with a resolution as sharp as one meter, making objects on the ground, such as buildings and automobiles, clearly visible. Second-generation high-resolution systems with resolution as low as 0.5 meters were authorized in November 2000. Both decisions were supported by the defense and intelligence communities.

The emergence of private sector operation of high-resolution remote sensing systems enhances our national security and promotes stability in areas of crisis around the world. Under an Administration initiative, the U.S. Government committed to spend millions of dollars to purchase imagery from the private sector. By using commercial systems to gather routine imagery, U.S. national security space assets will be freed to obtain higher value information. The use of commercial imagery also allows for wider dissemination of up-to-date information to U.S. forces deployed overseas, our international partners, and disaster relief agencies.

The widespread availability of high-resolution imagery worldwide will allow foreign governments to obtain accurate information about the actions of neighboring countries. Too often, regional conflicts are ignited when a country reacts to a perceived threat from a neighbor. Satellite imagery can provide accurate, timely information about countries' activities, thereby reducing uncertainty and easing regional tensions, or by shining the bright light of international attention on provocative actions.

At the same time, the Administration recognized that these systems could also be used by our adversaries to obtain valuable information about U.S. forces deployed abroad. To allay these concerns, the Administration implemented a policy of "shutter control," allowing the Secretary of Commerce to limit the collection or dissemination of imagery following a determination by the Secretary of State or Defense that "national security or international obligations and/or foreign policies may be compromised." No such determination has been made since the first commercial high-resolution satellite, Space Imaging's Ikonos, was launched into space in September 1999. For the second-generation commercial systems, an

additional provision was added prohibiting distribution of imagery until 24 hours after collection, which significantly diminishes the value of satellite imagery in times of armed conflict, when near real-time knowledge of troop movements can provide a sizeable military advantage.

The Administration has also made demonstrable progress in improving the coordination and integration of our national security and civil space capabilities. In February 2000, the Space Shuttle Radar Topography mission collected high-resolution radar data for both national security and civil users, creating a three-dimensional contour map of over 80 percent of the Earth's landmass with unprecedented accuracy. This map will prove invaluable for global national security operations and promises to improve safety during approaches to airports around the world. Another example is President Clinton's decision to set Selective Availability (SA) to zero on the GPS signal on May 1, 2000-five years sooner than promised in March 1996-allowing civil and private sector users to access the most precise GPS timing and navigation signals available while preserving our military advantages.

Reducing the overlap between our Nation's civil and national security space programs has been a priority since the beginning of the Clinton Administration. In May 1994, Vice President Gore announced the convergence of U.S. civil and military weather satellite capabilities under the National Polar-orbiting Operational Environmental Satellite System (NPOESS) program. Conceived by the Vice President, NPOESS will assure our own access to data to meet U.S. civil and national security requirements while encouraging cooperation with foreign governments, consistent with national security requirements, and allowing us to selectively deny critical environmental data to adversaries. As a first step toward convergence, our current fleet of civil and military weather satellites have been operated successfully from a single ground site in Suitland, Maryland since 1997.

Planning for the Future

There is no doubt that space assets are becoming increasingly valuable and important to U.S. decision-making and military operations. The rapid pace of innovation-with improved sensors, computer hardware and software, and communication technologies-makes it imperative to continue investing in advanced technologies to improve our ability to gather, exploit, and disseminate information. To meet the demand for more information to support a wider variety of users, the Clinton Administration has initiated major modernization efforts for each of our current national security satellite programs, including

next-generation GPS, weather, and early-warning satellites, improved communication satellites, and new intelligence collection systems.
In June 2000, the military Joint Chiefs of Staff published Joint Vision 2020, establishing the course for the future of our Nation's military forces. Joint Vision 2020 highlights the importance of information superiority, and reaffirms that space-based capabilities are, and will continue to be, essential to our ability to sustain global awareness, information dominance on the battlefield, and deter conflict. The Department of Defense has also updated its space policy to reflect this new era, noting that "the ability to access and utilize space is a vital national interest because many of the activities conducted in the medium are critical to U.S. national security and economic well-being."
Over the past eight years, the use of space to provide information superiority to our troops in the field has emerged as central to our military's effectiveness. As a result, the Administration has embarked on a sustained effort to modernize our national security space assets, leverage the capabilities now offered by commercial entities, and increase coordination with the Nation's civil space program.

AN ECONOMIC CENTER OF ACTIVITY
"Expanding U.S. commercial space activities will generate economic benefits for the Nation and provide the U.S. Government with an increasing range of space goods and services."

¾ National Space Policy, September 16, 1996
Commercial satellite services impact each of our lives every day. Each time we use a automated teller machine (ATM) at a bank, a credit card, or even a pager, satellites provide the connectivity to make it possible. Today, satellite dishes dot the rooftops of over 15 million homes in the United States, and an additional 50 million homes in Europe and Asia, receiving hundreds of television channels. Commercial satellites are also used by news organizations and cable television providers to transmit video and programming around the globe, bringing the world into our homes every day.
The explosive growth in the commercial use of space over the past eight years has reshaped the space industry. Once dominated by governments, revenues from commercial satellite services now equal spending on space activities by

governments worldwide. Space industry revenues have tripled over the past decade to an estimated $75 billion in 2000¾more than the movie, music, and radio industries in the United States combined. As the leaders in satellite technology, U.S. companies had over $35 billion in revenues in 2000.

A Catalyst for Today's High-tech Economy

Commercial satellites have emerged as a critical link in the global telecommunications infrastructure. Until the mid-1980s, commercial satellites were relatively few in number, and were used mainly for international telephony and video broadcasting. Today, more than 200 commercial satellites in geosynchronous orbit transmit video, data, and telephony across the country and around the world. With the rise of the internet and data communications for consumer and business markets, the telecommunications industry is investing billions of dollars in satellite systems to meet expected demand for broadband data. Satellites are well-suited for point-to-multi-point applications, broadcasting data to millions of users at the same time, as in direct-to-home television.

Public-Private Partnerships or Commercial Convergence

The success of our commercial satellite industry is due in large measure to the continued Government investment in our Nation's space program. Government space programs¾from the first communications satellites to the Apollo lunar program¾succeeded in opening the vast frontiers of space for commercial as well as government use. In fact, the use of commercial satellites by the military to provide over 80 percent of the communications for U.S. forces in Kosovo in 1999 is an excellent example of how Government can now reap the benefits of the commercial industry. To help enable the greater commercial use of space, this Administration has sought to forge public-private partnerships in which the private sector can participate in Government-sponsored programs for mutual benefit.

The most prominent example of such a public-private partnership is the Evolved Expendable Launch Vehicle (EELV) program to modernize the Nation's expendable launch vehicle fleet. Originally designed to meet the Government's requirements alone, the U.S. Government planned to invest $2 billion to develop one launch vehicle family to meet its needs. When the commercial launch market tripled in the mid-1990s to meet the growing demand for satellites, industry offered to invest $2 billion in EELV to develop two new launch vehicles. Industry's investment allowed the Air Force to reduce its own investment from $2 billion to $1 billion. Seeing the potential for an expanded space transportation market,

industry also invested in NASA's X-33 and X-34 experimental programs and a variety of entrepreneurial activities to develop next-generation reusable launch vehicle technologies.

The high cost of access to space¾as much as $10,000 per pound¾is universally cited as a barrier to the use of space for commercial purposes, but it is not the only one. Once on orbit, private companies need the facilities in which to pursue their activities. Now that we have achieved a permanent human presence in space on the International Space Station, we must allow the private sector full access to its capabilities. To do so, NASA has established a standard price list for companies to purchase space for experiments onboard the station, as well as astronaut's time to operate the equipment.

Recognizing Government's central role in the development of space technology, the Administration has also sought to revitalize NASA's role in research and development. In 1992, only 21 percent of NASA's budget went to research and development; today, that has increased to 42 percent and is projected to increase further following completion of the International Space Station. This investment will help establish the foundation for future technologies and capabilities that the commercial sector can exploit for its own purposes.

International Partnerships

The vast shift in the geopolitical landscape that followed the collapse of the former Soviet Union ushered in a new era in commercial space activities, just as it did in government space activities. In the early 1990s, U.S. industry was faced with the very real prospect that the former Soviet space industry would flood the commercial launch services market with large numbers of launch vehicles at below-market prices. Competition, not cooperation, appeared to loom over the horizon.

Soon after taking office, President Clinton and Russian President Boris Yeltsin established the U.S.-Russia Commission on Economic and Technical Cooperation, better known as the Gore-Chernomyrdin Commission (GCC) after its co-chairs Vice President Gore and Russian Prime Minister Viktor Chernomyrdin. One of the first areas the Commission would address was space, endorsing cooperation in both the government and commercial space realms. Instead of competition, cooperation with U.S. partners would define the entrance of Russian space systems on the world market.

The formation of strategic partnerships between U.S. and Russian launch providers has reshaped the international launch services market. Russia's Proton launch vehicle¾once shrouded in secrecy¾is now marketed alongside the U.S. Atlas in a

joint venture between Lockheed Martin and the Proton's Russian manufacturers, Khrunichev and Energia. At the same time, Boeing has teamed with Ukraine's Yuzhnoye, Russia's Energia, and Norway's Kvaerner to form Sea Launch, a joint venture to launch the Ukrainian Zenit with a Russian upper stage from a converted oil rig in the Pacific Ocean. A similar joint venture between France and Russia, Starsem, markets the Russian Soyuz launch vehicle.

The entry of former Soviet launch vehicles on the commercial market was governed by bilateral trade agreements between the United States and Russia and the United States and Ukraine. Designed to prevent disruption of the commercial launch market, the agreements contained quantitative restrictions (known as quotas) and pricing provisions to prevent former Soviet and Chinese launch providers from flooding the market with large numbers of launch vehicles at below-market prices. Adherence to the terms and conditions in the agreements minimized disruption of the industry and allowed the Administration to terminate the agreement with Ukraine in June 2000 and to decide not to restrict Russian participation in the international launch services market upon expiration of the trade agreement on December 31, 2000. These actions are a recognition that we have come a long way toward reaching the President's goal as established in the National Space Policy of "free and fair trade in commercial space launch services."

One of the crown jewels of the Soviet-Russian space program was rocket engine technology. Under a cooperative joint venture, U.S.-based Pratt & Whitney teamed with Russia's Energomash to develop the RD-180 rocket engine, a half-power version of an existing Energomash engine, to be used on a new commercial Atlas. Because of the tremendous capability of this engine, Lockheed Martin proposed its use for the Atlas 5 being developed for the Air Force's EELV program. Mindful of the risks of being dependent on a foreign supplier for critical national security missions, the Administration changed long-standing policy to permit the use of foreign components on U.S. space launch systems, with the stipulation that an independent production capability be established in the United States. [might want to add a sentence describing progress in establishing the production line]

"Space is Our Future"

Most space enthusiasts will agree that the commercial revolution in space is only just beginning. As revenues from commercial space activities have soared over the past decade, entrepreneurs have offered up new ideas and seed money for satellite communications systems, reusable launch vehicles, and even space tourism. As with other areas of commerce, some of these ventures will succeed, and some will not. Scattered among the commercial successes of the last eight years are several

failures which have served as a warning to space entrepreneurs. Perhaps no other event has shaken the commercial space industry more than the failure of Iridium. The world's first global satellite telephony system, Iridium deployed 88 satellites in low Earth orbit and built a network of ground stations at a cost of $5.5 billion. In the course of the ten years it took to develop Iridium, terrestrial cellular telephony experienced phenomenal growth in coverage area, number of subscribers, and quality of service while greatly reducing the price of that service. Once deployed, Iridium could not compete and failed to attract sufficient customers, forcing the company to file for bankruptcy less than a year after entering service.

At the same time, dozens of companies were planning to launch similar global satellite constellations to meet the burgeoning demand for telephony and data. This anticipated boom in the number of satellites being launched prompted several entrepreneurs to begin development of low-cost reusable launch vehicles. Funded by wealthy angel investors and Wall Street financiers, design concepts and test hardware began to take shape. Following Iridium's highly publicized demise, however, the plans of many of these companies have been put on hold or halted. While the ultimate success of any of these endeavors will depend on the growth of the commercial market, the Administration has encouraged Government agencies to work with these entrepreneurial companies, most notably through licensing and regulation activities at the FAA and consideration in NASA's Space Launch Initiative.

Satellite Exports

While the U.S. satellite industry is the world's undisputed leader in technology and innovation, this leadership is now threatened by the imposition of stringent export controls on U.S. manufactured satellites and satellite components. Following allegations of technology transfer to China by U.S. satellite manufacturers in the aftermath of the failures of two Chinese Long March rockets carrying U.S.-manufactured satellites in 1994 and 1996, Congress voted overwhelmingly to transfer the licensing of exports of U.S.-manufactured satellites and satellite components from the Department of Commerce back to the Department of State, from which they had been moved beginning in the Bush Administration. As a result, satellites were reclassified as military items on the United States Munitions List (USML), making the export of commercial telecommunications satellites¾even to U.S. allies and friends¾far more cumbersome, increasing the number of licenses necessary and the time to obtain them.

Since the transfer back to State in March 1999, the share of the international commercial satellite market captured by U.S. manufacturers has dropped precipitously, with Europe's proportion increasing in response. In the mid-1990s, for example, U.S. manufacturers captured an average of 75 percent of the market while in 2000 they won only 45 percent of international satellite tenders. Because of the difficulty in exporting satellite components, European satellite manufacturers have begun switching away from U.S. components to indigenously developed products, further reducing U.S. leadership in satellite technology. Negative perceptions associated with these changes to licensing of U.S. satellites coincided with an increasingly mature European industry. Over the past decade, the quality and sophistication of European satellites has rapidly advanced, reaching near-parity with U.S. manufacturers. As a result, satellite service providers around the world are able to turn to European industry for satellites without suffering a loss of on-orbit capability.
[second paragraph in a row to start with "since"]Since the eruption of this controversy, the Administration was consistent in its opposition to the retransfer of licensing from the Department of Commerce back to the Department of State. Once the transfer went into effect, the Administration worked with the Congress to provide additional funding for the State Department to secure the resources and manpower needed to process license applications in an efficient, timely manner, and to provide fast-track licensing for exports to U.S. allies and friends. While these efforts helped ease the burden on the satellite industry, more must be done to reexamine export policy to permit access to global markets while protecting legitimate national security concerns.

FORGING THE FUTURE
"The 20th century will forever be remembered as the time when we put a man on the moon. Together, we must work to ensure that the 21st Century is the time when we reach even further into our solar system, and beyond it; a time when we reap profound new insights into our own world - from the first light that illuminated the universe, to the forces affecting our global environment in the present day."

¾ Vice President Al Gore,, July 20, 1999
Space is a long-term investment in America's future. In establishing clear direction and priorities, the Clinton-Gore Administration has revitalized our

Nation's space program. NASA stands as a model of effective government, an agency transformed. After years of disarray, the International Space Station went from paper design to a permanent human research capability in space. We have restructured efforts to conduct global environmental monitoring, vastly improving our understanding of the Earth as an integrated system. Looking outward, we have established an energetic, sustained program for exploration of Mars, the solar system, and beyond to the stars. At the same time, space has become an integral part of America's defense, ensuring our national security by providing information superiority to our national leaders and our troops all over the globe.

The next¾and future¾Administrations will no doubt build upon these accomplishments. The challenges they face will test America's leadership in space and demand changes in national policy and direction. Several of these challenges will warrant examination early in the next Administration.

The overall health of the aerospace industry, for example, is the focus of the Commission on the Future of the Aerospace Industry established by Congress. The Commission is expected to examine the impact of industry consolidation, debt, international competition, export controls, and other factors in assessing the state of the U.S. aerospace industry. The goal of this review must be to recommend policy and plans that will enhance our leadership in space technology and the use of space for civil, national security, and commercial purposes.

To meet the challenge of opening space to new activities, no more important goal exists than to reduce the cost of access to space. This Administration has established the groundwork with the Space Launch Initiative, with plans to invest $4.5 billion over the next five years to conduct research and development on critical technologies for next-generation reusable launch vehicles. Government should also explore ways to incentivize U.S. industry to invest in next-generation space transportation capabilities, possibly through the use of loan guarantees, tax holidays, or advance purchasing mechanisms. Lowering the cost of access to space is essential, and promises to revolutionize the future of space.

The Clinton-Gore Administration has been a strong voice for leadership and direction for the United States in space, ensuring that America moves into the 21st century with a strong, stable, and balanced national space program that will benefit all Americans each and every day.

APPENDIX: NATIONAL SPACE POLICY

THE WHITE HOUSE

National Science and Technology Council

For Immediate Release September 19, 1996

FACT SHEET

NATIONAL SPACE POLICY

Introduction

(1) For over three decades, the United States has led the world in the exploration and use of outer space. Our achievements in space have inspired a generation of Americans and people throughout the world. We will maintain this leadership role by supporting a strong, stable and balanced national space program that serves our goals in national security, foreign policy, economic growth, environmental stewardship and scientific and technical excellence. Access to and use of space is central for preserving peace and protecting U.S. national security as well as civil and commercial interests. The United States will pursue greater levels of partnership and cooperation in national and international space activities and work with other nations to ensure the continued exploration and

use of outer space for peaceful purposes.
(2) The goals of the U.S. space program are to:
(a) Enhance knowledge of the Earth, the solar system and the universe through human and robotic exploration;
(b) Strengthen and maintain the national security of the United States;
(c) Enhance the economic competitiveness, and scientific and technical capabilities of the United States;
(d) Encourage State, local and private sector investment in, and use of, space technologies;
(e) Promote international cooperation to further U.S. domestic, national security, and foreign policies.
(3) The United States is committed to the exploration and use of outer space by all nations for peaceful purposes and for the benefit of all humanity. "Peaceful purposes" allow defense and intelligence-related activities in pursuit of national security and other goals. The United States rejects any claims to sovereignty by any nation over outer space or celestial bodies, or any portion thereof, and rejects any limitations on the fundamental right of sovereign nations to acquire data from space. The United States considers the space systems of any nation to be national property with the right of passage through and operations In space without interference. Purposeful interference with space systems shall be viewed as an infringement on sovereign rights.
(4) The U.S. Government will maintain and coordinate separate national security and civil space systems where differing needs dictate. AJI actions undertaken by agencies and departments in implementing the national space policy shall be consistent with U.S. law, regulations, national security requirements, foreign policy, international obligations and nonproliferation policy.
(5) The National Science and Technology Council (NSTC) is the principal forum for resolving issues related to national space policy. As appropriate, the NSTC and NSC will co-chair policy processes.
This policy will be implemented within the overall resource and policy guidance provided by the President.
Civil Space Guidelines
(1) The National Aeronautics and Space Administration is the lead agency for research and development in civil space activities.
(2) NASA, in coordination with other departments and agencies as appropriate, will focus its research and development efforts in: space science to enhance knowledge of the solar system, the universe, and fundamental natural and physical

sciences; Earth observation to better understand global change and the effect of natural and human influences on the environment; human space flight to conduct scientific, commercial, and exploration activities; and space technologies and applications to develop new technologies in support of U.S. Government needs and our economic competitiveness.
(3) To enable these activities, NASA will:
(a) Develop and operate the International Space Station to support activities requiring the unique attributes of humans in space and establish a permanent human presence in Earth orbit. The International Space Station will support future decisions on the feasibility and desirability of conducting further human exploration activities.
(b) Work with the private sector to develop flight demonstrators that will support a decision by the end of the decade on development of a next-generation reusable launch system.

(c) Continue a strong commitment to space science and Earth science programs. NASA will undertake:
(i) a sustained program to support a robotic presence on the surface of Mars by year 2000 for the purposes of scientific research, exploration and technology development;
(ii) a long-term program, using innovative new technologies, to obtain in-situ measurements and sample returns from the celestial bodies in the solar system;
(iii) a long-term program to identify and characterize planetary bodies in orbit around other stars;
(iv) a program of long-term observation, research, and analysis of the Earth's land, oceans, atmosphere and their interactions, including continual measurements from the Earth Observing System by 1998.
(d) In carrying out these activities, NASA will develop new and innovative space technologies and smaller more capable spacecraft to improve the performance and lower the cost of future space missions.
(4) In the conduct of these research and development programs, NASA will:
(a) Ensure safety on all space flight missions involving the Space Shuttle and the International Space Station.
(b) Emphasize flight programs that reduce mission costs and development times by implementing innovative procurement practices, validating new technologies and promoting partnerships between government, industry, and academia.
(c) Acquire spacecraft from the private sector unless, as determined by the NASA

Administrator, development requires the unique technical capabilities of a NASA center.
(d) Make use of relevant private sector remote sensing capabilities, data, and information products and establish a demonstration program to purchase data products from the U.S. private sector.
(e) Use competition and peer review to select scientific investigators.
(f) Seek to privatize or commercialize its space communications operations no later than 2005.
(g) Examine with DoD, NOAA and other appropriate federal agencies, the feasibility of consolidating ground facilities and data communications systems that cannot otherwise be provided by the private sector.
(5) The Department of Commerce (DoC), through the National Oceanic and Atmospheric Administration (NOAA), has the lead responsibility for managing Federal space-based civil operational Earth observations necessary to meet civil requirements. In this role, the DoC, in coordination with other appropriate agencies, will:
(a) acquire data, conduct research and analyses, and make required predictions about the Earth's environment;
(b) consolidate operational U.S. Government civil requirements for data products, and define and operate Earth observation systems in support of operational monitoring needs; and
(c) in accordance with current policy and Public Law 102-555 provide for the regulation and licensing of the operation of private sector remote sensing systems.
(6) The Department of the Interior, through the U.S. Geological Survey (USGS), will maintain a national archive of land remote sensing data and other surface data as appropriate, making such data available to U.S. Government and other users.
(7) The Department of Energy will maintain the necessary capability to support civil space missions, including research on space energy technologies and space radiation effects and safety.
National Security Space Guidelines
(1) The United States will conduct those space activities necessary for national security. These activities will be overseen by the Secretary of Defense and the Director of Central Intelligence (DCI) consistent with their respective responsibilities as set forth in the National Security Act of 1947, as amended, other applicable law, and Executive Order 12333. Other departments and agencies

will assist as appropriate.
(2) Improving our ability to support military operations worldwide, monitor and respond to strategic military threats, and monitor arms control and non-proliferation agreements and activities are key priorities for national security space activities. The Secretary of Defense and DCI shall ensure that defense and intelligence space activities are closely coordinated; that space architectures are integrated to the maximum extent feasible; and will continue to modernize and improve their respective activities to collect against, and respond to, changing threats, environments and adversaries.

(3) National security space activities shall contribute to U.S. national security by:
(a) providing support for the United States' inherent night of self-defense and our defense commitments to allies and friends;
(b) deterring, warning, and if necessary, defending against enemy attack;
(c) assuring that hostile forces cannot prevent our own use of space;
(d) countering, if necessary, space-systems and services used for hostile purposes;
(e) enhancing operations of U.S. and allied forces;
(f) ensuring our ability to conduct military and intelligence space-related activities;
(g) satisfying military and intelligence requirements during peace and crisis as well as through all levels of conflict;
(h) supporting the activities of national policy makers, the intelligence community, the National Command Authorities, combatant commanders and the military services, other federal officials, and continuity of government operations.
(4) Critical capabilities necessary for executing space missions must be assured. This requirement will be considered and implemented at all stages of architecture and system planning, development, acquisition, operation, and support.
(5) The Department of Energy, in coordination with DoD, ACDA and the DCI will carry out research on and development of technologies needed to effectively verify international agreements to control special nuclear materials and nuclear weapons.
(6) Defense Space Sector Guidelines:
(a) DoD shall maintain the capability to execute the mission areas of space

support, force enhancement, space control, and force application.
(b) In accordance with Executive Orders and applicable directives, DoD shall protect critical space-related technologies and mission aspects.
(c) DoD, as launch agent for both the defense and intelligence sectors, will maintain the capability to evolve and support those space transportation systems, infrastructure, and support activities necessary to meet national security requirements. DoD will be the lead agency for improvement and evolution of the current expendable launch vehicle fleet, including appropriate technology development.
(d) DoD will pursue integrated satellite control and continue to enhance the robustness of its satellite control capability. DoD will coordinate with other departments and agencies, as appropriate, to foster the integration and interoperability of satellite control for all governmental space activities.
(e) The Secretary of Defense will establish DoD's specific requirements for military and national-level intelligence information.
(f) The Secretary of Defense, in concert with the DCI, and for the purpose of supporting operational military forces, may propose modifications or augmentations to intelligence space systems as necessary. The DoD may develop and operate space systems to support military operations in the event that intelligence space systems cannot provide the necessary intelligence support to the DoD.
(g) Consistent with treaty obligations, the United States will develop, operate and maintain space control capabilities to ensure freedom of action in space and, if directed, deny such freedom of action to adversaries. These capabilities may also be enhanced by diplomatic, legal or military measures to preclude an adversary's hostile use of space systems and services. The U.S. will maintain and modernize space surveillance and associated battle management command, control, communications, computers, and intelligence to effectively detect, track, categorize, monitor, and characterize threats to U.S. and friendly space systems and contribute to the protection of U.S. military activities.
(h) The United States will pursue a ballistic missile defense program to provide for: enhanced theater missile defense capability later this decade; a national missile defense deployment readiness program as a hedge against the emergence of a long-range ballistic missile threat to the United States; and an advanced technology program to provide options for improvements to planned and deployed defenses.
(7) Intelligence Space Sector Guidelines:

(a) The DCI shall ensure that the intelligence space sector provides timely information and data to support foreign, defense and economic policies; military operations; diplomatic activities; indications and warning; crisis management; and treaty verification, and that the sector performs research and development related to these functions.
(b) The DCI shall continue to develop and apply advanced technologies that respond to changes in the threat environment and support national intelligence priorities.
(c) The DCI shall work closely with the Secretary of Defense to improve the intelligence space sector's ability to support military operations worldwide.
(d) The nature, the attributable collected information and the operational details of intelligence space activities will be classified. The DCI shall establish and implement policies to provide appropriate protection for such data, including provisions for the declassification and release of such information when the DCI deems that protection is no longer required.
(e) Collected information that cannot be attributed to space systems will be classified according to its content.
(f) These guidelines do not apply to imagery product, the protection of which is governed by Executive Order 12951.
(g) Strict security procedures will be maintained to ensure that public discussion of satellite reconnaissance by Executive Branch personnel and contractors is consistent with DCI guidance. Executive Branch personnel and contractors should refrain from acknowledging or releasing information regarding satellite reconnaissance until a security review has been made.
(h) The following facts are UNCLASSIFIED:
(i) That the United States conducts satellite photoreconnaissance for peaceful purposes, including intelligence collection and monitoring arms control agreements.
(ii) That satellite photoreconnaissance includes a near real-time capability and is used to provide defense-related information for indications and warning, and the planning and conduct of military operations.
(iii) That satellite photoreconnaissance is used in the collection of mapping, charting, and geodetic data and such data is provided to authorized federal agencies.
(iv) That satellite photoreconnaissance is used to collect mapping, charting and geodetic data to develop global geodetic and cartographic materials to support defense and other mapping-related activities.

(v) That satellite photoreconnaissance can be used to collect scientific and environmental data and data on natural or man-made disasters, and such data can be disseminated to authorized federal agencies.
(vi) That photoreconnaissance assets can be used to image the United States and its territories and possessions.
(vii) That the U.S. conducts overhead signals intelligence collection.
(viii) That the U.S. conducts overhead measurement and signature intelligence collection.
(ix) The existence of the National Reconnaissance Office (NRO) and the identification and official titles of its senior officials.
All other details, facts and products of intelligence space activities are subject to appropriate classification and security controls as determined by the DCI.
(i) Changes to the space intelligence security policy set forth in the national space policy can be authorized only by the President.
Commercial Space Guidelines
(1) The fundamental goal of U.S. commercial space policy is to support and enhance U.S. economic competitiveness in space activities while protecting U.S. national security and foreign policy interests. Expanding U.S. commercial space activities will generate economic benefits for the Nation and provide the U.S. Government with an increasing range of space goods and services.
(2) U.S. Government agencies shall purchase commercially available space goods and services to the fullest extent feasible and shall not conduct activities with commercial applications that preclude or deter commercial space activities except for reasons of national security or public safety. A space good or service is "commercially available" if it is currently offered commercially, or if it could be supplied commercially in response to a government service procurement request. "Feasible" means that such goods or services meet mission requirements in a cost-effective manner.
(3) The United States will pursue its commercial space objectives without the use of direct Federal subsidies. Commercial Sector space activities shall be supervised or regulated only to the extent required by law, national security, international obligations and public safety.
(4) To stimulate private sector investment, ownership, and operation of space assets, the U.S. Government: will facilitate stable and predictable U.S. commercial sector access to appropriate U.S. Government space-related hardware, facilities and data. The U.S. Government reserves the right to use such

hardware, facilities and data on a priority basis to meet national security and critical civil sector requirements. Government Space Sectors shall:
(a) Enter into appropriate cooperative agreements to encourage and advance private sector basic research, development, and operations while protecting the commercial value of the intellectual property developed.
(b) Identify, and propose appropriate amendments to or the elimination of, applicable portions of United States laws and regulations that unnecessarily impede commercial space sector activities.
(c) Consistent with national security, provide for the timely transfer of government-developed space technology to the private sector in such a manner as to protect its commercial value, including retention of technical data rights by the private sector.
(d) To the extent feasible, pursue innovative methods for procurement of space products and services.
(5) Free and fair trade in commercial space launch services is a goal of the United States. In support of this goal, the United States will implement, at the expiration of current space launch agreements, a strategy for transitioning from negotiated trade in launch services towards a trade environment characterized by the free and open interaction of market economies. The U.S. Trade Representative, in coordination with the Office of Science and Technology Policy and the National Economic Council, will develop a strategy to guide this implementation.
(6) Consistent with Executive Order 12046 and applicable statutes, U.S. Government agencies and departments will ensure that U. S, Government telecommunications policies support a competitive international environment for space-based telecommunications.
Intersector Guidelines
The following paragraphs identify priority intersector guidance to support major United States space policy objectives.
(1) International Cooperation
The United States will pursue and conduct international cooperative space-related activities that achieve scientific, foreign policy, economic, or national security benefits for the nation. International agreements related to space activities shall be subject to normal interagency coordination procedures, consistent with applicable laws and regulations. United States cooperation in international civil space activities will:
(a) Promote equitable cost-sharing and yield benefits to the United States by

increasing access to foreign scientific and technological data and expertise and foreign research and development facilities;
(b) Enhance relations with U- S. allies and Russia while supporting initiatives with other states of the former Soviet Union and emerging spacefaring nations;
(c) Support U.S. technology transfer and nonproliferation objectives;
(d) Create new opportunities for U.S. commercial space activities; and
(e) Protect the commercial value of intellectual property developed with Federal support and ensure that technology transfers resulting from cooperation do not undermine U.S. competitiveness and national security.
(f) In support of these objectives:
(i) NASA and the Department of State will negotiate changes in the existing legal framework for International Space Station cooperation to include Russia in the program along with the United States, Europe, Japan, and Canada; and
(ii) NASA, in coordination with concerned U.S. Government agencies, will explore with foreign space agencies and international organizations the possible adoption of international standards for the interoperability of civil research spacecraft communication and control facilities.
(2) Space Transportation
(a) Assuring reliable and affordable access to space through U.S. space transportation capabilities is fundamental to achieving national space policy goals. Therefore, the United States will:
(i) Balance efforts to modernize existing space transportation capabilities with the need to invest in the development of improved future capabilities;
(ii) Maintain a strong transportation capability and technology base to meet national needs for space transport of personnel and payloads;
(iii) Promote reduction in the cost of current space transportation systems while improving their reliability, operability, responsiveness, and safety;
(iv) Foster technology development and demonstration to support a future decision on the development of next generation reusable space transportation systems that greatly reduce the cost of access to space;
(v) Encourage, to the fullest extent feasible, the cost-effective use of commercially provided U.S. products and services that meet mission requirements; and
(vi) Foster the international competitiveness of the U.S. commercial space transportation industry, actively considering commercial needs and factoring them into decisions on improvements to launch facilities and vehicles.
(b) The Department of Transportation (DoT) is the lead agency within the Federal

government for regulatory guidance pertaining to commercial space transportation activities, as set forth in 49 U.S.C. 701, et seq., and Executive Order 12465. The U.S. Government encourages and will facilitate U.S. private sector and state and local government space launch and recovery activities.
(c) All activities related to space transportation undertaken by U.S. agencies and departments will be consistent with PDD/NSTC-4.
(3) Space-based Earth Observation
(a) The United States requires a continuing capability for space-based Earth observation to provide information useful for protecting public health, safety, and national security. Such a capability contributes to economic growth and stimulates educational, scientific and technological advancement. The U.S. Government will:
(i) Continue to develop and operate space-based Earth observing systems, including satellites, instruments, data management and dissemination activities;
(ii) Continue research and development of advanced space-based Earth observation technologies to improve the quality and reduce the costs of Earth observations;
(iii) Support the development of U.S. commercial Earth observation capabilities by:
-- pursuing technology development programs, including partnerships with industry;
-- licensing the operation and, as appropriate, the export of private Earth observation systems and technologies, consistent with existing policy;
-- providing U.S. Government civil data to commercial firms on a non-discriminator y basis to foster the growth of the "value-added" data enhancement industry; and
-- making use, as appropriate, of relevant private sector capabilities, data, and information products in implementing this policy.

(iv) Produce and archive long-term environmental data sets.
(b) The U.S. Government will continue to use Earth observation systems to collect environmental data and provide all U.S. Government civil environmental data and data products consistent with OMB Circular A-130, applicable statute and guidelines contained in this directive.
(c) The U. S. Government will seek mutually beneficial cooperation with U.S. commercial and other national and international Earth observation system developers and operators, to:
(i) define an integrated global observing strategy for civil applications;
(ii) develop U.S. Government civil Earth observing systems in coordination with

other national and international systems to ensure the efficient collection and dissemination of the widest possible set of environmental measurements;
(iii) obtain Earth observation data from non-U. S. sources, and seek to make such data available to users consistent with OMB Circular A-130, national security requirements, and commercial sector guidance contained in the national space policy; and
(iv) support, as appropriate, the public, non-discriminatory direct read-out of data from Federal civil systems.
(d) The U.S. Government space sectors will coordinate, and where feasible, seek to consolidate Earth observation activities to reduce overlaps in development, measurements, information processing, and archiving where cost-effective and consistent with U.S. space goals.
(i) In accordance with PDD/NSTC-2, DoC/NOAA, DoD, and NASA shall establish a single, converged, National Polar-Orbiting Environmental Satellite System (NPOESS) to satisfy civil and national security requirements.
(ii) NASA, DoC/NOAA, DoD, the Intelligence Community, and DoE shall work together to identify, develop, demonstrate, and transition advanced technologies to U.S. Earth observation satellite systems.
(iii) In accordance with PDD/NSTC-3, NASA, DoC/NOAA, and DoI/USGS shall develop and operate an ongoing program to measure the Earth's land surface from space and ensure the continuity of the Landsat-type data set.
(iv) Consistent with national security, the U.S. Government space sectors shall continue to identify national security products and services that can contribute to global change research and civil environmental monitoring, and seek to make technology, products and services available to civil agencies for such uses. Both unclassified and, as appropriate, classified data from national security programs will be provided through established mechanisms.
(4) Nonproliferation, Export Controls, and Technology Transfer
(a) The MTCR Guidelines are not designed to impede national space programs or international cooperation in such programs as long as such programs could not contribute to delivery systems for weapons of mass destruction. Consistent with U.S. nonproliferation policy, the United States will continue to oppose missile programs of proliferation concern, and will exercise particular restraint in missile-related cooperation. The United States will continue to retain a strong presumption of denial against exports of complete space launch vehicles or other MTCR Category I components.
(b) The United States will maintain its general policy of not supporting the

development or acquisition of space launch vehicle systems in non-MTCR states.
(c) For MTCR countries we will not encourage new space launch vehicle programs which raise questions from a proliferation and economic standpoint. The United States will, however, consider exports of MTCR-controlled items to MTCR countries. Additional safeguard measures could also be considered for such exports, where appropriate. Any exports would remain subject to the non-transfer provisions of the INF and START treaties.
(d) The United States will work to stem the flow of advanced space technology to unauthorized destinations. Executive departments and agencies will be fully responsible for protecting against adverse technology transfer in the conduct of their programs.
(e) In entering into space-related technology development and transfer agreements with other countries, Executive Departments and Agencies will take into consideration whether such countries practice and encourage free and fair trade in commercial space activities.
(5) Arms Control
The United States will consider and, as appropriate, formulate policy positions on arms control and related measures governing activities in space, and will conclude agreements on such measures only if they are equitable, effectively verifiable, and enhance the security

of the United States and our allies. The Arms Control and Disarmament Agency (ACDA) is the principal agency within the Federal government for arms control matters. ACDA, in coordination with the DoD, DCI, State, DoE, and other appropriate Federal agencies, will identify arms control issues and opportunities related to space activities and examine concepts for measures that support national security objectives.
(6) Space Nuclear Power
The Department of Energy will maintain the necessary capability to support space missions which may require the use of space nuclear power systems. U.S. Government agency proposals for international cooperation involving space nuclear power systems are subject to normal interagency review procedures. Space nuclear reactors will not be used in Earth orbit without specific approval by the President or his designee. Such requests for approval will take into account public safety, economic considerations, international treaty obligations, and U.S. national security and foreign policy interests. The Office of Science and Technology Policy, in coordination with the NSC staff, will examine the existing

approval process, including measures to address possible commercial use of space nuclear systems.

(7) Space Debris

(a) The United States will seek to minimize the creation of space debris. NASA, the Intelligence Community, and the DoD, in cooperation with the private sector, will develop design guidelines for future government procurements of spacecraft, launch vehicles, and services. The design and operation of space tests, experiments and systems, will minimize or reduce accumulation of space debris consistent with mission requirements and cost effectiveness.

(b) It is in the interest of the U.S. Government to ensure that space debris minimization practices are applied by other spacefaring nations and international organizations. The U.S. Government will take a leadership role in international fora to adopt policies and practices aimed at debris minimization and will cooperate internationally in the exchange of information on debris research and the identification of debris mitigation options.

(8) Government Pricing

The price charged for the use of U.S. Government facilities, equipment, and service, will be based on the following principles:

(a) Prices charged to U.S. private sector, state and local government space activities for the use of U.S. Government facilities, equipment, and services will be based on costs consistent with Federal guidelines, applicable statutes and the commercial guidelines contained within the policy. The U.S. Government will not seek to

recover design and development costs or investments associated with any existing facilities or new facilities required to meet U.S. Government needs and to which the U.S. Government retains title.

(b) Consistent with mission requirements, NASA and DoD will seek to use consistent pricing practices for facilities, equipment, and services.

(c) Tooling, equipment, and residual hardware on hand at the completion of U.S. Government programs will be priced and disposed of on a basis that is in the best overall interest of the United States while not precluding or deterring the continuing development of the U.S. commercial space sector.

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A Permanent Outpost in Space

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