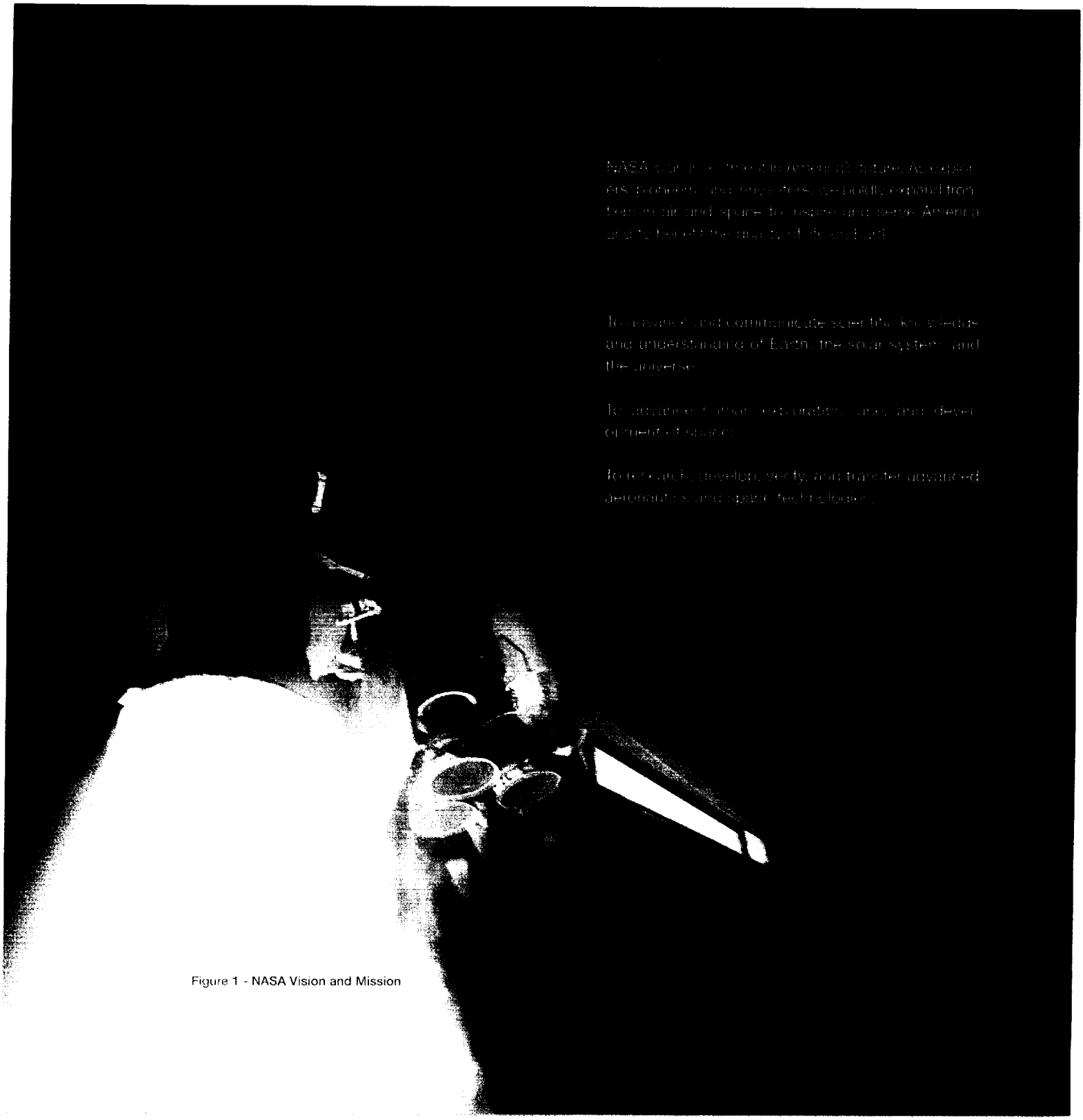


Figure 1 - NASA Vision and Mission

Contents

04 Message from the Administrator

05 Message from the Acting Chief Financial Officer

07 Management's Discussion and Analysis
- 09 NASA Overview
  - 10 NASA Today
  - 16 Verification and Validation
  - 18 Looking Forward—Present Conditions and Prospective Challenges
- 23 Strategic Enterprise and Performance Highlights
  - 24 Space Science
  - 36 Earth Science
  - 46 Human Exploration and Development of Space
  - 60 Aerospace Technology
  - 70 Crosscutting Processes
- 77 Management Systems, Controls, and Legal Compliance

87 Financial Overview, Financial Statements, and Auditors' Reports
- 89 Financial Overview
- 97 Financial Statements
- 127 Auditors' Reports

137 Appendices
- 139 Acronyms
- 143 Illustration Index

Message from the Administrator

For more than 40 years, NASA proudly holds an unparalleled record of accomplishments in science, aeronautics, and space. Our ability to continue to achieve great things increasingly depends on our ability to remember, learn from, and build upon the important lessons of our past, while making safety our number-one priority. Results come from the hard work of the NASA team—employees, contractors, academic researchers, industry, Government, and international partners—and the continued support of the President, Congress, and the public.

Programmatic accomplishments include new understandings in four strategic areas:

- The Space Science Enterprise studies the origin and operations of the universe. Important scientific breakthroughs included the Mars Global Surveyor's discovery of evidence of liquid water on Mars, the NEAR-Shoemaker spacecraft's rendezvous with the asteroid Eros, and the creation of the most detailed map of the early universe, developed by BOOMERANG data.

- The Earth Science Enterprise continues to provide invaluable satellite and aircraft observations that are unraveling the mysteries of Earth system processes. The Shuttle Radar Topography Mission was a breakthrough in the science of remote sensing and produced topographic maps of Earth 30 times as precise as the best global maps in use today.

- The Human Exploration and Development of Space Enterprise made substantial progress toward the ultimate completion of the International Space Station, docking the Zvezda Service Module, and preparing the Station for its first crew, which took up residence in October 2000.

- The Aerospace Technology Enterprise and its general aviation partners demonstrated a low-emission combustor that resulted in reductions in oxides of nitrogen emission levels. The Aircraft Vortex Spacing System, tested in July 2000, was developed to help a pilot navigate by predicting aircraft wake turbulence on final approach.

NASA's achievements, perhaps more so than other agencies, rest in open scrutiny by our customers—the American taxpayers. Our Nation's space program is strong, it is relevant, and it is vital to every American. Through international partnerships, commercial ventures, and customer-driven projects, we will do things in space not possible here on Earth and continue the cutting-edge research in science and technology that will make the missions of tomorrow a reality. We face a new frontier of possibilities and opportunities and, in 2001, our space odyssey is just beginning.

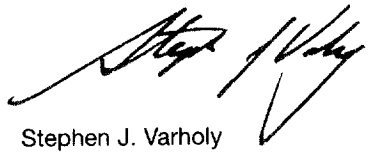
Daniel S. Goldin
Administrator

Message from the Acting Chief Financial Officer

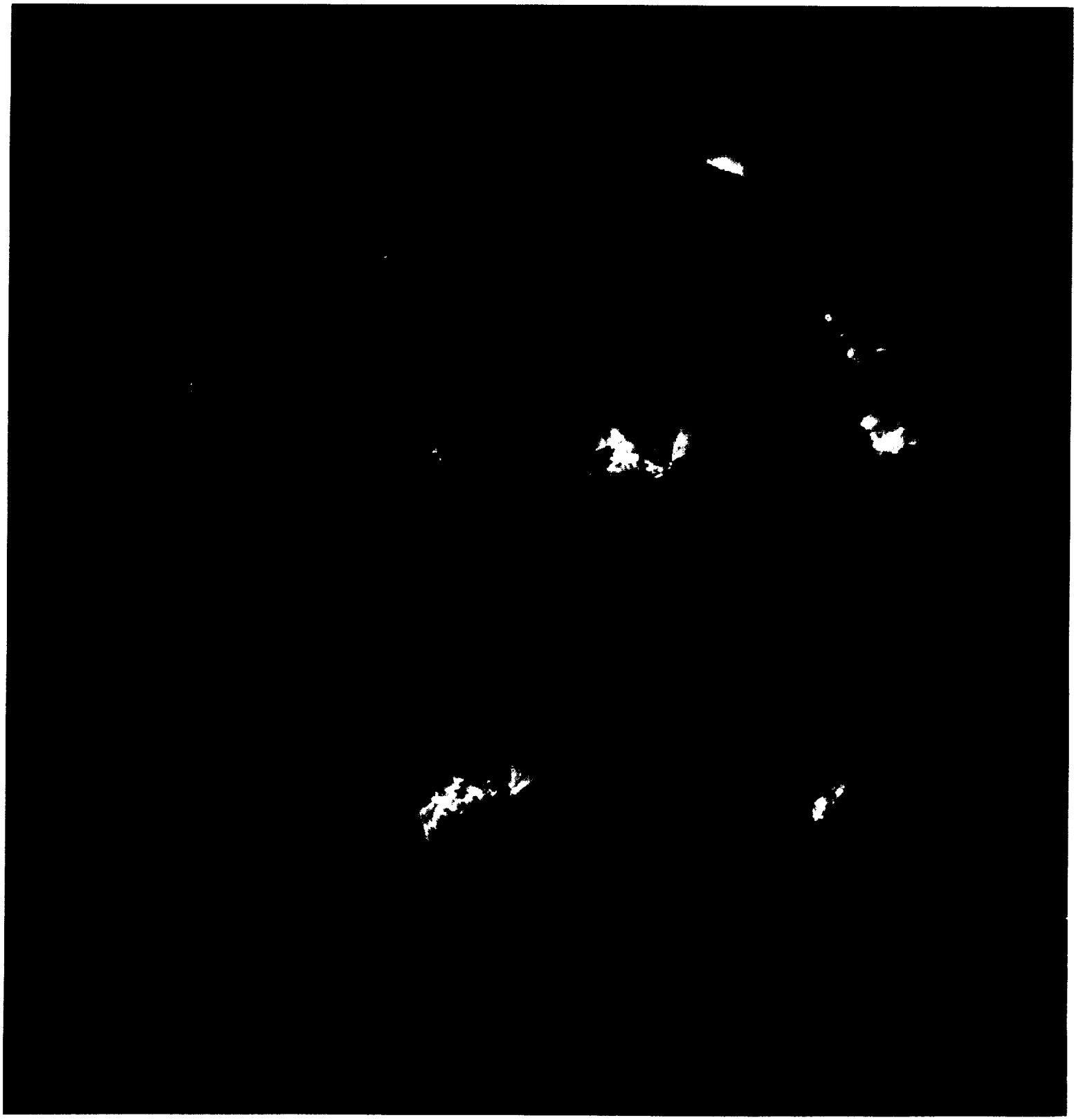
This Accountability Report consolidates reports required by various statutes and summarizes NASA's program accomplishments and its stewardship over budget and financial resources. It is a culmination of NASA's management process, which begins with mission definition and program planning, continues with the formulation and justification of budgets for the President and Congress, and ends with scientific and engineering program accomplishments. The report covers activities from October 1, 1999, through September 30, 2000, with a discussion of some subsequent events. Achievements are highlighted in the Statement of the Administrator and summarized in the Report.

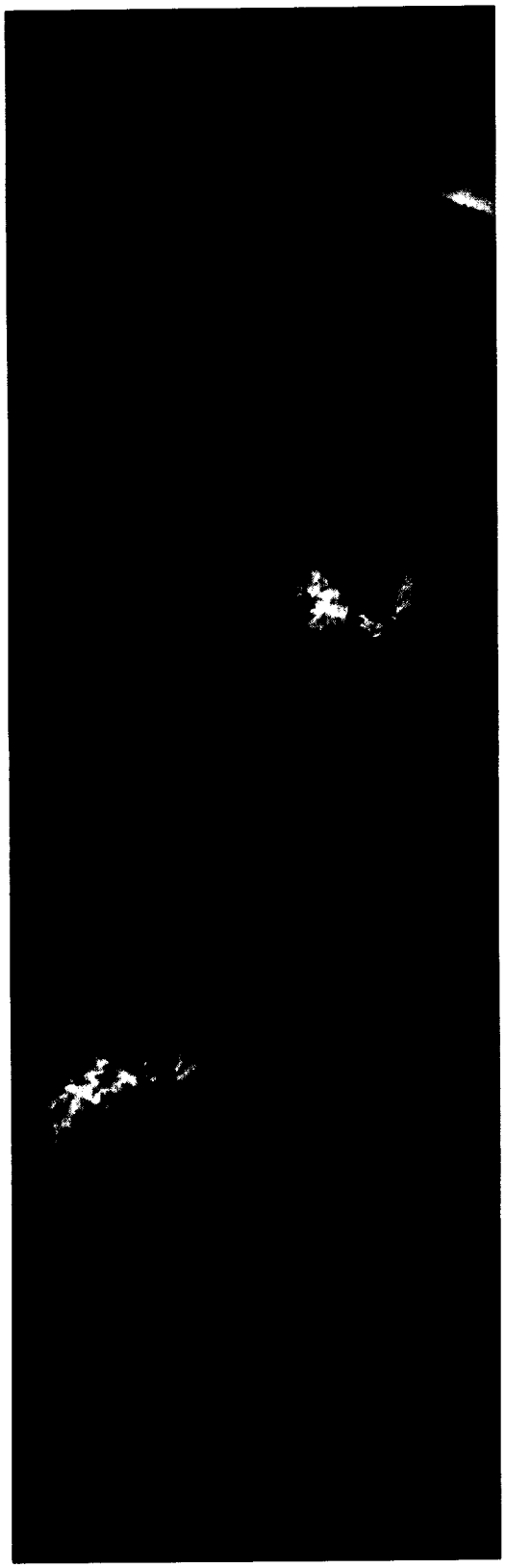
In the past 10 years, there have been more legislative changes in Federal financial management than were made in the previous 50 years. Internal controls have been improved and budget and financial management streamlined. In that regard, NASA's financial management systems substantially comply with the Federal Financial Management Improvement Act. Financial statements were prepared in accordance with Federal Generally Accepted Accounting Principles and reporting instructions specified by the Office of Management and Budget. NASA has received the highest possible financial statement audit ratings (unqualified opinions) on its financial statements for seven consecutive years. The preparation of this Report required the teamwork and dedicated efforts of NASA's staff at Headquarters and the Centers. We appreciate their dedication and professionalism.

The manner by which NASA transacts business in this new century will continue to evolve to take advantage of the most recent developments in technology. As the Agency continues to advance the technologies of space, we will continue to lead innovations and improvements in reporting on the accountability of the Federal Government.

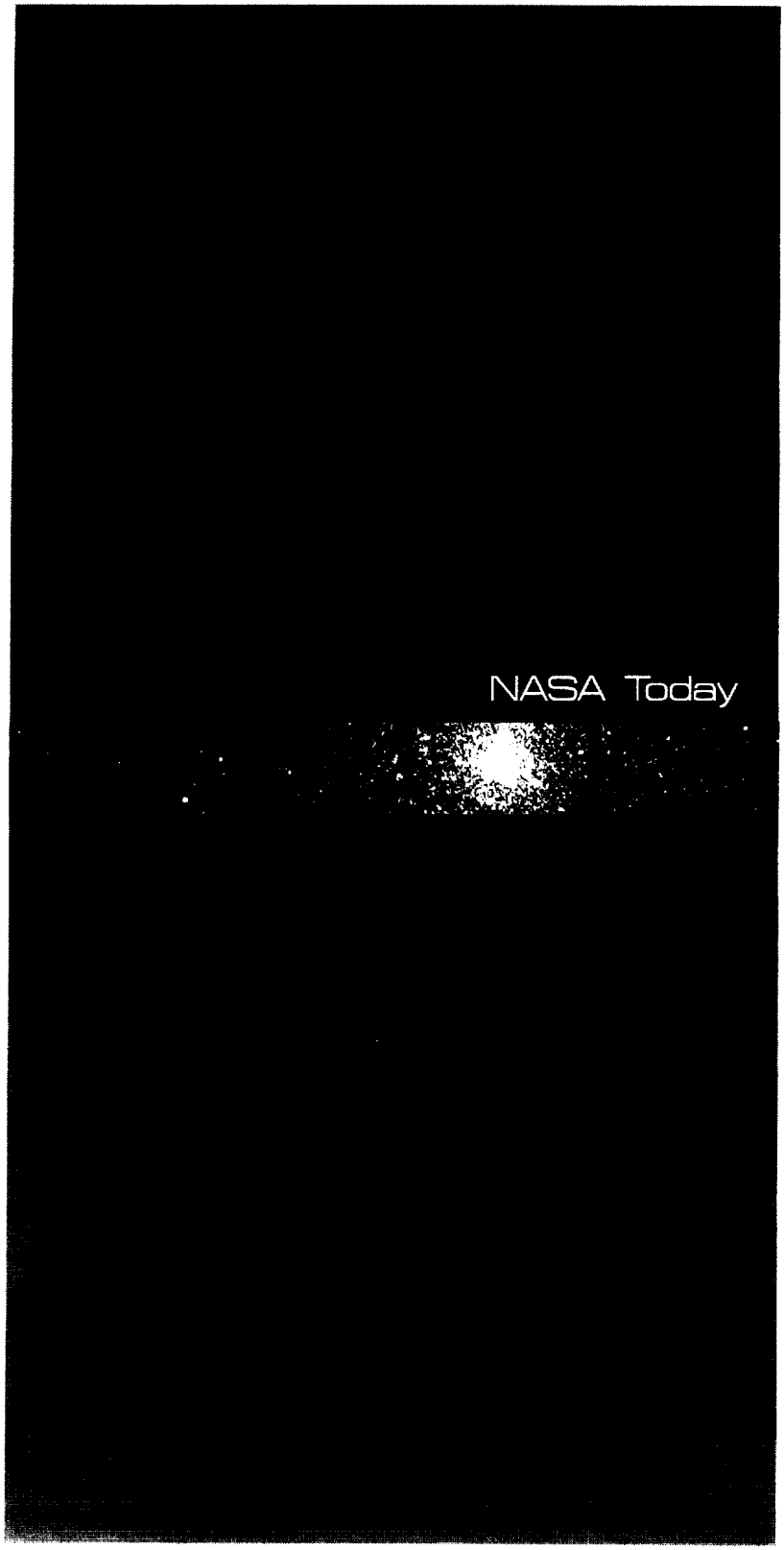


Stephen J. Varholy
Acting Chief Financial Officer





NASA Overview



Since its inception in 1958, NASA has accomplished many great scientific and technological feats in air and space. NASA technology also has been adapted for many nonaerospace uses by the private sector. The Agency remains a leading force in scientific research and in stimulating public interest in aerospace exploration, as well as science and technology in general. Perhaps more importantly, our exploration of space has taught us to view Earth, ourselves, and the universe in a new way. While the tremendous technical and scientific accomplishments demonstrate vividly that humans can achieve previously inconceivable feats, we also are humbled by the realization that Earth is just a tiny "blue marble" in the cosmos.

NASA is a Federal research and engineering Agency that accomplishes most of its space, aeronautics, science, and technology programs through its Centers and contractors across the United States. NASA also owns the facility known as the Jet Propulsion Laboratory (JPL). JPL, a Federally Funded Research

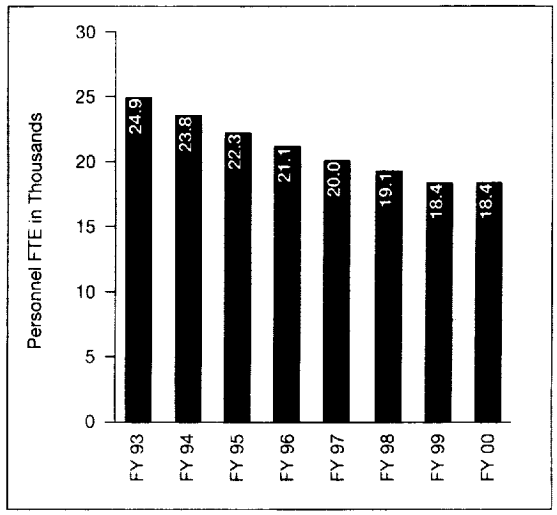


Figure 2 - Personnel FTE

and Development Center (FFRDC), is operated by the California Institute of Technology. In recent years, NASA has carried out its mission (Figure 1) while downsizing and reducing its budget. NASA has reduced its workforce from a high of nearly 25,000 full-time equivalents (FTEs) in FY 1993 to approximately 18,375 FTEs in FY 2000 (Figure 2). Discussion of recent budget trends can be found in the "Financial Overview" section of this Report.

Organization and Structure

The NASA team is a dedicated, skilled, and diverse group of scientists, engineers, managers, and support staff that works cooperatively with industry, academia, other Federal agencies, and the space agencies of other nations. This team is dedicated to achieving NASA's mission while maintaining the

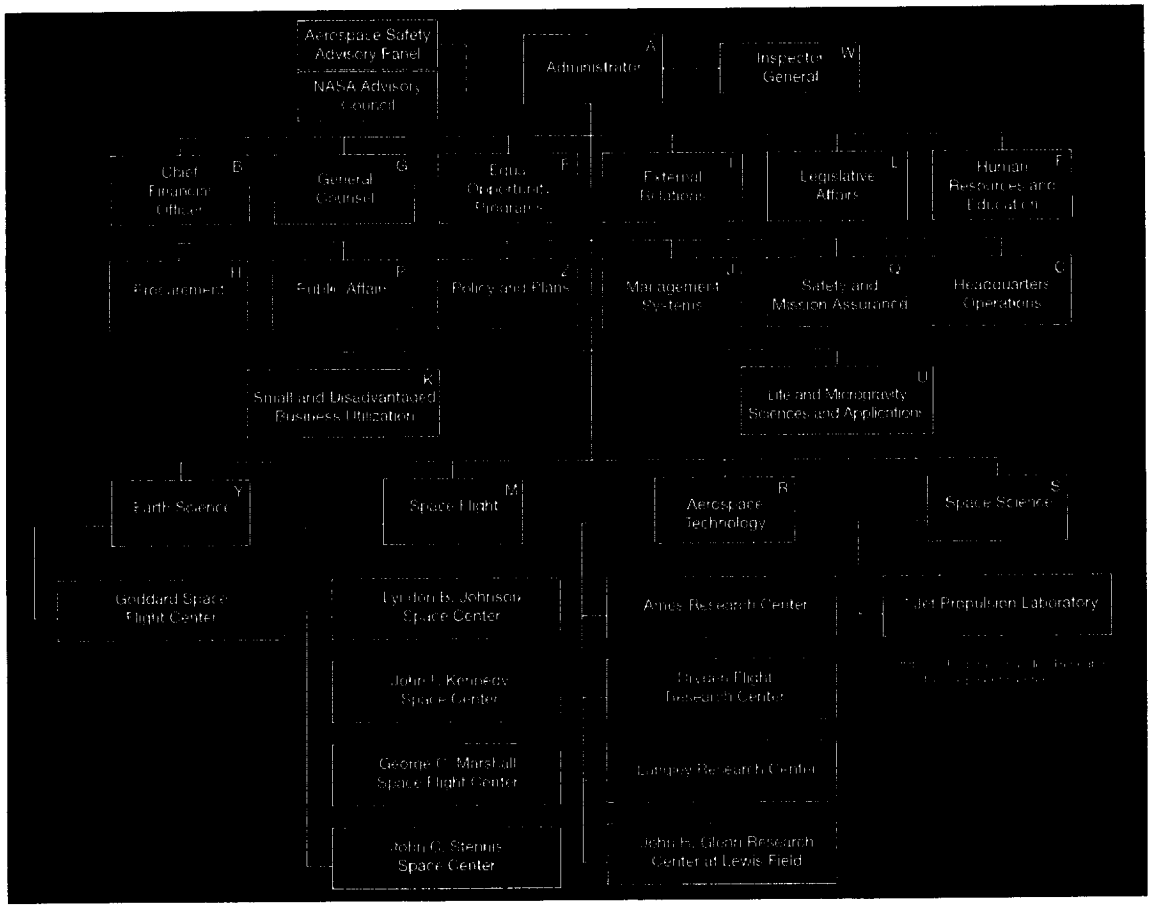


Figure 3 - NASA Organization

strongest possible commitment to safety, efficiency, and integrity.

The Agency consists of Headquarters in Washington, DC, nine Centers throughout the country, and a number of additional installations that support specific Centers (Figure 3). The roles of Headquarters and the Centers are distinct. Headquarters determines what the mission is and explains why it is necessary; the Centers determine how it will be implemented.

Headquarters

Headquarters develops, coordinates, and promulgates Agency policy. It sets program direction at the highest level. Headquarters has primary responsibility for communications with the Administration and Congress and is the focal point for accountability with external entities. It guides and integrates the NASA budget, defines long-term institutional investments, and leads and coordinates Agencywide functions. The Headquarters organization consists of the Office of the Administrator, the four Strategic Enterprises, functional offices, and the Office of the Inspector General (OIG). The Office of the Administrator directs the carrying out of policies approved by the President and Congress, as well as oversees administrative and program management. The Strategic Enterprises have primary responsibility for strategic goals, objectives, and programs and for overseeing the Centers and serving customers. Agency functional offices establish and disseminate policy and leadership strategies in their areas of responsibility. As a group, they serve in an advisory capacity to the Administrator and work in partnership with the Strategic Enterprise Associate Administrators and Center Directors to ensure that activities are conducted in accordance with statutory and regulatory requirements, including fiduciary responsibilities. They also advise the Administrator and Senior Managers of potential efficiencies to be gained through standardization and consolidation and coordinate the implementation of approved initiatives.

Centers

Scientific and engineering work is largely performed at the Centers and the Jet Propulsion Laboratory. Centers carry out the work of the

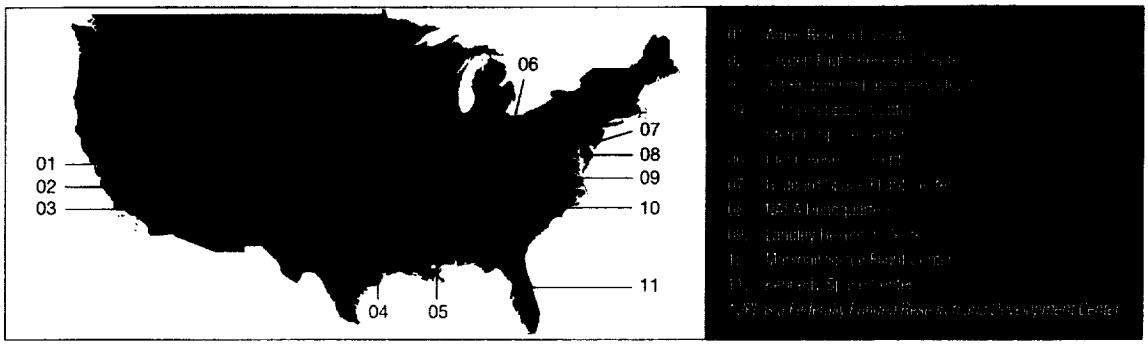


Figure 4 - NASA Centers of Excellence

Enterprises. Each Center has specific mission responsibilities and is responsible for providing certain types of expertise and infrastructure. Centers also are responsible for assigned NASA-wide programs—overseeing their implementation and ensuring that they meet schedule, budget, safety, and reliability requirements. Finally, each Center serves as a "Center of Excellence" for a specific discipline; examples are structures and materials, information technology, and human operations in space. Centers of Excellence shown in Figure 4 not only support immediate program needs, but strengthen long-term capabilities of the Agency and the Nation in critical areas. Additional work is carried out by offsite contractors, the academic community, and international partners.

Programs and Planning

The Strategic Plan describes how we will pursue our vision, implement our mission, and seek answers to fundamental questions of science and technology that provide the foundation for our goals and objectives (Figure 5). In addition to the vision and mission, the strategic architecture consists of four Strategic Enterprises supported by four Crosscutting Processes. The Strategic Enterprises are NASA's primary mission areas. The Crosscutting Processes are common operating principles, coordinated across the Agency, that enhance the return on NASA's work toward diverse programmatic and functional objectives. They are the processes NASA uses to develop and deliver products and services to customers. The Agency's goals and objectives are organized by Strategic Enterprises and Crosscutting Processes.

Strategic Enterprises

The aeronautics and space program consists of a variety of national programs, projects, and activities. Detailed comprehensive program, project, and subproject requirements are consistent throughout the Agency and its systems, including budget and accounting. The Strategic Enterprises are:

- Space Science (SSE)
- Earth Science (ESE)
- Human Exploration and Development of Space (HEDS)
- Aerospace Technology (AST)

It is through the Enterprises that missions are accomplished and we communicate with external customers. For example, Space Science manages the Hubble Space Telescope and current missions to other planets. Earth Science is responsible for the growing knowledge of Earth as a planetary system. Human Exploration and Development of Space is responsible for the Space Shuttle and the International Space Station. Aerospace Technology is responsible for advances in the capabilities and safety of civil aviation, as well as improved access to space.

Note: In FY 2001, NASA established a new Enterprise, the Biological and Physical Research Enterprise, which includes some elements of the previously existing HEDS Enterprise. This Report does not reflect this change because it reports on activities that preceded the reorganization.

Crosscutting Processes

In addition to these Strategic Enterprises, NASA delivers its products and services to customers

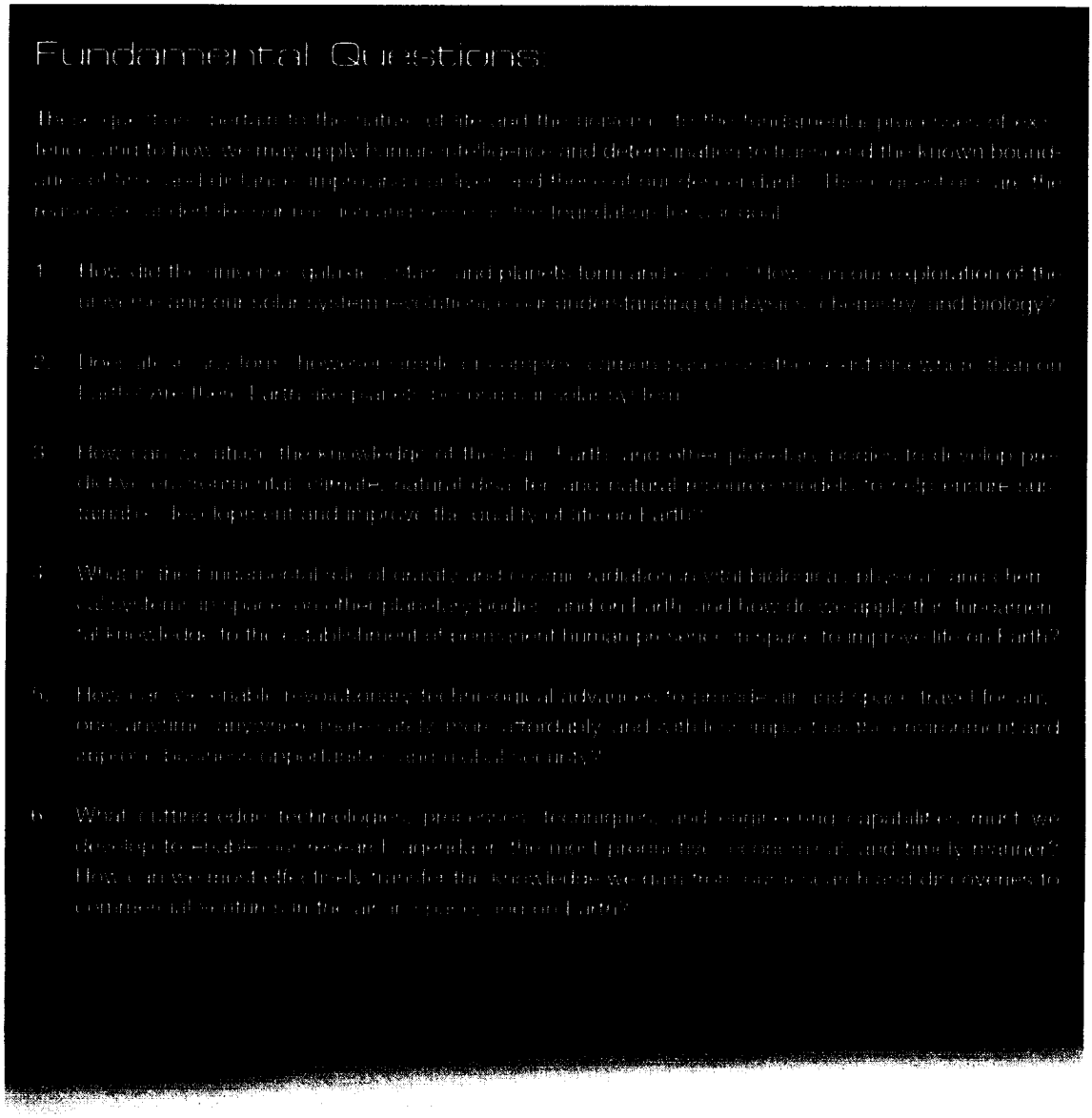


Figure 5 - Fundamental Questions

through four processes that cut across all NASA organizations and have Agencywide impact. The Crosscutting Processes are:

- Manage Strategically
- Provide Aerospace Products and Capabilities
- Generate Knowledge
- Communicate Knowledge

In the face of declining budgets, changes have been made in program emphasis. Budgets have been oriented consistent with strategic planning and missions—explore, use, and enable the development of space; advance scientific knowledge; and research, develop, verify, and transfer space-related technologies. Declining resources have been allocated to mission-related top priorities: safely operating the Space Shuttle, developing and operating the International Space Station, and maintaining a strong program of science and technology development.

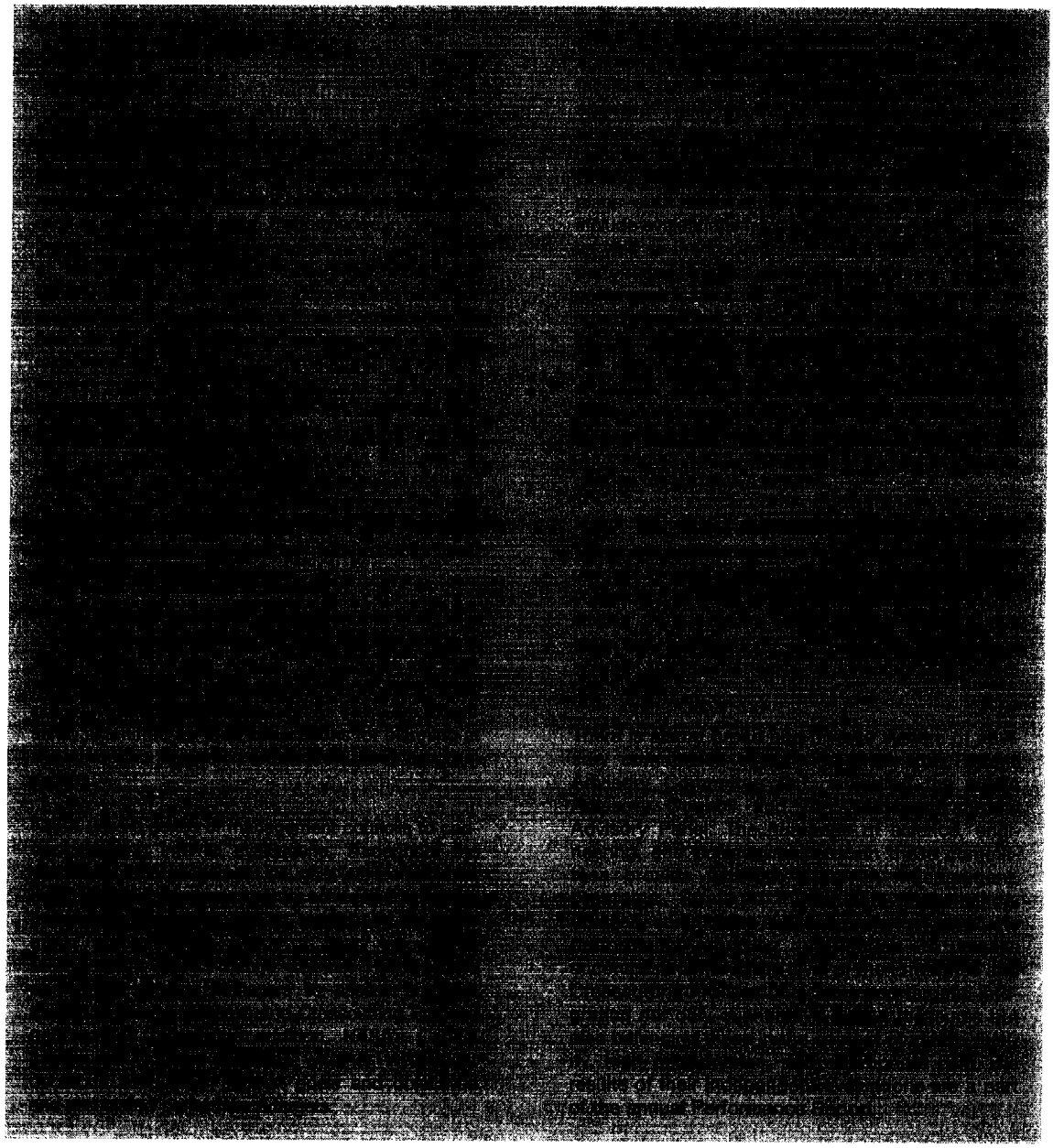
Planning

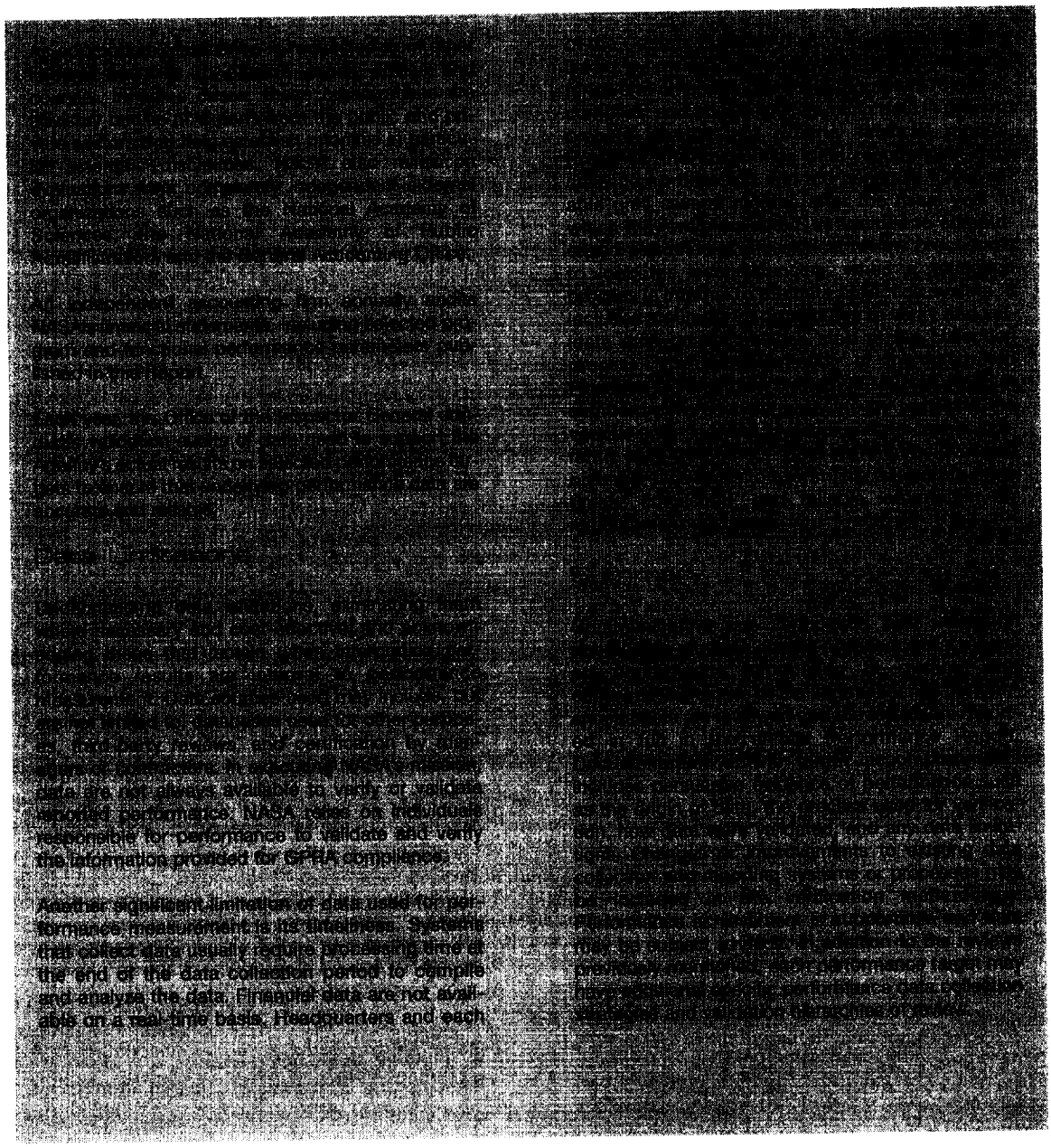
Planning and management processes have been steadily improved, consistent with the Government Performance and Results Act (GPRA). For FY 2000, program and support activities were guided by a comprehensive strategic planning process and strategic management systems documented in the NASA Strategic Management Handbook and the 1998 NASA Strategic Plan with 1999 Interim Adjustments (NASA Policy Directive (NPD) 1000.1a). For an electronic version of this plan and an updated version, published in September 2000, reflecting recent revisions, go to *http://www.hq.nasa.gov* and click on "Strategic Plans" located in the left menu.

The organizational and program structure is aligned with the requirements of customers and stakeholders and integrated with strategic planning, budgeting, performance management, and accounting and reporting activities. Selected measures highlighting performance have been included in this Accountability Report in detail. Progress toward the achievement of goals and objectives is described in the "Strategic Enterprise and Performance Highlights" section. That section provides a summary of accomplishments and selected detailed performance results for each Strategic Enterprise and the Crosscutting Processes. Detailed reporting on all of the performance targets can be found in the FY 2000 Performance Report.

Due to the nature of aeronautics and space research, strategic objectives cannot be attained in a single year (barring unanticipated breakthroughs). As a result, annual performance targets reflect incremental steps toward achieving our long-term strategic goals and objectives. To help bridge the gap between annual activity and ultimate objective accomplishment, NASA is moving toward using higher-level performance targets in its Performance Plans.

In addition, the Strategic Plan includes roadmaps depicting levels of accomplishment below full Agency objectives but above performance targets for any one year. The roadmaps cover near-, mid-, and long-term plans, showing anticipated progress toward achieving goals and objectives over the next 25 years. These goals and objectives are supported by the budget described in the "Financial Overview" section of this Report. Achievement of these goals and objectives over the first quarter of the 21st century will benefit our ultimate stakeholders—the public—and contribute to priorities of the Nation: increasing the understanding of science and technology, protecting Earth's fragile environment, providing educational excellence, achieving peaceful exploration and discovery, and promoting economic growth and security.





Looking Forward

Present Conditions and Prospective Challenges

In considering and discussing the possible future effects of significant existing conditions, it should be recognized that the future is unpredictable and will be influenced by factors outside NASA's control, including actions by Congress. NASA is challenged in finding a "balance" in its initiatives because various dynamics pull in opposing directions. Many of these challenges are not issues for NASA alone, but issues that face the entire Federal Government.

Cutting-Edge Research and Development

NASA's charter is to look to the future. It is charged with constantly "pushing the envelope" in science and technology. By its very nature, this work is unique to every mission and has inherent and sometimes extensive risks. It is difficult to anticipate the possible future effects of current and planned projects and missions because the outcome of those projects is unknown and future discoveries may lead to paths presently not contemplated. NASA is proud of its scientific and technological accomplishments, particularly during the past decade when it faced significant budgetary and workforce reductions. Nonetheless, NASA takes a proactive approach in assessing the present state of the Agency in terms of its people, policies, procedures, and capabilities to discern what is needed to improve in the future.

The Aging of NASA's Infrastructure—Its Facilities and Workforce

Through NASA, the American people have invested in a public aerospace research and development infrastructure consisting of a unique combination of physical resources and human talent. With the huge

space push in the 1960's, NASA's initial "buildup" of facilities was rapid and extensive. Today, however, many of those facilities are aging simultaneously, posing significant management challenges to ensure they continue to meet Agency needs in a dramatically different technological era and operate efficiently and safely. A parallel exists within the demographics of NASA's workforce. Management is challenged by an aging employee population and the continuing potential for the loss of substantial "corporate knowledge" and experience. If these issues are not effectively addressed, the future impact could be a situation in which inadequate facilities and a less experienced workforce could jeopardize the achievement of goals and compromise the Agency's ability to meet the intentions of Congress expressed through the appropriated funds it provides. As shown in the Required Supplementary Information included in the financial statements in this Report, the Agency faces a backlog of maintenance and repairs of its facilities of approximately $1.16 billion. There is no identified source of revenue to fund the cost of performing this deferred maintenance.

NASA's success depends upon having a knowledgeable and skilled workforce, supported by clearly understood processes and methodologies, and armed with the correct tools. Guided by the National Performance Review, the Agency reduced its civil service workforce by 24 percent from FY 1993 through FY 1999, resulting in a loss of "corporate knowledge" and a substantially increased workload for remaining employees. During FY 2000, NASA declared downsizing complete. These changes in practice, skills, and knowledge of the workforce, coupled with the demand for innovation in aerospace science and technology, particularly the revolution in information technologies, present a tremendous challenge.

The entire Federal Government workforce is aging. Recent data show that half of all Federal employees are between the ages of 45 and 60; only 5 percent are 29 and younger. NASA, and the rest of the Government, must prepare for the impending further loss of significant institutional experience and leadership. This need for talent comes at a time when skilled workers are in short supply and private sector opportunities offer significant financial advantages over Federal employment.

Emphasis is now focused on the restructure and revitalization of the NASA workforce to ensure the right sets of skills are in the right places at the right times. The Agency has embarked on a strategy to accomplish its work through a balance of permanent civil service personnel, time-limited civil service appointees, and individuals from the academic world who contribute through postdoctoral fellowships, grant programs, or Intergovernmental Personnel Act assignments. The objective is to draw from a variety of sources to ensure effective use of talent both within and outside the Agency. The use of non-permanent civil service personnel, where it makes sense, can infuse the workforce with fresh ideas and allow changes to be made quickly and efficiently, with minimal adverse impact on the core workforce. The leadership model was updated, specifying the latest cutting-edge skills and behaviors required for effective leadership. As part of the accompanying Learning Strategy Development process, existing leadership and management development programs and processes were realigned and efforts begun to develop new programs and processes to aid in career development of future leaders.

NASA's employees and its partners are the linchpins of its present and future success. NASA must properly invest in the maintenance and professional

growth of its most valuable resources—its human capital. To support the full utilization of the workforce in achieving strategic outcomes, the workforce must have the tools, skills, knowledge, and experience for optimal performance.

Dissemination of Information vs. Security Concerns

While it is part of NASA's charter to disseminate and encourage public access to information, this activity must be balanced with long-standing security requirements and increased security concerns regarding data, technology, and other sensitive areas. NASA continually asks itself, "Is it safe?" Safety and security are linked; training and awareness in these areas are vital. Adequate resources must be invested to ensure that systems, information, technology, and personnel are safe and secure.

Some of the Agency's most dynamic research and missions play an important role in our Nation's security, and there is a responsibility for both sharing and protecting information from those activities and related assets. Substantial reliance is placed upon computers, data, and networks to perform missions. Security training, planning, and sufficient resources are key to ensuring the security and integrity of information technology systems essential to accomplish missions safely and reliably. NASA's relationships with over 80 different countries have helped it realize the goals of its programs. Vigilance must be maintained, however, in restricting access to sensitive material, such as unclassified but export-controlled technical data and industry proprietary information, as well as classified information. Tension exists between the desire to foster collaboration with foreign colleagues and the need to impose constraints on open collaboration in order to protect U.S. technology. This area poses continuing problems for all Government agencies. If the balance between dissemination of information and its security is not effectively achieved, the Agency may not be able to fulfill its charter in the future, resulting in a lack of encouragement for students to pursue science and engineering fields, the compromising of national security, the loss of the Nation's technological competitive edge, increased risks to data and staff, and the inhibition of international cooperation.

Rigorous Risk Management

In March 2000, NASA released reports that were a product of activities initiated in response to failures in some programs and projects, including the Mars program and problems with Shuttle wiring. These independent reviews were conducted to examine problems, search for root causes, and recommend changes. In addition to program-specific assessments, the Administrator recognized a need to assess and respond to findings and recommendations that could be more broadly applied to the wide range of NASA programs and projects. As a result, the NASA Integrated Action Team was established. It defined an integrated plan to address the recommendations and formulated proactive steps to address opportunities for improvement. Significant reformulation activities are under way in a number of program areas. The resulting program adjustments have caused some delays in meeting FY 2000 Performance Plan targets. In most cases, however, the objectives themselves are not in jeopardy—only the anticipated date of accomplishment.

A central theme that emerged from the recent independent reviews involved the issue of risk

assessment. Risk is a part of every NASA mission. As we build and fly more spacecraft deeper into space, we will venture more and more into territory never before explored. NASA has always recognized risk management as a key factor in project management. However, the risks must be identified, assessed, tracked, quantified, managed, communicated, and agreed upon by management, customers, and stakeholders. If not considered, the future effects of this concern could include technical and other program problems that could jeopardize the effective achievement of the mission and, therefore, compromise our ability to meet the intentions of Congress expressed through the appropriated funds it provides.

Acceptance of prudent mission risk that does not compromise safety must remain hallmark to enhance performance that achieves challenging mission objectives while vigorously pursuing cost and schedule improvements.

Full Cost

As is the case with most of the Federal Government, NASA's cost accounting systems were not designed to tie all Agency costs, including civil service personnel and all indirect costs, to its major activities. The current approach does not give project managers full data on, and control over, all costs associated with their projects. Continuation of the status quo would preclude the opportunity for more effective and efficient project management and use of resources in the future.

With the implementation of its new Integrated Financial Management System (IFMS), discussed elsewhere in this Report, NASA also plans to implement full cost practices during the next few years to improve visibility over the use of resources and, through improved cost management, cost-effectiveness of mission performance. The initiative includes policy and practice improvements in the accounting, budgeting, and management areas and is expected to provide complete cost information for more informed decisionmaking. Plans are to associate all costs (including civil service personnel costs) with major projects and to budget, account, report, and manage these activities from a full cost perspective. The future effects of this initiative are expected to provide more visibility into the full cost of programs and projects to improve the matching of costs with performance. While achievement of the complete benefits of the full cost initiative is contingent upon implementation of the IFMS, NASA adopted an interim approach that has provided more cost information for managers than was previously available.

NASA's Future Budgets and Budget Requests

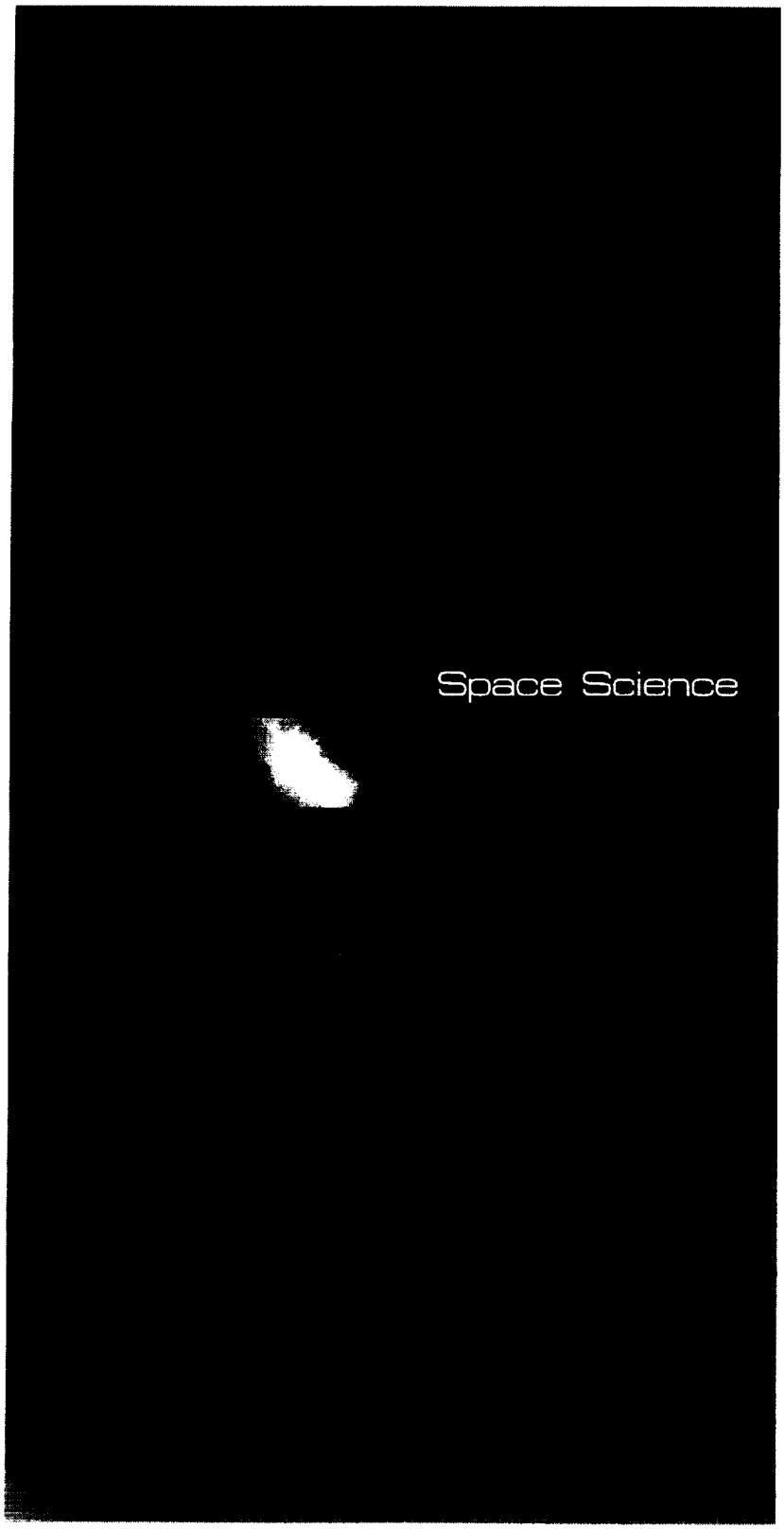
NASA's share of Federal spending has declined from a high of 4 percent of the Federal budget in 1966, at the height of the Apollo program, to less than 1 percent. The Agency continues to make significant scientific and engineering advances with fewer resources.

The budget for FY 2001 reaffirmed a commitment to a balanced aeronautics and space program. Priorities include safety for human aeronautics and space flight, support of the International Space Station, and support for the cutting-edge research in science and technology that make the missions of tomorrow a reality. The budget also provides support for an aggressive space science program;

a program of long-term observation, research, and analysis of Earth from space; and revolutionary advancements that will sustain global U.S. leadership in civil aeronautics and space.

Under the current appropriation structure, the Mission Support appropriation carries a portion of the direct support required to execute Enterprise programs. This includes research and operations support and civil service salaries and travel. Under the appropriation structure established for FY 2002, NASA is moving into the era of full cost management and the budget for these supporting elements is to be directly allocated to programs and projects.

Strategic Enterprise and Performance Highlights



Mission

The Space Science Enterprise (SSE) serves the human quest to understand our origin, existence, and fate. Broadly stated, the SSE mission is to solve mysteries of the universe, explore the solar system, discover planets around other stars, and search for life beyond Earth. Innovative space technologies are developed, used, and transferred to support all the Enterprises and contribute to the Nation's global competitiveness. Scientific support is provided to the human exploration program and knowledge and discoveries are used to enhance science, mathematics, and technology education, and the scientific and technological literacy of all Americans.

Strategic Goals and Objectives

SSE's goals and objectives for FY 2000 were to:

- Chart the evolution of the universe, from origins to destiny, and understand its galaxies, stars, planets, and life.
    - Solve the mysteries of the universe
    - Explore the solar system
    - Discover planets around other stars
    - Search for life beyond Earth
- Develop new critical technologies to enable innovative and less costly mission and research concepts.
    - Develop innovative technologies for Enterprise missions and for external customers

- Contribute measurably to achieving the science, math, and technology education goals of our Nation, and share widely the excitement and inspiration of our mission and discoveries.
    - Incorporate education and enhanced public understanding of science as integral components of Space Science missions and research

SSE addresses fundamental questions 1, 2, and 6 (Figure 5). SSE's near-, mid-, and long-term plans (along with revised goals and objectives) are identified in the Space Science Roadmap in the NASA Strategic Plan and are elaborated in the Space Science Enterprise Strategic Plan, both of which can be found at *http://www.hq.nasa.gov/office/codez/plans.html*. As described in those plans, these objectives are pursued through a comprehensive and balanced program of space science flight missions, technology development, and supporting scientific research.

Highlights of Accomplishments and Performance Measures

Detailed discussion of FY 2000 performance against each of the goals, objectives, and targets is discussed in the FY 2000 Performance Report at *http://www.hq.nasa.gov/office/codez/plans.html*.

Goal: Chart the evolution of the universe, from origins to destiny, and understand its galaxies, stars, planets, and life.

Objective: Solve the mysteries of the universe.

The Chandra X-ray Observatory (CXO) continued to operate flawlessly and exceeded efficiency and data recovery expectations. The CXO has resolved most of the x-ray background, a pervasive glow of x-rays throughout the universe first discovered in the early days of space exploration. The background proved to be the superposition of a very large number of very distant, disturbed galaxies and quasars, and this insight provided a new window on conditions many billions of years ago.

Among the many images released during FY 2000, the CXO captured images of the Antennae Galaxies, which showed the central regions of two galaxies in collision (Figure 6). Although it is rare for stars to hit each other during a galactic collision, clouds of dust and gas do collide. Compression of these clouds can lead to the rapid birth of millions of stars, and a few million years later, to thousands of supernovae.

Figure 6 - Galaxies in Collision captured by Chandra

Performance Target: The Chandra X-ray Observatory (formerly AXAF) instrument will meet nominal performance expectations, and science data will be taken with 70 percent efficiency, with at least 90 percent of science data recovered on the ground.

Target Achieved: All of the CXO instruments continued to operate nominally with excellent science return. Overall operational efficiency has exceeded 88 percent and more than 99 percent of the science data have been recovered on the ground.

FY 2000 marked the 10th anniversary of the Hubble Space Telescope (HST), the optical space observatory that has produced some of the most amazing images of the universe. To verify the HST's refurbishment following the December 1999 servicing mission, astronomers resumed operations by aiming it at two scientifically intriguing and photogenic celestial targets. HST captured a majestic view of a planetary nebula, the glowing remains of a dying, Sun-like star. It has been nicknamed the "Eskimo" Nebula because, when viewed through ground-based telescopes, it resembles a face surrounded by a fur parka (Figure 7).

The second target imaged by HST was a giant, cosmic magnifying glass—a massive cluster of galaxies called Abell 2218. This "hefty" cluster resides in the constellation Draco, some 2 billion light-years from Earth, and acts like a giant zoom lens in space (Figure 8). The gravitational field of the cluster magnifies the light of more distant galaxies far behind it, providing a deep probe of the very distant universe. The cluster was imaged in full color, providing astronomers with a spectacular and unique new view of the early universe.

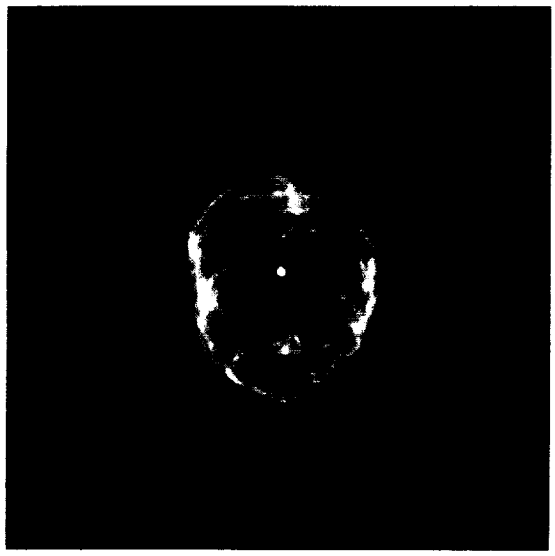


Figure 7 - Eskimo Nebula

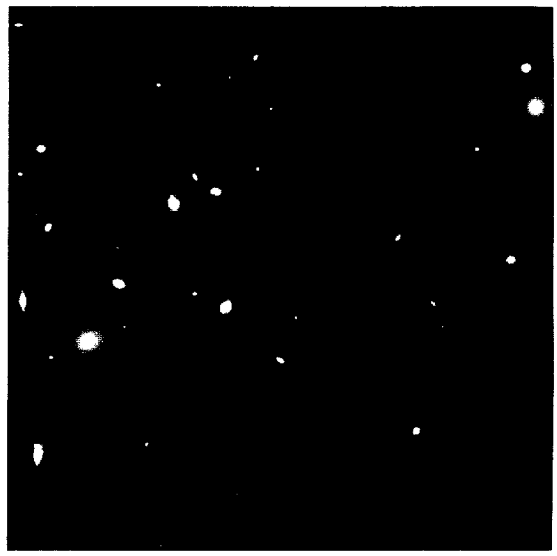


Figure 8 - Galactic Lenses

Through an extraordinary chance alignment, the HST captured a view of a face-on spiral galaxy lying precisely in front of another larger spiral. This line up provided astronomers with the rare chance to see the dark material within the foreground galaxy, seen only because it was silhouetted against the light from the object behind (Figure 9).

As HST observations of distant galaxies continue, imaging and spectroscopy are confirming the basic picture of a hierarchical universe in which structure is built from the bottom up. The Massive Cluster Survey has so far uncovered 101 giant galaxy clusters, many of them so distant and, thus, forming so early in the history of time that they challenge current theories of how quickly the universe evolved into its current hierarchical structure of stars, galaxies, and clusters. HST observations of more than 30 galaxies confirm, with surprising uniformity, that their central black holes grew until they contained about 0.2 percent of their respective galaxy's total mass. This means that the growth of a massive black hole is closely connected to the evolution of the entire galaxy in which it exists.

The balloon-borne BOOMERANG submillimeter telescope mapped the faint light left over from the Big Bang, revealing the earliest structure in the universe that billions of years later would become the vast clusters of galaxies. Combining BOOMERANG and (related) MAXIMA data with results from ground-based astronomy, HST, and x-ray observations of clusters of galaxies, strong and growing evidence exists that the inflationary scenario of Big Bang cosmology is correct, that the universe has a flat geometry, and that the current expansion of the universe may be accelerating, perhaps due to an entirely new physical phenomenon dubbed "dark energy" (Figure 10).

Figure 9 - Galactic Silhouettes

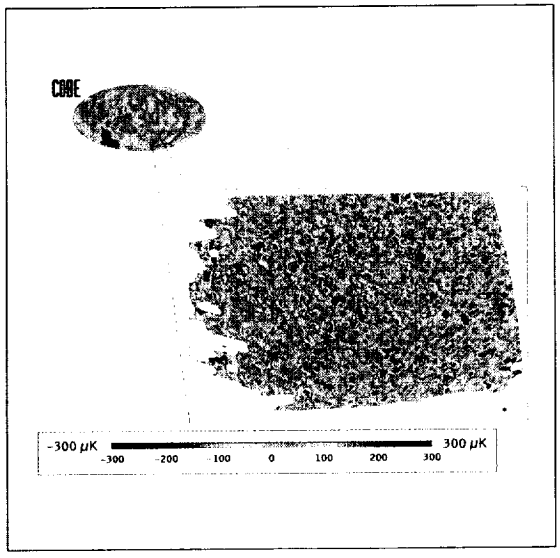


Figure 10 - Detailed Map of the Early Universe

Objective: Explore the solar system.

Fountains of multimillion-degree, electrified gas in the atmosphere of the Sun revealed the location where the solar atmosphere is heated to temperatures 300 times greater than the Sun's visible surface. Scientists discovered this important clue for solving the long-standing mystery of the hot solar atmosphere while observing the gas fountains (known as coronal loops) in unprecedented detail with NASA's Transition Region and Coronal Explorer (TRACE) spacecraft. Scientists are interested in the Sun's outer atmosphere, called the corona, because eruptive events occurring in this region can disrupt high-technology systems on Earth. Moreover, studies of the solar corona will help astronomers better understand other stars, which cannot be observed in as fine detail as the Sun. The TRACE observations show that most of the heating must occur at the bases of the coronal loops, near where they emerge from and return to the solar surface (Figure 11).

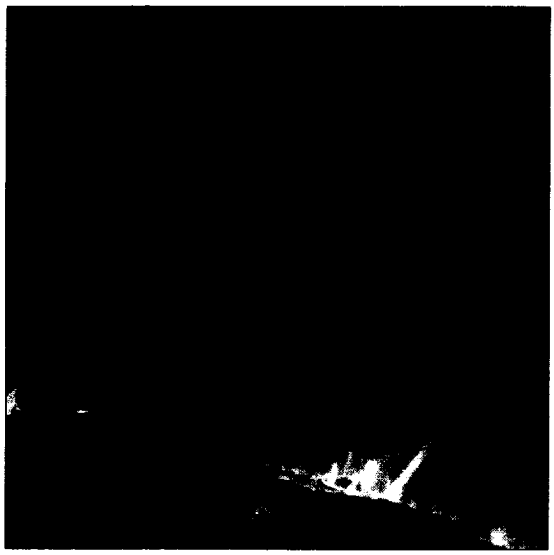


Figure 11 - TRACE Fountains of Fire

It is estimated that the total population of near-Earth asteroids larger than 1 kilometer is about 1,000, and some 435 have already been discovered. Forty percent of these discoveries have been made in the last 2 years. The Near-Earth Asteroid Rendezvous mission (NEAR-Shoemaker) became the first spacecraft to orbit an asteroid on February 14, 2000. NEAR's close encounter with the asteroid Eros brought the spacecraft within 3 miles (5 kilometers) of the space rock. A number of asteroids have been imaged by passing spacecraft in recent years, and the NEAR-Shoemaker mission was in orbit around Eros performing extremely detailed observations in FY 2000. NEAR images and early compositional data for Eros show the asteroid to be very primitive (Figure 12).

Following the loss of the Mars Climate Orbiter and the Mars Polar Lander in late 1999, the Mars exploration program has been comprehensively reformulated.

Performance Target: The Mars Polar Lander (MPL) will successfully land on Mars in December 1999 and operate its science instruments for the 80-day prime mission with at least 75 percent of planned science data returned.

Target Not Achieved: Spacecraft failure on arrival at Mars. Mars Surveyor Program redesigned during FY 2000.

Despite challenges in the Mars program, other research continues to use data from the Mars Global Surveyor (MGS). Gullies seen on Martian cliffs and crater walls in a small number of high-resolution

images from the MGS Mars Orbiter Camera suggest that liquid water has seeped onto the surface in the geologically recent past, increasing the probability that life existed on Mars. The gullies are rare landforms that are too small to have been detected by the cameras of the Mariner and Viking spacecraft that examined the planet prior to MGS. The relative freshness of these features might indicate that some of them are still active today—meaning that liquid water may presently exist in some areas at depths of less than 500 meters (1,640 feet) beneath the surface of Mars (Figure 13).

Performance Target: The Mars Global Surveyor (MGS) will acquire 70 percent of science data available, conduct at least two 5-day atmospheric mapping campaigns, and relay to Earth at least 70 percent of data transmitted at adequate signal levels by the Deep Space-2 (DS-2) Mars microprobes.

Target Achieved: MGS has exceeded expectations, acquiring over 92 percent of the science data available and conducting three campaigns. Although no DS-2 data were available to relay, the MGS relay antenna functioned properly and its beacon was detected from Earth by the Stanford 45-meter antenna.

On July 14, 2000, the Sun erupted with the largest solar event in over a decade. An erupting filament lifted off the active solar surface and blasted this enormous bubble of magnetic plasma into space. The SOlar and Heliospheric Observatory (SOHO) spacecraft imaged a halo coronal mass ejection (CME) headed for Earth (Figure 14). Strong CMEs are seen to profoundly influence space weather, and those directed toward our planet can have serious effects as they are of one the most massive disturbances in our solar system. With a technique called helioseismology that uses ripples on the

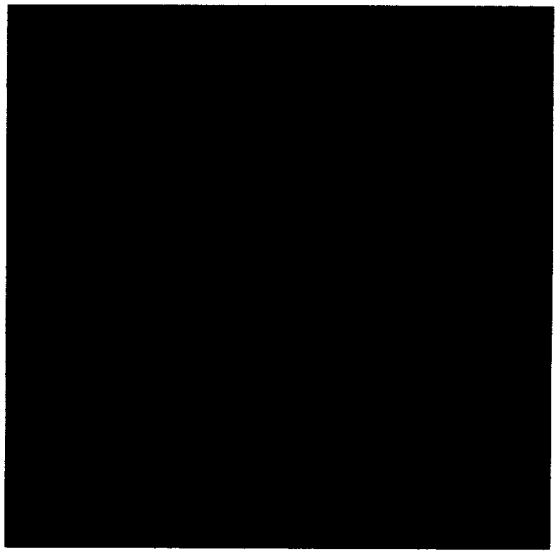


Figure 13 - Water on Mars

Figure 14 - SOHO Image of Coronal Mass Ejection

Sun's visible surface to probe its interior, SOHO scientists have, for the first time, imaged solar storm regions on the far side of the Sun, the side facing away from Earth.

The following day, Advanced Composition Explorer (ACE) measurements indicated shock velocities of more than 1,000 km/sec. ACE and Wind observed one of the largest solar particle events during the past 40 years, while Polar, Imager for Magnetopause-to-Aurora Global Exploration (IMAGE), Solar, Anomalous, and Magnetospheric Particle Explorer (SAMPEX), and Geotail recorded the effects of this CME on Earth's magnetosphere and upper atmosphere. Aurorae were observed as far south as South Carolina. This unusual event provided a rare opportunity to test models of the Sun-Earth connection from the solar surface to the boundaries of the heliosphere. The successful launch and early observations of IMAGE have provided the first simultaneous global view of magnetospheric storms and substorms, including the auroral zone, plasma sheet, and ring current.

Performance Target: IMAGE will be delivered on time for a planned February 2000 launch within 10 percent of the planned development budget.

Target Achieved: IMAGE launched successfully on March 25, 2000. IMAGE was delivered early (in September) and under budget.

Instruments were selected in FY 2000 for the Solar TErrestrial RElations Observatory (STEREO) mission, currently planned for launch in 2004. The STEREO mission will be a multilateral international collaboration involving participants from France, Germany, the United Kingdom, and the United States. STEREO will, for the first time, unveil the Sun in three dimensions. Its objective is to address the origin, evolution, and interplanetary consequences of CMEs. The instrument suite for STEREO will characterize the CME plasma all the way from the solar surface to the orbit of Earth. These instruments will measure physical characteristics of CMEs with remote sensing and local sensing instruments, allowing scientists to determine solar origins of CMEs, their propagation into the interplanetary medium, and ultimately their consequences on Earth's magnetic field. By placing two spacecraft off the Sun-Earth line, STEREO will reveal details about CME structure and dynamics that have been impossible to obtain.

Performance Target: Complete STEREO Phase A studies by June 2000, including the release of an Announcement of Opportunity (AO) for investigations with specific instruments and selection of the formulation phase payload.

Target Partially Achieved: The AO was released. Specific instruments and the formulation phase payload were selected, and all included international co-investigators. Phase A studies were not completed. International Traffic in Arms Regulations requirements were tightened after the AO was issued; therefore, it was not possible to establish all of the necessary letters of agreement with foreign governments in time to avoid delaying completion of Phase A studies until FY 2001.

Objective: Discover planets around other stars.

Astronomers crossed an important threshold in planet detection with the discovery of two planets outside our solar system that may be smaller in mass than Saturn. Of the 30 planets around Sun-like stars detected previously outside our solar system, all have been the size of Jupiter or larger. The existence

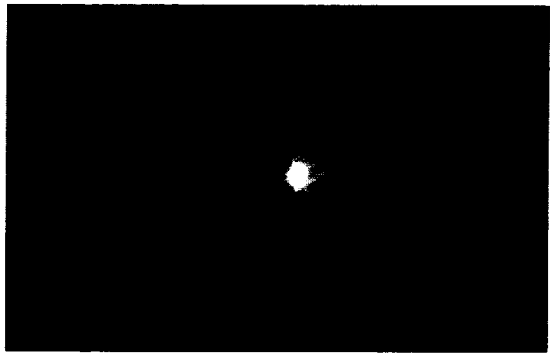


Figure 15 - Artist's Concept of Planets Smaller Than Saturn

of these Saturn candidates suggests that many stars harbor smaller planets, in addition to the Jupiter-sized ones (Figure 15). Finding Saturn-sized planets reinforces the theory that planets form by a snowball effect of growth from small ones to large, in a star-encircling dust disk. The 20-year-old theory predicts there should be more small planets than large planets, and this is a trend researchers are beginning to see.

The Space Interferometry Mission (SIM), scheduled for launch later this decade, will determine the positions and distances of stars several hundred times more accurately than any previous program. This accuracy will allow SIM to determine the distances to stars throughout the galaxy and to probe nearby stars for Earth-sized planets. This breakthrough in capabilities is possible because SIM will be the first space mission to use optical interferometry, which can fulfill its full potential only outside the distorting effects of Earth's atmosphere. There, it can combine light from two or more telescopes as if they were pieces of a single, gigantic telescope mirror. Developed for use in space with SIM, this technique will eventually lead to the development of telescopes powerful enough to take images of Earth-like planets orbiting distant stars and to determine whether these planets sustain life as we know it.

Performance Target: The Space Interferometry Mission (SIM) System Testbed (STB) will demonstrate, in May 2000, that Remote Manipulator System optical path difference can be controlled at 1.5 nanometers, operating in an emulated onorbit mode.

Target Achieved: In FY 2000, the SIM System Testbed-1 (STB-1) demonstrated the technology for stabilizing a space optical system to the level of 1.5 nanometers (one 50,000th the thickness of a human hair). This technology, in addition to providing a quiet enough platform for SIM to perform its planet-finding mission, will help enable the next generation of large space optical systems for scientific, civil, and defense purposes. The optical path length difference was controlled to 0.7 nanometers, which exceeded the performance target.

Objective: Search for life beyond Earth.

Beyond Mars, there is evidence of the presence of liquid water in the outer solar system as well. The Galileo mission's magnetic readings and observation of Jupiter's moon Europa suggest there is water beneath its icy crust. Europa, the fourth largest satellite of Jupiter, has long been suspected of harboring vast quantities of water. Since life as we know it requires water, this makes the moon a prime target for the search of exobiology—life beyond Earth. Galileo observations of Europa indicate that curved fractures on Europa's surface are produced by tidal stressing and are consistent with only a thin ice crust. Furthermore, magnetometer data demonstrate the presence of a conducting

subsurface feature, consistent with a subsurface ocean. The potential existence of a subsurface ocean has prompted theoretical assessments of energy sources and their implications for primitive life on Europa. NASA is planning a Europa Orbiter mission to carry instruments capable of providing measurements of gravity and altitude to check for the effects of tides. Magnetic evidence for an ocean is possible because Europa orbits within the magnetic field of Jupiter. That field induces electric current to flow through a conductive layer near Europa's surface, and the current creates a secondary magnetic field at Europa.

Goal: Develop new critical technologies to enable innovative and less costly mission and research concepts.

Objective: Develop innovative technologies for Enterprise missions and for external customers.

In the technology area, the Center for Industrial Sensors and Measurements' technology products, funding, and delivery milestones are being replanned as part of the SSE reformulation of the Deep Space Systems program. Demonstration in space opens the door for each of the validated components to be incorporated in future science missions, resulting in lower cost, better performance, or both.

Goal: Contribute measurably to achieving science, math, and technology education goals of our Nation, and share widely the excitement and inspiration of our mission and discoveries.

Significant progress was achieved in education and public outreach as implementation of the Enterprise's wide-ranging and systematic approach to sharing results of its missions and research is reaching maturity. All new flight programs now have funded components for outreach. The National Space Science Network is in place to collect and disseminate educational materials. These steps lay the groundwork for an expanded realization of the benefits of space science expenditures in American society.

Objective: Incorporate education and enhanced public understanding of science as integral components of Space Science missions and research.

Performance Target: Successful achievement of at least seven of the following eight objectives will be made.

(1) Each new Space Science mission will have a funded education and outreach program.
(2) By the end of FY 2000, 10 percent of all Space Science research grants will have an associated education and outreach program under way.
(3) Twenty-six States will have Enterprise-funded education or outreach programs planned or under way.
(4) At least five research, mission development/operations, or education programs will have been planned or undertaken in Historically Black Colleges and Universities (HBCU), Hispanic Serving Institutions (HSI), or Tribal Colleges and Universities (TCU), with at least one project under way in each group.
(5) At least three national and two regional educational or outreach conferences will be supported with a significant Space Science presence.
(6) At least three exhibits or planetarium shows will be on display.
(7) An online directory providing enhanced access to major Space Science-related products and

programs will be operational by end of the fiscal year.

(8) A comprehensive approach to assessing the effectiveness and impact of the Space Science education and outreach efforts will be under development, with a pilot test of the evaluation initiated.

Target Achieved: Seven of the eight specific objectives were achieved or substantially exceeded. The only objective not met ((2) above) involved the number of research grants having an associated education and public outreach (E/PO) component under way. Progress on each objective is as follows:

(1) Each new Space Science mission in FY 2000 had a funded education and outreach program. As new missions replace older ones over the next several years, the total number of missions with funded education and outreach programs will continue to grow.

(2) Plans are being developed to achieve a goal of 10 percent of all Space Science grants having associated education and outreach programs.

The FY 2000 goals (3) through (8) are all activities expected to be carried out with the assistance of a national organized network of E/PO contacts.

(3) E/PO programs are now under way in well over 26 States. For example, Space Place exhibits developed by the New Millennium program are in more than 40 States, and Solar System Educator Fellows/Ambassadors are carrying out programs in more than 30 States.

(4) The Space Science Minority University Initiative has established space science activities at 15 minority universities, including 6 HBCUs, 3 HSIs, and 3 TCUs. In addition, an HSI (University of Puerto Rico at Mayagüez) is providing ground station operations for the Far Ultraviolet Spectroscopic Explorer mission, and an HBCU (Hampton University) has been selected in the study phase for new Small Explorer missions.

(5) More than 30 education and outreach conferences were supported, including major national conferences, such as the Association of Science and Technology Centers, the National Science Teachers Association, the National Council of Teachers of Mathematics, and many regional conferences.

(6) Major exhibits/planetarium shows now on national tour include Space Weather, Hubble Space Telescope (two versions), Marsquest, and Journey to the Edge of Space and Time.

(7) The NASA Space Science Education Resource Directory was made available to educators in September 2000.

(8) A comprehensive evaluation effort is being led by the Program and Evaluation and Research Group of Leslie University, with an initial report on the pilot evaluation effort issued in June 2000.

SSE tracks the annual estimated cost of major missions in development versus commitment to Congress. A gauge of success in meeting cost performance commitments for major development programs within the Enterprise, this measure is the ratio of the present budget estimates compared to commitments made by the Agency to Congress on the maximum cost for each major SSE spacecraft. The commitment to Congress is established at the time the program moves from planning and design into development. The goal

is to hold down the cost of major spacecraft. Success is demonstrated when the ratio remains below 100 percent. In FY 2000, the average cost of major SSE missions in development was estimated to be 93.5 percent of commitments to Congress (Figure 16). This measure has shown improvement in recent years; many larger missions which exceeded their cost commitments have been launched, while most recent missions are being completed within or under cost commitment.

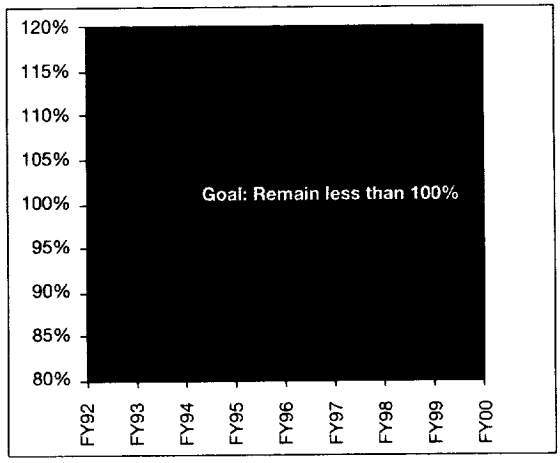


Figure 16 - Program Cost Status Versus Cost Commitment

Earth Science

Mission

The Earth Science Enterprise (ESE) mission is to understand the total Earth system and the effects of natural and human-induced changes on the global environment. ESE conducts global and regional scale research requiring the vantage point of space, contributing to an international capability to forecast and assess the health of the Earth system. In concert with academic and industry partners, research results will contribute to the development of environmental policy and economic investment decisions. Knowledge and discoveries are shared with the public to enhance science, mathematics, and technology education and increase the scientific and technological literacy of all Americans. The same spirit of innovation that embodies the ESE flight programs applies to technology development. Obtaining data from the private sector, where applicable, is an emerging feature of the Enterprise strategy to reduce costs and encourage growth of a viable commercial remote-sensing industry in the United States.

Strategic Goals and Objectives

ESE's goals and objectives for FY 2000 were:

- Expand scientific knowledge by characterizing the Earth system.
    - Understand the causes and consequences of land-cover/land-use change
    - Predict seasonal-to-interannual climate variations
    - Identify natural hazards, processes, and mitigation strategies

- Detect long-term climate change, causes, and impacts
- Understand the causes of variation in atmospheric ozone concentration and distribution

- Disseminate information about the Earth system.
  - Implement open, distributed, and responsive data system architectures
  - Increase public understanding of Earth Science through education and outreach

- Enable the productive use of Earth Science and technology in the public and private sectors.
  - Develop and transfer advanced remote-sensing technologies
  - Extend the use of Earth Science research for national, State, and local applications
  - Support the development of a robust commercial remote-sensing industry
  - Make major scientific contributions to environmental assessments

ESE addresses fundamental questions 3 and 6 (Figure 5). ESE's near-, mid-, and long-term plans (along with revised goals and objectives) are identified in the Earth Science Roadmap in the NASA Strategic Plan and are elaborated in the Earth Science Enterprise Strategic Plan, both of which can be found at *http://www.hq.nasa.gov/office/codez/plans.html*. As described in those plans, these objectives are pursued through comprehensive and balanced programs, advancing new disciplines of Earth Science, with near-term milestones on a path to long-term inquiry, research, and analysis of Earth.

Highlights of Accomplishments and Performance Measures

Detailed discussion of FY 2000 performance against each of the goals, objectives, and targets is discussed in NASA's 2000 Performance Report at *http://www.hq.nasa.gov/office/codez/plans.html*.

Goal: Expand scientific knowledge by characterizing the Earth system.

FY 2000 was a year of substantial scientific advancement in our understanding of the major elements that comprise the Earth system.

Objective: Understand the causes and consequences of land-cover/land-use change.

The Space Shuttle *Endeavour* served as an Earth observatory early in 2000 during STS-99. The Shuttle Radar Topography Mission (SRTM), an international project spearheaded by the National Imagery and Mapping Agency and NASA, was a breakthrough in the science of remote sensing. Topographic data were gathered over approximately 80 percent of the land surfaces of Earth, creating the first-ever, near-global data set of land elevations.

Using a technique called radar interferometry in which two radar images are taken from slightly different locations, differences between these images allow for the calculation of surface elevation or change (Figure 17). To acquire the topographic (elevation) data, the SRTM payload was outfitted with two radar antennas. One antenna was located in the Shuttle's payload bay, the other

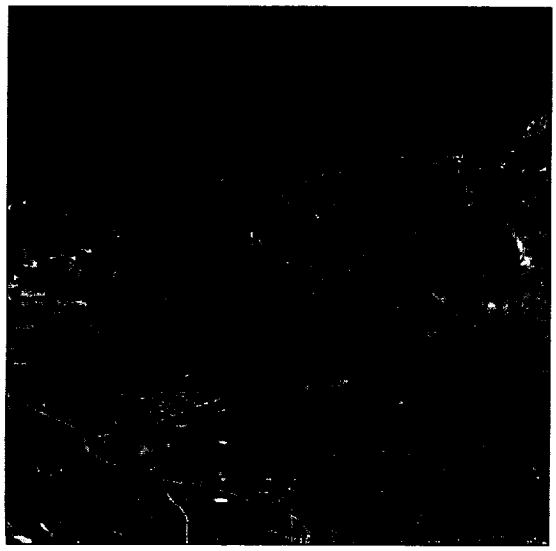


Figure 17 - Image of Pasadena, California, Using Elevation Data from SRTM

on the end of a 60-meter (200-foot) mast that extended from the payload bay once the Shuttle was in space.

The information collected will help produce one of the most comprehensive and accurate maps of Earth ever assembled, 30 times as precise as the best global maps in use today. The processed SRTM radar data can be tailored to meet the needs of the military, civil, and scientific user communities. In addition to contributing to the production of better maps, other uses of the SRTM measurements include improved water drainage modeling, more realistic flight simulators, better locations for cell phone towers, and enhanced navigation safety.

In December 1999, NASA's premier Earth Observing System (EOS) satellite, Terra, was launched into space and "opened for business." Terra is the first satellite to monitor daily—on a global scale—how Earth's atmosphere, lands, oceans, solar radiation, and life influence each other. Terra's wide array of measurements provides a comprehensive evaluation of Earth as a system and establishes a new basis for long-term monitoring of Earth's climate changes. Terra will use its position in space to observe Earth's continents, oceans, and atmosphere with unprecedented measurement accuracy and capability. This approach enables scientists to study interactions among these three components of Earth's system, which determine the cycling of water and nutrients. NASA plans to encourage widespread use of Terra information to allow citizens, businesses, and governments to make more informed decisions on national issues affecting every American—health and safety, economic well-being, and quality of life in communities across the Nation.

Performance Target: Continue to collect near-daily global measurements of the terrestrial biosphere (an index of terrestrial photosynthetic processes from which calculations of carbon uptake are made) from instruments on the EOS AM-1 (Terra spacecraft).

Target Achieved: The Terra spacecraft was launched in December 1999. Its instruments were activated for science operations on February 24, 2000, and continue to operate as intended. Calibration and validation activities are still under way, and the data quality from all Terra sensors appear to be exceptional. Near-daily global measurements of the terrestrial biosphere have been collected by the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument and archived (Figure 18). Data have been processed to corrected and calibrated levels.

Landsat 7 is a long-term global research program studying human-induced and natural changes in Earth's global environment and continues to serve a wide variety of "Earth customers" with its spectacular data—creating global maps of Earth in record time. The land-use and land-cover program is utilizing these data to undertake regional scale land-cover and land-use studies. Regional land-cover mapping and land-use studies are being undertaken in the United States and abroad. Scientists from a partner agency in the Landsat 7 mission, the U.S. Geological Survey (USGS), are using Landsat 7 to determine the amount and condition of dry biomass on the ground, a potential fuel source for wildfires that can threaten humans, animals, and natural resources. In addition, USGS scientists have used Landsat 7 to provide a synoptic view of the landscape simultaneously with the outbreak of infectious diseases—most recently, the outbreak of the West Nile Virus, a mosquito-borne disease that caused encephalitis in some residents of New York City last summer.

Performance Target: Produce near-real-time fire monitoring and impact assessment based on Landsat and EOS inventory and process monitoring to provide an observational foundation for monitoring change in ecosystem productivity and disturbance. Post near-real-time assessments on a Web site for quick access by researchers and regional authorities.

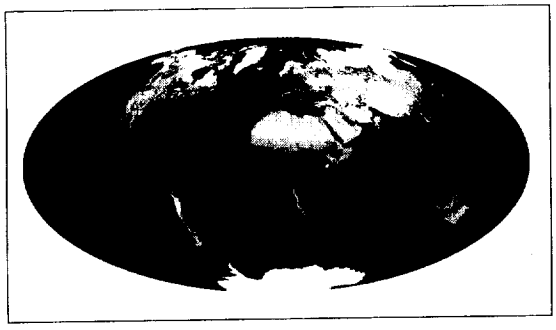


Figure 18 - MODIS Plant Productivity

Target Achieved: During the FY 2000 fire season, data from Landsat and Terra for Montana fires were made available to the Forest Service (Figure 19).

Objective: Predict seasonal-to-interannual climate variations.

In FY 2000, ESE continued to invest in observations, research, data analysis, and modeling in this area. Tropical rainfall estimates from the Tropical Rainfall Measuring Mission (TRMM) were combined with other satellite and surface-based measurements to establish a benchmark for global and regional rainfall measurements and a standard for comparison

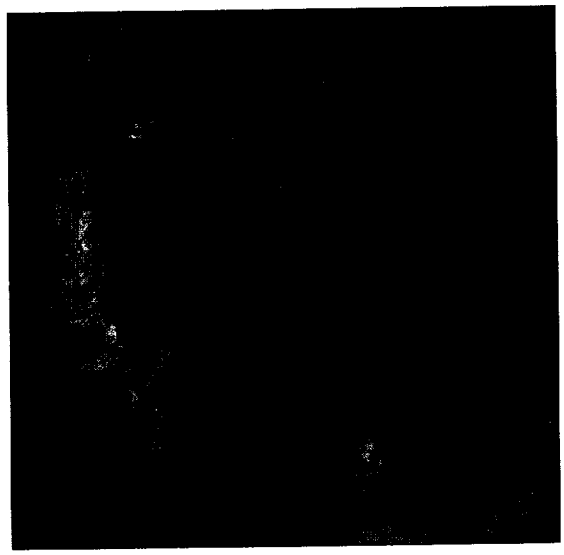


Figure 19 - Landsat 7 Montana Wildland Fires

with previous data sets and climatologies. The diurnal variation of precipitation over the oceans has been documented with the first 2 years of TRMM data and shows a distinct early morning peak.

Objective: Identify natural hazards, processes, and mitigation strategies.

ESE uses a combination of space-based and airborne assets to monitor and assess impacts of natural hazards, such as volcanoes, earthquakes, forest fires, hurricanes, floods, and droughts.

Performance Target: Demonstrate the utility of spaceborne data for flood plain mapping with the Federal Emergency Management Administration (FEMA).

Target Achieved: NASA, FEMA, and the Army Corps of Engineers conducted Phase 1 of a cooperative technology demonstration program to evaluate using NASA and commercial high-accuracy, high-resolution digital topographic and image-based information products to remap floodplains. Phase 1 used a set of FEMA's high-priority floodplain communities in the Los Angeles basin around Sacramento, California; in Virginia Beach, Virginia; in Red River, North Dakota; and in the Project Impact Community of San Francisco, California, for the technology demonstration. Phase 1 collected new International Federation for Systems Research and Laser Altimeter data sets (using NASA and commercial airborne systems and leveraging NASA data buy activities) and built on existing joint data collection activities to automate the extraction of information, fusion of data, and creation of floodplain maps, and to enable dynamic flood modeling. Phase 1 data and results were used to develop performance specifications for future data collections and product definitions for Phase 2. In Phase 2, NASA and FEMA will develop and initiate a long-term strategy to operationalize the results of this cooperative activity for future floodplain mapping.

Objective: Detect long-term climate change, causes, and impacts.

ESE studies long-term climate trends to learn how human-induced and natural changes affect our global environment. The study of Greenland's ice is an example of how a somewhat localized phenomenon is providing insight to climate systems that relate to the entire planet. Based on research using NASA's airborne laser altimeter, scientists have identified pronounced and rapid thinning of Greenland's ice cap. The thinning is most severe along the coasts (at a rate of 3 feet per year), while the center of the landmass appears to thicken slightly. Any change is important since a smaller ice sheet could result in higher sea levels. After Antarctica, Greenland's ice cap contains the second largest mass of frozen freshwater in the world. With Greenland's southern tip protruding into temperate latitudes, monitoring this portion of the ice sheet may be one of the best ways to measure changes in climate in the Northern Hemisphere. Now, for the first time, portions of the entire ice sheet covering Greenland have been mapped with sufficient accuracy to detect significant changes in elevation (Figure 20). This new research indicates enough ice loss to cause a measurable rise in sea levels and to raise the average sea level worldwide about 0.13 millimeters per year. By measuring fluctuations, experts look for clues into broader subjects like global warming and

atmospheric changes over time. Only with continued observations will more comprehensive understanding of these trends be determined.

Performance Target: Publish the first detailed estimates of thickening/thinning rates for all major ice-drainage basins of the Greenland ice sheet, derived from repeated airborne laser-altimetry surveys. Measures represent the baseline data set to compare with early Geoscience Laser Altimeter System data (July 2001 launch).

Target Achieved: The survey was completed and estimates derived. Aircraft laser altimetry surveys of northern Greenland in 1994 and 1999 have been combined with previously reported data from southern Greenland to analyze the recent mass balance of the entire Greenland ice sheet. Above 2,000 meters altitude, the ice sheet is in balance on average, but thinning predominates close to the coast, with thinning rates in some areas exceeding 1 meter per year.

Objective: Understand the causes of variation in atmospheric ozone concentration and distribution.

The Total Ozone Mapping Spectrometer instrument aboard NASA's Earth Probe (TOMS-EP) satellite detected an Antarctic ozone "hole" that is three times larger than the entire landmass of the United States—the largest such area ever observed (Figure 21). The "hole" expanded to a record size of approximately 11 million square miles (28.3 million square kilometers) on September 3, 2000. Ozone molecules, made up of three atoms of oxygen, comprise a thin layer of the atmosphere that absorbs harmful ultraviolet radiation from the Sun. The ozone hole's size has stabilized, but the low levels in its interior continue to fall. These observations reinforce concerns about the frailty of Earth's ozone layer. TOMS-EP and other ozone-measurement programs are important parts of a global environmental effort of ESE, a long-term research program designed to study Earth's land, oceans, atmosphere, ice, and life as a total integrated system. Although production of ozone-destroying gases has been curtailed under international agreements, concentrations of the gases in the stratosphere are only now reaching their peak. Researchers believe it may be many decades before the ozone hole is no longer an annual occurrence.

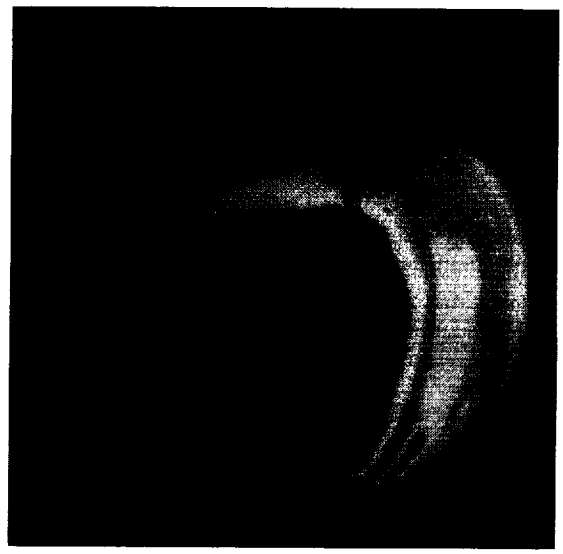


Figure 21 - Antarctic Ozone "Hole"

During the winter of 1999 to 2000, the NASA-sponsored Stratospheric Aerosol and Gases Experiment (SAGE) III Ozone Loss and Validation Experiment (SOLVE) and European Union-sponsored Third European Stratospheric Experiment on

Figure 22 - Arctic Ozone Losses

Ozone (THESEO-2000) obtained measurements of ozone, other atmospheric gases, and particles using satellites; airplanes; large, small, and long-duration balloons; and ground-based instruments. Scientists from the United States joined with scientists from Europe, Canada, Russia, and Japan in mounting the largest field measurement campaign yet to measure ozone amounts and changes in the Arctic stratosphere. During this period, ozone losses of over 60 percent occurred in the Arctic stratosphere near 60,000 feet (18 km), one of the worst ozone losses at this altitude in the Arctic (Figure 22). Investigations into the Arctic stratosphere have provided better insights into the processes that control polar ozone.

Performance Target: Implement the SAGE III Ozone Loss and Validation Experiment (SOLVE). Measurements will be made between October 1999 and March 2000 in the Arctic/high-latitude region from the NASA DC-8, ER-2 aircraft, and balloon platforms. These tools will acquire correlative data to validate SAGE III data and assess high-latitude ozone loss.

Target Achieved: The SOLVE campaign successfully completed objectives.

Goal: Disseminate information about the Earth system.

ESE has continued to broaden its capabilities to maximize the dissemination and use of data and information. A working prototype federation program, started in 1998, is maturing as a coordinated network of Earth Science Information Partners (ESIP). The partners are working with our Distributed Active Archive Centers (DAACs) to provide new research products targeted to specific communities involved within the applications, State and local governments, and the commercial sector. Regional Earth Science Applications Centers have also been established to focus on end-to-end projects involving academia and a wide array of end-user practitioners. Education in the Earth sciences is one of the key products of ESE. Its extensive and growing collection of science data and research results is used to develop new educational products and to support curriculum development and teacher training.

Objective: Implement open, distributed, and responsive data system architectures.

ESE tracks three types of programwide performance measures: how well it makes data available to scientists, its contribution to Earth Science education, and the practical application of its

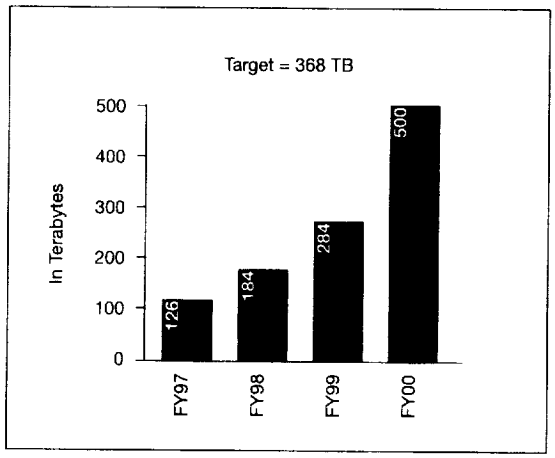


Figure 23 - Data Volume Archived at the DAACs (In Terabytes)

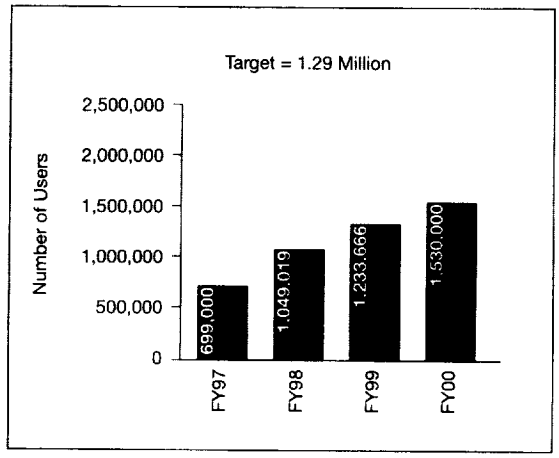


Figure 24 - Number of Distinct Users Accessing the DAACs

research. NASA tracks these three performance measures regarding ESE's first-line customers—the scientists and others who use Earth Science data products. Accordingly, ESE is making a substantial investment in data and information services to make these data products readily accessible. Science data products are made accessible through a set of DAACs.

Performance Target: The Earth Observing System Data and Information System (EOSDIS) will double the volume of data archived compared to FY 1998 (FY 2000 target is 368 terabytes (TB)).

Target Exceeded: ESE had approximately 500 TB of data in our archives at the end of FY 2000, exceeding the goal of 368 TB. The volume increase is due in part to the new data from the Terra satellite and the addition of data from the Federation ESIP 2s. Of the total amount, 440 TB were archived in the V0 systems, over 100 TB were archived in the ECS systems, and over 6 TB were archived by the Federation ESIPs. Figure 23 displays the trend of the continually increasing volume of such data that are archived.

Performance Target: EOSDIS will increase the number of distinct customers by 20 percent compared to FY 1998 (FY 2000 target is 1.29 million distinct users).

Target Exceeded: During FY 2000, approximately 1.53 million distinct customers accessed the DAACs and ESIP 2s, exceeding the performance target of 1.29 million users by 20 percent. This increase was due to the increasing number of users coming to the DAACs for Landsat 7 and Terra information and data products, as well as to the addition of the users from the Federation. Figure 24 reflects this increase and displays the trend of the continually increasing number of users accessing data archived at the DAACs.

Performance Target: EOSDIS will increase products delivered from the DAACs by 10 percent compared to FY 1998 (FY 2000 target is 4.96 million products delivered).

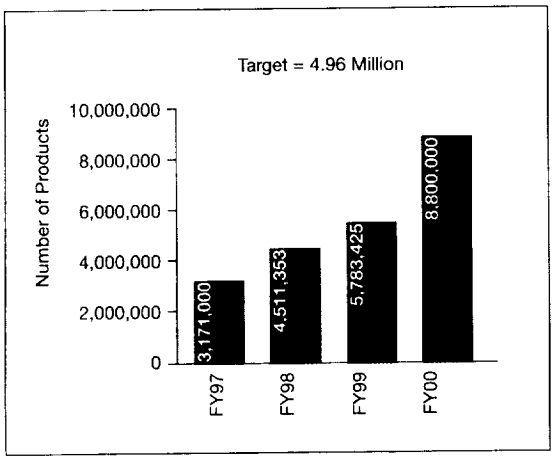


Figure 25 - Number of Products Delivered by the DAACs

Target Exceeded: In FY 2000, EOSDIS exceeded the performance target of 4.96 million data products by 80 percent as the number of data product deliveries was approximately 8.8 million. This success is attributed to the growing interest in ESE information and data products due to the launches of the Terra and Landsat 7 missions and general awareness of Earth Science and global environmental research. Figure 25 depicts the increasing number of products delivered by the DAACs.

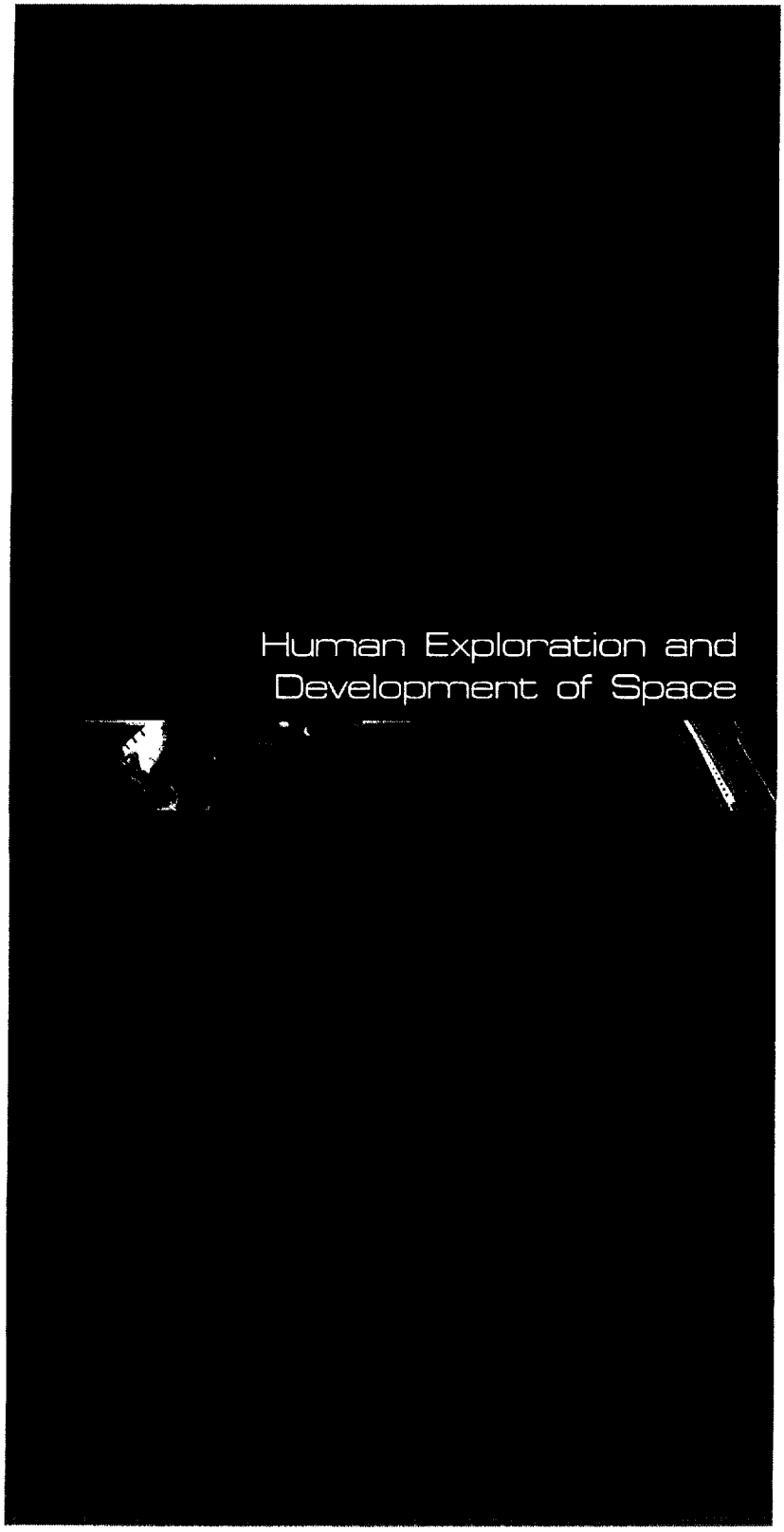
Goal: Enable the productive use of Earth Science Enterprise science and technology in the public and private sectors.

The Enterprise has an interest in seeing that its research results in practical applications in the U.S. economy. To this end, the Commercial Remote Sensing Program at Stennis Space Center works with U.S. industries to help them become suppliers of remote-sensing data. The Commercial Remote Sensing Program is responsive to its mission and the remote-sensing industry through implementing programs that include the Earth Observations Commercial Applications Program, Affiliated Research Centers, and the Science Data Purchase.

Objective: Support the development of a robust commercial remote-sensing industry.

Performance Target: Provide three commercial sources of science data from the Scientific Data Purchase for global change research and applications.

Target Achieved: Under the Science Data Purchase, three commercial sources—Positive Systems, IKONOS, and Earthwatch/Intermap—were established and validated for global change and applications.



Mission

The mission of the Human Exploration and Development of Space (HEDS) Enterprise is to open the space frontier by exploring, using, and enabling the development of space and to expand the human experience into the far reaches of space. In exploring space, HEDS brings people and machines together to overcome challenges of distance, time, and environment. The Space Shuttle and the International Space Station (ISS) serve as research platforms to pave the way for sustained human presence in space through critical research on human adaptation. The Enterprise contributes new scientific knowledge by studying the effects of gravity and the space environment on important biological, chemical, and physical processes and develops biomedical knowledge and technology to allow people to thrive physically and psychologically while exploring and opening the space frontier.

HEDS seeks out synergies between commercial capabilities and Government needs—promoting investments in commercial assets as pathfinders in ISS commercial operations and reducing the cost of Space Shuttle operations through privatization, eventual commercialization, and flying payloads. HEDS serves as a catalyst for commercial space development by facilitating commercial research and product development on the ISS and the Space Shuttle.

In FY 2001, NASA established a new Enterprise, the Biological and Physical Research Enterprise, which includes some elements of the previously existing HEDS Enterprise. This report does not reflect this change since it reports on activities that preceded the reorganization.

Strategic Goals and Objectives

Progress has been reported against the goals and objectives established in the FY 2000 Performance Plan. HEDS' goals and objectives have undergone significant revision since the publication of the FY 2000 Performance Plan.

HEDS' goals and objectives for FY 2000 were to:

- Expand the space frontier.
  - Enable human exploration through collaborative robotic missions
  - Define innovative, safe, and affordable human exploration mission architectures
  - Invest in enabling, high-leverage exploration technologies
- Expand scientific knowledge.
  - In partnership with the scientific community, use the space environment to explore chemical, biological, and physical systems
- Enable and establish a permanent and productive human presence in Earth orbit.
  - Provide safe and affordable access to space
  - Deploy and operate the ISS to advance scientific, exploration, engineering, and commercial objectives
  - Ensure and enhance the health, safety, and performance of humans in space
  - Meet strategic space mission operations needs while reducing costs and increasing standardization and interoperability
- Expand the commercial development of space.
  - Facilitate access to space for commercial researchers
  - Foster commercial participation on the ISS
- Share the experience and discovery of human space flight.
  - Engage and involve all Americans in the exploration and development of space
  - Increase the scientific, technological, and academic achievement of the Nation by sharing our knowledge, capabilities, and assets

The HEDS Enterprise addresses fundamental questions numbers 4 and 6 (Figure 5). The near-, mid-, and long-term plans (along with revised goals and objectives) of HEDS are identified in the HEDS Roadmap in the NASA Strategic Plan and are elaborated in the HEDS Enterprise Strategic Plan, both of which can be found at *http://www.hq.nasa.gov/office/codez/plans.html.*

Highlights of Accomplishments and Performance Measures

Detailed discussion of FY 2000 performance against each of the performance targets that support the goals and objectives can be found in NASA's FY 2000 Performance Report at *http://www.hq.nasa.gov/office/codez/plans.html.*

Goal: Expand the space frontier.

Objective: Enable human exploration through collaborative robotic missions.

NASA is working to establish safe, self-sustaining systems enabling humans to live and work independently from Earth for extended periods in space, and in the long-term, on other planets and their moons. It is establishing the interdisciplinary knowledge base needed for safe, effective, and affordable robotic and human exploration.

In FY 2000, NASA substantially revised its plans for robotic exploration of the surface of Mars. HEDS concluded its preparations for experiments on a planned 2001 mission that has since been cancelled. HEDS and the Biological and Physical Research Enterprise will continue to participate in planning for future robotic missions to Mars. In FY 2001, the National Research Council will conduct a study to better understand the environmental, chemical, and biological risk posed by Mars for human exploration. The study results will guide the planning for HEDS participation in robotic missions to Mars.

Objective: Define innovative, safe, and affordable human exploration mission architectures.

HEDS continued efforts to define human exploration missions through the development of a HEDS technology plan and creation of a decadal planning team. Preliminary planning was completed for a FY 2001 HEDS Technology and Commercialization Initiative.

Objective: Invest in enabling, high-leverage exploration technologies.

In FY 2000, select low-level investments were made in extravehicular activity (EVA) and *in situ* resource utilization technologies. Limited technology development in support of future human exploration is ongoing within HEDS and within crosscutting technology programs. This includes HEDS Enterprise investments in human support, microgravity, and radiation effects and countermeasures; Small Business Innovation Research (SBIR) investments in *in situ* resource utilization; and cross-Enterprise investments in space power and data management.

Goal: Expand scientific knowledge.

Objective: In partnership with the scientific community, use the space environment to explore chemical, biological, and physical systems.

Throughout most of history, humans have viewed gravity as an inescapable constant. Gravity has also profoundly affected how humans evolved as physical beings. Access to the space environment allows scientists to conduct unprecedented research in low gravity, opening a new window on longstanding questions of science and technology. Researchers can take advantage of this opportunity to conduct experiments that are impossible on Earth. For example, most combustion processes on Earth are dominated by the fact that hot gases rise. In space, this is not the case, and hidden properties of combustion emerge. Results from this research promise to improve fire safety, fuel efficiency, and pollution control.

Materials scientists will study the role of gravity in important industrial processes. Their results may lead not only to the formation of new materials impossible to produce on Earth, but to better control of Earth-based processes to obtain improved

products. Physicists will take advantage of microgravity to study exotic forms of matter that are better handled in space. Biological research will investigate the role of gravity in life processes. The Enterprise will conduct research to integrate our understanding of the role of gravity on the evolution, development, and function of living organisms and on biological processes.

HEDS continued to develop a robust scientific community to maximize return from future flight opportunities, including the ISS. HEDS made awards under 6 NASA Research Announcements (NRAs) in FY 2000 and built its investigator community to approximately 955 investigations as part of continuing preparations for ISS utilization. All scientific research within HEDS is selected through an open and competitive peer-review process. The health of the research community is indicated by strong responses to NRAs, leading to selection of about 20 percent of proposals received. HEDS researchers published over 1,400 articles in peer-reviewed journals in FY 2000. HEDS completed preparations for research on STS-107, currently scheduled for launch at the end of FY 2001.

HEDS executed a memorandum of understanding with the National Cancer Institute of the National Institutes of Health (NIH) focusing on new approaches to detect, monitor, and treat disease. This cutting-edge effort uses biological models to develop medical sensors that will be smaller, more sensitive, and more specific than today's state-of-the-art sensors. The new agreement builds on a strong existing relationship between HEDS and NIH.

While preparations for the next dedicated research mission were completed, HEDS ground-based research continued to provide the following important results:

- Research implicates elevated levels of nitric oxide in decreased blood vessel contraction in an animal model of weightlessness. This points to a possible mechanism for orthostatic intolerance (dizziness on standing) in astronauts and a target for future countermeasures.
- Investigators have demonstrated that muscle healing is inhibited by a period of simulated microgravity before injury.
- Investigators have identified a key gene in the regulation of plant growth and the response of plants to gravity.
- Research shows parathyroid hormone modulates the response of bone-building cells to mechanical stimulation.
- A HEDS-supported researcher first demonstrated that it is possible to "amplify" a beam of atoms similar to the way a beam of light can be amplified. The researcher has increased the number of atoms in an initial atom beam by using light and a Bose-Einstein condensate.
- Researchers fabricated single-wall carbon nanotubes using flame synthesis in 1g.

Performance Target: Support an expanded research program of approximately 935 investigations, an increase of approximately 17 percent over FY 1999. Publish 100 percent of science research progress in the annual Office of Life and Microgravity Sciences and Applications (OLMSA) Life Sciences and Microgravity Research Program Task Bibliographies and make this available on the Internet.

Target Achieved: An expanded research program funded approximately 955 investigations in FY 2000. Figure 26 illustrates the research program's funding

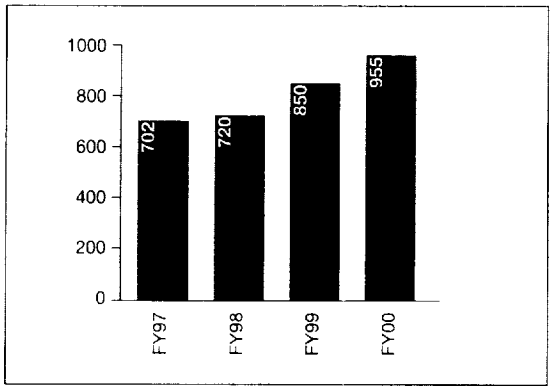


Figure 26 - Scientific Investigations

of an increasing number of scientific investigations to explore the role of gravity and the space environment in physical, chemical, and biological processes. In addition, all FY 1999 progress reports have been published in the OLMSA Life Sciences and Microgravity Research Program Task Bibliography, which is available on the Internet.

Goal: Enable and establish a permanent and productive human presence in Earth orbit.

Objective: Provide safe and affordable access to space.

The goal of the Space Shuttle program is to provide safe, reliable, and affordable access to space. The Space Shuttle is the only U.S. vehicle that provides human transportation to and from orbit. The priorities of the Space Shuttle program are to (1) fly safely, (2) meet the flight manifest, (3) improve mission supportability, and (4) continuously improve the system.

Several indicators and trends illustrate the improvement gained toward these program priorities in FY 2000. Workforce safety is reflected by an 80 percent reduction in lost workdays and a 57 percent reduction (since 1992) in lost-time cases during a period when the Shuttle Flight Operations Contract transitioning was implemented and program contractor and program civil service workforce reductions of 38 percent and 50 percent, respectively, occurred.

Process improvements, along with hardware and software enhancements, have reduced ascent risk from approximately 1 in 248 to 1 in 438, and have reduced total mission risk from approximately 1 in 145 to 1 in 245. Safety upgrades are expected to reduce these risk assessments further, to about 1 in 995 for ascent and 1 in 420 for total mission risk.

Five EVAs (spacewalks) were performed during the FY 2000 flights, contributing almost 13 hours to ISS assembly and over 24 hours of Hubble Space Telescope servicing time.

HEDS supported four successful Space Shuttle missions in FY 2000:

- STS-103 serviced the Hubble Space Telescope with EVAs to renew and refurbish the telescope (Figure 27).
- STS-99 was the Shuttle Radar Topography Mission (SRTM), part of the international project spearheaded by the National Imagery and Mapping Agency and NASA, with participation from the German Aerospace Center, DLR. The Shuttle's radar covered 99.98 percent of the planned mapping area at least once (Figure 28).
- STS-101 delivered supplies to the ISS and inaugurated *Atlantis'* new Multifunction Electronic Display Subsystem (MEDS), known as the "glass cockpit" (Figures 29 and 30).

- STS-106 was Space Station assembly flight ISS-2A.2b and utilized the SPACEHAB Double Module and the Integrated Cargo Carrier to bring supplies to the Station (Figure 31).

To improve Space Shuttle safety, an effort is ongoing to upgrade Shuttle elements.

Performance Target: Have in place an aggressive Shuttle Upgrade Program that ensures the availability of a safe and reliable Shuttle system through the ISS era.

Target Not Achieved: Accomplishments during FY 2000 included all certification testing on the High Pressure Fuel Turbopump and continuing project formulation for the following Space Shuttle Upgrade projects: the Electric Auxiliary Power Unit (EAPU), the Space Shuttle Main Engine Block III upgrade, the Advanced Health

Figure 28 - Crew of STS-99

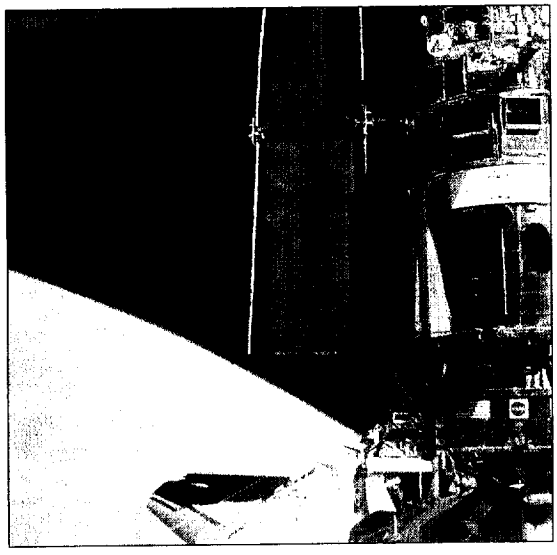


Figure 27 - The Hubble Space Telescope

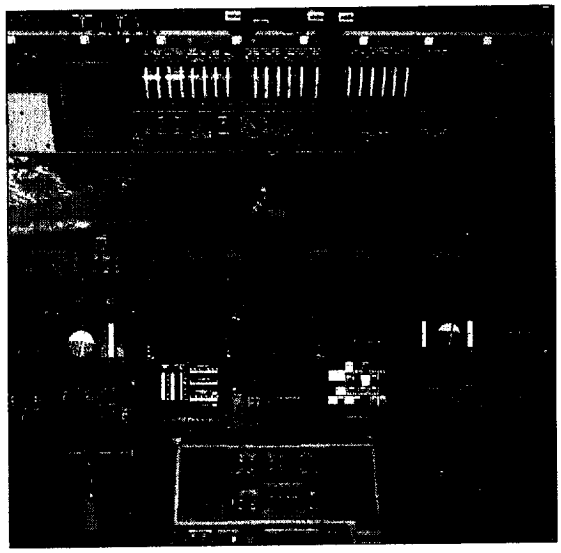


Figure 29 - The Glass Cockpit (MEDS)

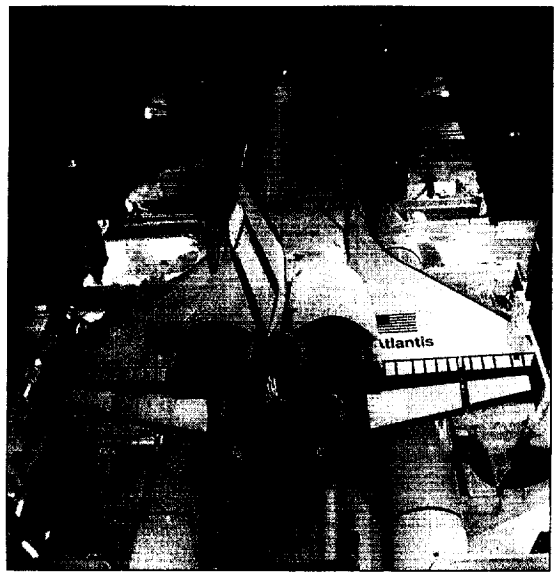


Figure 30 - Preparation of *Atlantis* for Mission STS-101

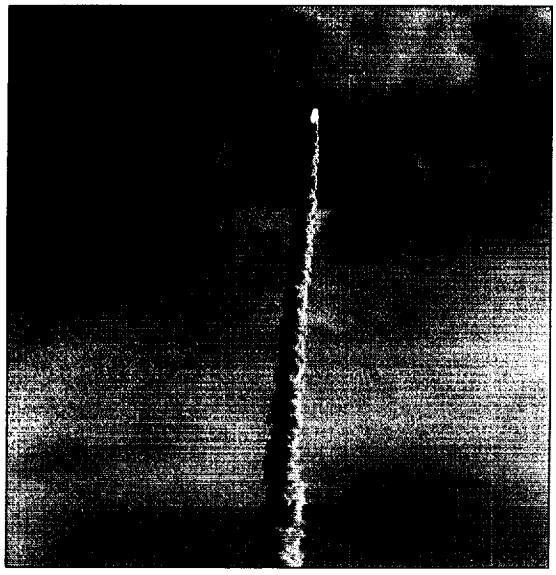


Figure 31 - Launch of STS-106

Management System, and the Cockpit Avionics Upgrade (CAU). When all the Space Shuttle safety enhancements are completed, the mean-time between failure for a Space Shuttle mission will go from 1 in 245 to 1 in 402. The target was not achieved, however, due to cost growth in the EAPU and CAU projects; after a year, there is still not a well-defined and stable program for the projects in formulation.

Improving Space Shuttle safety and reliability is indicated by a reduced rate of in-flight anomalies (IFAs) and reduced time required for mission preparation. Mission planning reductions were realized for call-up flights, with the STS-103 Hubble Space Telescope servicing mission planning template requiring only 8 months versus previous mission planning timelines of 12 months. FY 2000 averages of 5.00 IFAs per flight represent a 50 percent reduction in the last 5 years.

Performance Target: Achieve seven or fewer IFAs per mission.

Target Achieved: In FY 2000, the entire set of IFAs was included for each mission and not just those that affected the orbiter during the mission. This inclusion of all IFAs was deemed necessary in order to capture all potential issues associated with a particular flight. There were four missions in FY 2000, which resulted in an average of 5.00 IFAs per mission (Figure 32).

Performance Target: Achieve a 12-month flight manifest preparation time.

Target Achieved: The 12-month flight manifest preparation time template was implemented in FY 2000. Having a 12-month template gives the

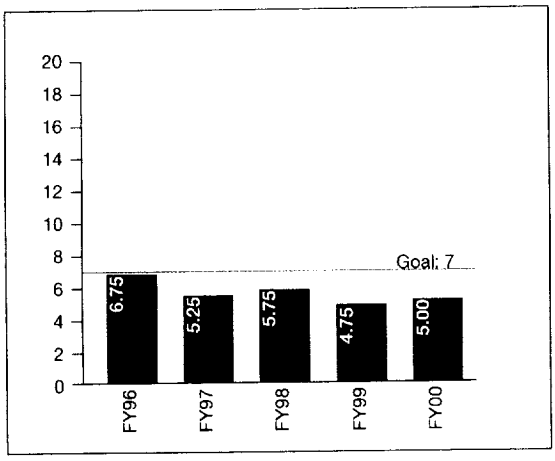


Figure 32 - Space Shuttle In-Flight Anomalies per Mission

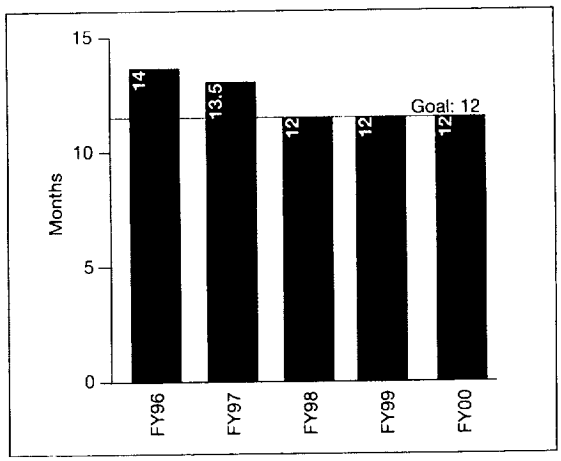


Figure 33 - Space Shuttle Manifest Preparation Time

Space Shuttle program a great deal of flexibility in manifesting for short-notice requirements as well as giving program customers a good sense of what is required (e.g., lead times) to fly on the Space Shuttle (Figure 33).

Objective: Deploy and operate the ISS to advance scientific, exploration, engineering, and commercial objectives.

HEDS made substantial progress toward the ultimate completion of the ISS. The Unity Node, Zarya Functional Cargo Block, and Zvezda Service Module are flying and operating normally as the cornerstone of what will be a world-class orbiting laboratory and a landmark in international cooperation. The launch and docking of the Service Module this past summer marked a critical success in ISS assembly. Two Space Shuttle missions and a Russian Progress cargo ship visited the ISS to prepare it for its first crew, which took up residence in October 2000. Russia has delivered more infrastructure and capabilities to orbit than any other U.S. partner will deliver by completion of assembly. Russia followed the Service Module launch with the successful deployment of the first Progress resupply mission delivering propellant and approximately 1,100 pounds of dry cargo. Outfitting of the ISS via the U.S. Shuttle also continued in FY 2000. During the STS-101 and STS-106 missions, the crew transferred several tons of equipment and supplies to the orbiting outpost and performed various tasks for the health and safety of future crews. At the close of FY 2000, the onorbit vehicle was approaching 2 years of service with most onorbit systems operating at or above design specifications. The United States and Russia continued to demonstrate an excellent level of cooperation in mission management responsibilities.

In addition to the modules on orbit, more than 90 percent of the ISS prime contractor's development work has been completed. U.S. flight hardware, for missions through flight assembly 12A, are undergoing integrated testing and launch preparation at

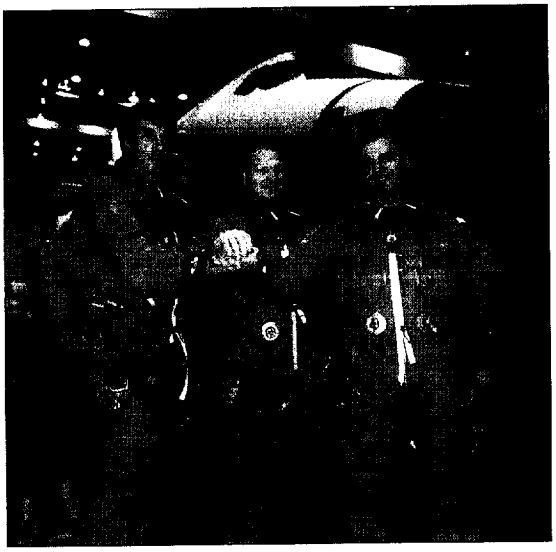


Figure 35 - ISS Expedition 1 Crew

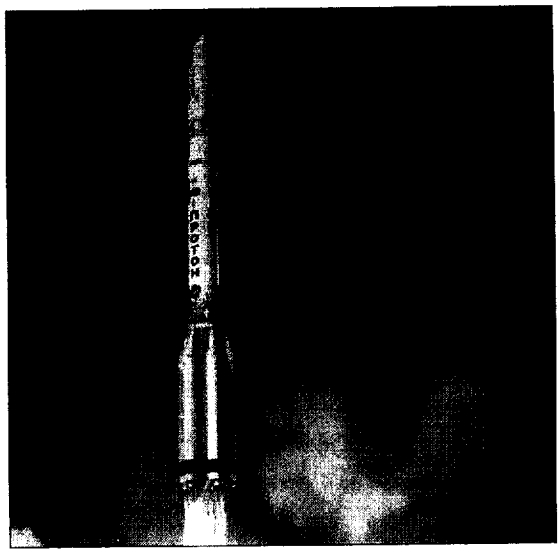


Figure 36 - Launch of the Zvezda Service Module

Kennedy Space Center. The Canadian-built Space Station Remote Manipulator System (SSRMS) and three Italian-built Multi-Purpose Logistics Modules have also been delivered to Kennedy. The program completed the first phase of the Multi-Element Integration Testing (MEIT) with ISS elements successfully demonstrating overall hardware and software compatibility. The first assembly flight of FY 2001, Flight 3A, delivered and integrated the Z1 Truss, Control Movement Gyros, and PMA-3 with the on-orbit vehicle.

A three-person permanent human presence was established aboard the ISS (Figure 34) as the Expedition 1 crew was launched via a Soyuz on Flight 2R in October 2000 (Figure 35). Also deployed in late 2000 was ISS Flight 4A, which provided the ISS with an additional 19 kilowatts of renewable electric power through the delivery of the photovoltaic arrays, batteries, and thermal radiators.

ISS assembly activity will greatly accelerate over the next year. During FY 2001, the program has scheduled seven U.S. assembly missions, one Russian assembly mission, two Soyuz flights, and five Progress resupply flights. Microgravity and biomedical research capabilities will become available with the launch of the U.S. Laboratory. The Canadian robotic arm and the SSRMS will join U.S. and Russian operational elements onorbit.

Although tremendous progress was made during FY 2000, several ongoing issues continued to constrain the program and prevent achievement of the FY 2000 performance targets. The Russian Proton failures and Service Module launch schedule delayed the entire Assembly Sequence. With the launch of the Service Module in July 2000 (Figure 36), the program will support an aggressive plan, which includes 15 missions to the ISS during FY 2001. Outyear ISS contingency planning

includes plans to augment Russian propulsion and logistics capabilities with the Space Shuttle, Interim Control Module, and development of a permanent U.S. propulsion module. Early design, schedule, and cost issues with the U.S. propulsion module dictated a reassessment of the entire project. A new design approach has been selected, and a formal decision to proceed is expected in the spring of 2001. The seven-person Crew Return Vehicle (CRV) Phase 1 activities are making progress, and a decision to proceed with the design and development phase is expected in FY 2001.

Performance Target: Deploy and activate the U.S. Laboratory Module to provide a permanent on-orbit laboratory capability (Figure 37).

Target Partially Achieved: The Laboratory was not launched during FY 2000 as planned; however, progress was significant. The revised Assembly Sequence delayed the Laboratory Module flight from FY 2000 until January 2001. During this delay, the Laboratory continued to make significant progress in MEIT and Shuttle integration. The Laboratory was launched in February 2001 and installed in the ISS.

Objective: Ensure and enhance the health, safety, and performance of humans in space.

Space flight exposes humans to low-gravity conditions for the first time in our evolutionary history and poses major challenges to virtually every system of the body. Beyond the atmosphere and outside Earth's protective magnetic field, space travelers encounter a unique and hostile radiation environment. If we are to fully utilize the opportunities of space flight, we must find ways to protect ourselves from hazards unprecedented in the history of human evolution. NASA's OLMSA conducts interdisciplinary, fundamental, and applied research to address these challenges.

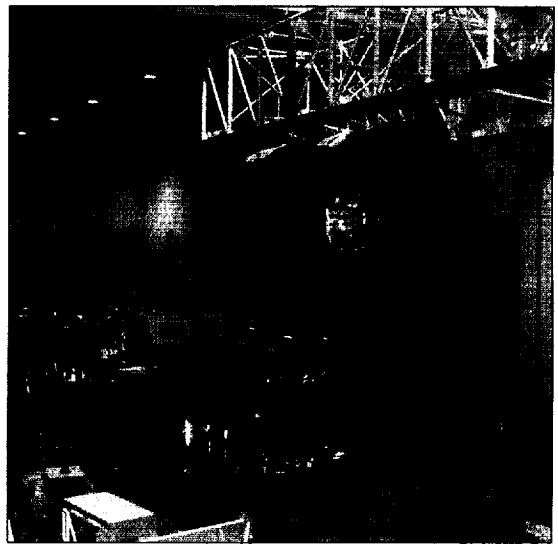


Figure 37 - U.S. Laboratory Module

HEDS made significant progress toward developing advanced new life-support technologies and improved approaches for maintaining health in the hostile environment of space. HEDS completed utilities outfitting of its new BIOplex closed life-support test chamber system. Researchers produced the next generation of tunable diode lasers and continued testing of an advanced miniature mass spectrometer for monitoring spacecraft atmospheres. Ground-based research designed to simulate space flight demonstrated that the clinically approved drug midodrine prevented human orthostatic intolerance (or fainting on return to gravity). Research implicated elevated levels of nitric oxide in

decreased blood vessel contraction, thus identifying a target for the control of blood pressure changes associated with space flight.

Objective: Meet strategic space mission operations needs while reducing costs and increasing standardization and interoperability.

NASA's ground and space networks successfully supported all NASA flight missions and numerous other U.S. Government agency, commercial, and international missions. Highlights included (1) support to the Compton Gamma Ray Observatory spacecraft reentry, (2) retirement of the Advanced Communications Technology Satellite to the gravity well, (3) support to the Tracking and Data Relay Satellite (TDRS-8) spacecraft launch in June 2000, and (4) continuous coverage to the Ulysses mission during a project-declared spacecraft emergency. The program also successfully supported all Space Shuttle missions and the ISS program, including the Service Module docking phase in July 2000. Overall, the networks provided data delivery for all customers in excess of 98 percent.

The Consolidated Space Operations Contract (CSOC) successfully completed a full year of operational support, with performance levels that met or exceeded all contract metric standards. Other significant activities included installation of initial 70-meter X-band uplink capability at the Goldstone Deep Space Communications Complex, construction and testing of the monopulse pointing system for the Cassini radio science experiment, and commercial off-the-shelf software infusion for the Flight Dynamics Facility at Goddard Space Flight Center.

Initial acquisition of commercial ground network services is well under way. Contracts have been established with Wang to provide wide-area network telecommunications services, Datalynx for EOS support, and Universal Space Network to support the Triana project. In addition, NASA is pursuing an indefinite delivery/indefinite quantity contract with CSOC to supply communications services for routine, low-Earth-orbiting missions.

Goal: Expand the commercial development of space.

Objective: Facilitate access to space for commercial researchers.

HEDS's Space Product Development (SPD) program markets the benefits of space-based research to industry, facilitates industry's access to space, provides space research expertise and flight hardware, and advocates the development of policies to encourage commercial use of space. The program is executed through Commercial Space Centers (CSCs) that establish industry partnerships with the objective of developing new commercial space products or dual-use technologies. The industry partners invest substantial cash or in-kind resources in the projects. The NASA funding for the SPD program is typically leveraged by approximately $50 million per year in non-NASA resources. Some highlights for FY 2000 work include:

- The Wisconsin Center for Space Automation and Robotics CSC received a Space Technology Hall of Fame 2000 Award from Space Foundation/NASA for innovative light-emitting diode (LED) technology for medical applications. Originally used to light

space-flown plant chambers, the LED technology is finding uses in photodynamic cancer therapy and wound healing.

- Bristol-Myers Squibb (BMS) continues its strategic partnership with BioServe Space Technologies CSC and is currently focusing with BioServe on microgravity fermentation research for improved production of antibiotics. BMS will commit to BioServe a substantial level of cash and in-kind investment for the coming year and will potentially double the commitment per year for the following 4 years. BMS and BioServe have had an ongoing collaboration on this research for 4 years. The partnership between BioServe and BMS is planned to continue into research on the ISS.
- Hewlett Packard (HP) has signed a membership agreement with the Center for Commercial Applications of Combustion in Space (CCACS) CSC. HP scientists in Colorado will work with CCACS scientists to develop techniques for *in situ* imaging of bone ingrowth into porous ceramic implants. They are partners in the CCACS biomaterials consortium that includes BioServe (a CSC at the University of Colorado at Boulder), Colorado State University, Guigne International, Ltd., and Sulzer Orthopedics Biologics.
- The Wisconsin Center for Space Automation and Robotics CSC's STS-95 research with industrial partner International Flavors and Fragrances, Inc., contributed to the development of a new product. The Zen fragrance is being marketed by Shiseido.
- Two companies joined the Center for Advanced Microgravity Materials Processing (CAMMP) as full members: Polaroid Corp. and Busek Co., Inc. A system was built and testing initiated to explore the growth of silver halides at CAMMP for Polaroid.

Objective: Foster commercial participation on the ISS.

In preparation for commercial participation in ISS research, HEDS supported small-scale Space Shuttle research and established a Commercial Demonstration program, including a pricing policy, protections for intellectual property, and a process for reviewing and selecting entrepreneurial offers. The Enterprise also entered into two initial commercial agreements.

Goal: Share the experience and discovery of human space flight.

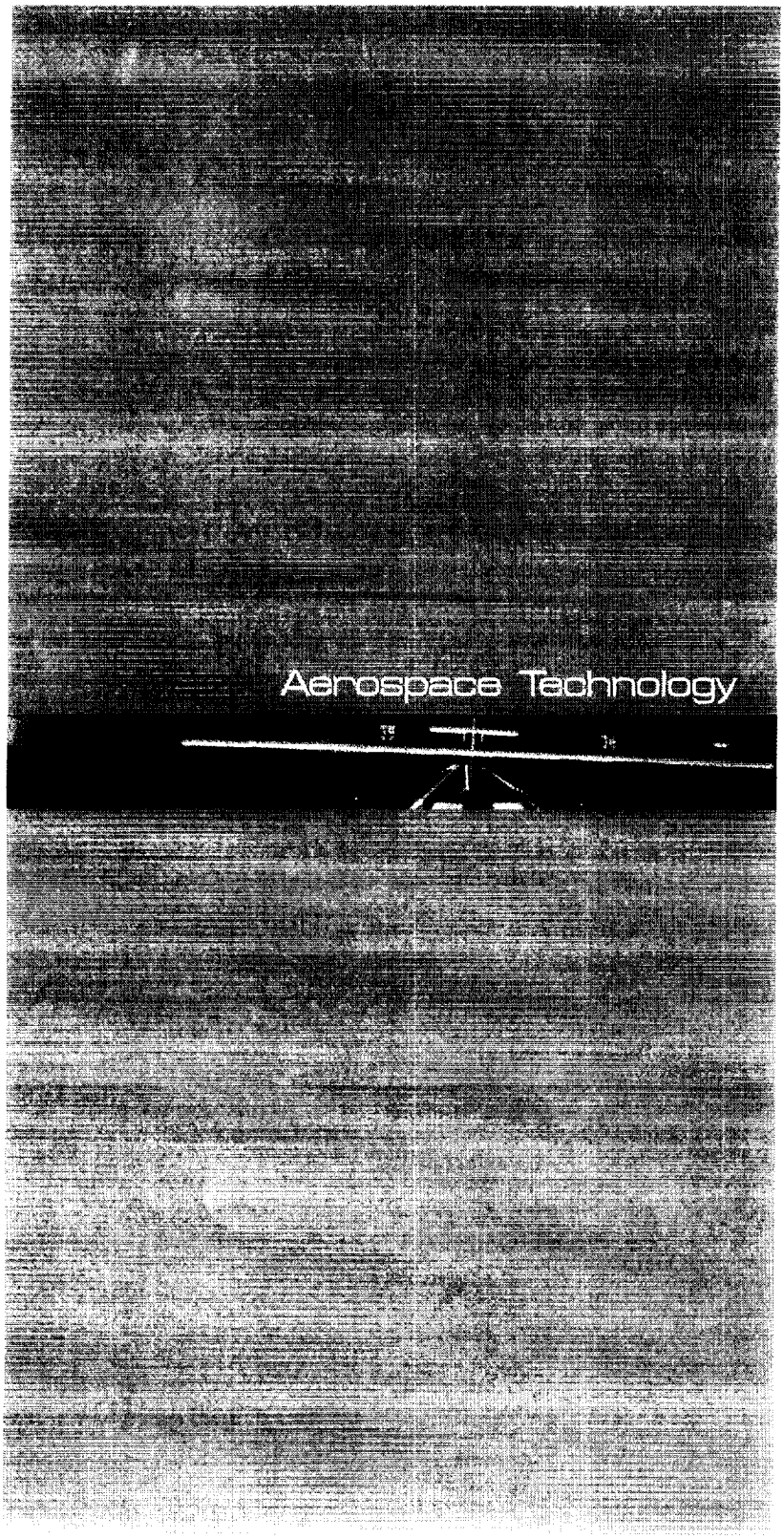
Objective: Increase the scientific, technological, and academic achievement of the Nation by sharing our knowledge, capabilities, and assets.

HEDS produced an electronic light-tower exhibit that traveled to five conventions across the country, presenting the complete story of the development and use of the ISS to over 100,000 citizens. In addition, NASA's Life Sciences and Microgravity Sciences Divisions exhibited at 15 educational conventions across the country, supplying products to educators. The commercial division exhibited at four business conventions to inform Government and industry leaders of the commercial potential of space.

On the lecture circuit, HEDS sponsored a special session to present Life Sciences concepts to eight museum curators throughout the country for consideration in museum exhibit planning. Life Sciences continued to offer 6-week programs for academically gifted undergraduate students at

NASA Centers and gave students throughout the country an additional opportunity to participate in hands-on investigations of space-flown seeds. Life Sciences also made posters and educator guides available to teachers internationally.

Finally, in preparation for FY 2001 scientific use of the ISS, middle and high school students in Alabama, California, Florida, and Tennessee helped with the first long-duration experiment to be delivered to the ISS, preparing 150 of the 500 biological samples launched on September 8, 2000. Students and teachers from 20 other States attended classes as part of the pilot education program sponsored by Marshall Space Flight Center. To further interest students in biotechnology, NASA is sponsoring teacher workshops and providing curricular materials, including crystal growth experiments.



Mission

The Aerospace Technology (AST) Enterprise pioneers the identification, development, verification, transfer, application, and commercialization of high-payoff aeronautics and space transportation technologies. The Enterprise plays a key role in maintaining a safe and efficient national aviation system and an affordable, reliable space transportation system. The Enterprise directly supports national policy in both aeronautics and space as directed in the President's Goals for a National Partnership in Aeronautics and Research Technology, the National Space Policy, and the National Space Transportation Policy.

Strategic Goals and Objectives

AST's goals and objectives for FY 2000 were:

Global Aviation—Enable U.S. leadership in global civil aviation through safer, cleaner, quieter, and more affordable air travel.

- Contribute to Aviation Safety—Reduce aircraft accident rate
- Contribute to Environmental Compatibility—Reduce aviation emissions
- Contribute to Environmental Compatibility—Reduce aviation noise
- Affordable Air Travel—Increase aviation system throughput

Revolutionary Technology Leaps—Revolutionize air travel and the way in which aircraft are designed, built, and operated.

- General aviation revitalization

- Next-generation experimental aircraft
- Next-generation design tools

Space Transportation—Enable the full commercial potential of space and expansion of space research and exploration.

- Revolutionize in-space transportation
- Revolutionize space launch capabilities

Research and Development—Enable, as appropriate, on a national basis, world-class aerospace research and development services, including facilities and expertise, and proactively transfer cutting-edge technologies in support of industry and U.S. Government research and development.

- Provide world-class aerospace research and development services, facilities, and expertise

The AST Enterprise addresses fundamental questions 5 and 6 (Figure 5). AST's near-, mid-, and long-term plans (along with revised goals and objectives) are identified in the Aerospace Technology Roadmap in the NASA Strategic Plan and are elaborated in the Aerospace Technology Enterprise Strategic Plan, both of which can be found at *http://www.hq.nasa.gov/office/codez/plans.html*. As described in those plans, the outcome-focused nature of the objectives project a preferred end-state within air and space transportation systems. The achievement of these objectives requires a multiyear investment in research, technology development, and both ground and flight verification tests. Performance targets established annually to measure progress toward each objective inherently cover a wide spectrum, ranging from early investigative research to final technology verification activities.

Highlights of Accomplishments and Performance Measures

The Enterprise produced many exciting accomplishments in support of its goals and objectives. These accomplishments will directly benefit the American people through safer, more affordable, and more environmentally friendly air travel and more efficient and affordable access to space.

Detailed discussion of FY 2000 performance against each of the goals, objectives, and targets is discussed in NASA's 2000 Performance Report at *http://www.hq.nasa.gov/office/codez/plans.html*.

Goal: Global Aviation—Enable U.S. leadership in global civil aviation through safer, cleaner, quieter, and more affordable air travel.

Research and technology play a vital role in ensuring the safety, environmental compatibility, and productivity of the air transportation system and in enhancing the economic health and national security of the Nation. However, numerous factors, including growth in air traffic, increasingly demanding international environmental standards, an aging aircraft fleet, aggressive foreign competition, and launch costs that impede affordable access to space, represent a formidable challenge to the Nation. Achievement of the goal will develop a more environmentally friendly, safe global air transportation system for the next century and improve the Nation's mobility.

Objective: Contribute to Aviation Safety—Reduce aircraft accident rate.

Flight Deck Technologies. In close cooperation with the Federal Aviation Administration, NASA's response to this challenge of reducing the aircraft accident rate stresses the development and integration of information technologies needed to build a safer aviation system, to support pilots and air traffic controllers, and to provide information to assess situations and trends that might indicate unsafe conditions before they lead to accidents. The Aircraft Vortex Spacing System (AVOSS), tested in July 2000, was developed to help a pilot navigate by predicting aircraft wake turbulence on final approach. In October 2000, an advanced cockpit display called the Runway Incursion Prevention System was tested on a specially fitted Boeing 757 (Figure 38). Following the review and completion of airborne and ground-based systems and data collection at the Dallas/Fort Worth International Airport, flight demonstrations were held October 24-26, 2000, of a conceptual aircraft flight deck integrated with ground-based incursion avoidance technologies for individuals in the aviation community.

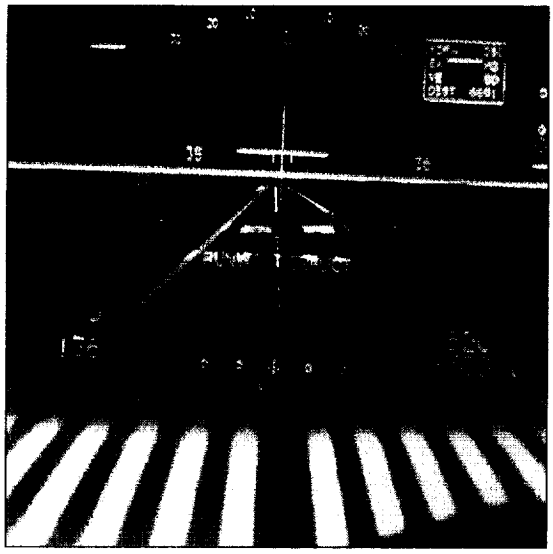


Figure 38.—Runway Incursion Avoidance Technology

Objective: Contribute to Environmental Compatibility—Reduce aviation emissions.

Performance Target: Demonstrate, in a laboratory combustion experiment, an advanced turbine-engine combustor concept that will achieve up to a 70 percent reduction of oxides of nitrogen (NO_x) emissions based on the 1996 International Civil Aviation Organization (ICAO) standard.

Target Exceeded. Three fuel injector concepts were tested in 25 atmosphere flametubes. NO_x reductions of 83 percent, 76 percent, and 73 percent, relative to the ICAO standard, were achieved with three multipoint lean direct injectors: the 36 Point Integrated Module, the 25 Point Integrated Module, and 9 Point Butterfly fuel injectors, respectively.

Objective: Contribute to Environmental Compatibility—Reduce aviation noise.

Performance Target: Validate the technologies to reduce noise for large commercial transports by at least 7 dB relative to 1992 production technology.

Target Achieved: System analysis indicates a 7-dB, with the potential of up to 9-dB, noise reduction from the following technologies:

- Engine cycle changes alone were shown to reduce community noise impact 3 to 7 dB, depending on aircraft suitability.

- Fan and stator geometry were optimized, utilizing new noise-prediction tools to reduce fan noise by 3 dB.
- Advanced low-noise engine nozzles were developed that reduced jet noise of modern turbofan engines by 3 dB.
- Engine inlet shape was investigated, and new designs reduced inlet fan noise by 2 to 3 dB.
- New engine nacelle liner technology has shown the potential to reduce forward and aft radiated fan noise by 2 dB.
- Active noise control was aggressively pursued and has shown the potential to enable new engine designs that have the potential to reduce engine system community noise by more than 1 dB.
- Airframe noise, a dominant noise source on approach, was reduced by 4 dB through an improved physics-based design of the flap, slat, and landing gear systems.
- Finally, advanced operations were investigated and found to offer the potential to reduce community noise impact by 2 dB.

Objective: Affordable Air Travel—Increase aviation system throughput.

Terminal Air Productivity. The Terminal Area Productivity project was concluded. Field demonstrations displayed an increase in nonvisual single runway throughput of 12 to 15 percent through the use of the following technologies: (1) Center TRACON Automation System/Flight Management System with aFAST (Active Final Approach Spacing Tool) and (2) AVOSS. These demonstrations also exhibited the ability to reduce lateral spacing to 2,500 feet for independent operations on parallel runways by using Airborne Information for Lateral Spacing.

Goal: Revolutionary Technology Leaps—Revolutionize air travel and the way in which aircraft are designed, built, and operated

Objective: General aviation revitalization.

Advanced General Aviation Engines. NASA's cooperative efforts with industry to develop advanced engine technology to revitalize general aviation continued in FY 2000. Slowed by technical problems, the piston engine was not ready for the flight demonstration at the annual Experimental Aircraft Association air show in Oshkosh, Wisconsin. The engine was run in both the dynamometer and propeller test stands (Figure 39). A unique counterweight system developed for this engine is working well and the engine is running smoothly. The dynamometer test demonstrated development of full power while the propeller test demonstrated propeller/engine

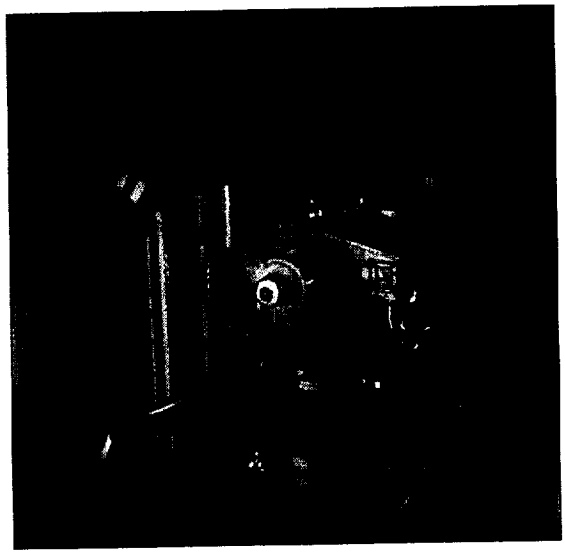


Figure 39 - Turbine Engine Propeller Test

interaction and engine durability. The piston engine flight demonstration is scheduled for April 2001. Based on significant technical progress, Eclipse, a new aircraft company, announced that it will utilize a derivative of the turbine engine developed in this project for the Eclipse 500 aircraft. NASA's partner, Williams International, desiring to concentrate efforts in the new venture, requested cancellation of the flight demonstration and the Agency agreed. The commitment by Eclipse to utilize a derivative of the turbine engine meets the intent of the flight demonstration.

Objective: Next-generation experimental aircraft.

Hyper-X Experimental Aircraft. The airframe-integrated, dual-mode, scramjet test vehicle (X-43) was delivered to the Dryden Flight Research Center in October 1999, and the first booster was accepted at Dryden in January 2000. While several technical challenges had to be overcome, both are completing validation testing and final preparations for flight, which is now scheduled for the third quarter of FY 2001. Technical risk was significantly reduced through 40 wind tunnel tests of the scramjet engine at flight conditions of Mach 7 and 95,000 feet, which verified engine performance and operability, validated the flight engine control system, and provided powered and nonpowered aerodynamic data (Figure 40).

Environmental Research Aircraft and Sensor Technology (ERAST): The ERAST project was replanned to be more responsive to the needs of the Earth Science community. A demonstration was conducted of the Continuous Over-the-Horizon command and control capabilities of a remotely piloted aircraft that would extend the operating range from 40 to 200 nautical miles, which is required to support Earth Science requirements. The Proteus aircraft flew a series of direct commands from the ground station as well as a series of waypoint sets (Figure 41). The flexibility of the system was demonstrated when air traffic control directed the Proteus to change from its planned altitude of 45,000 feet to 44,000 feet. The ground controller quickly uploaded a descent command to bring the aircraft to the new altitude, and within 2 minutes, the altitude for the entire route was updated and loaded on the aircraft.

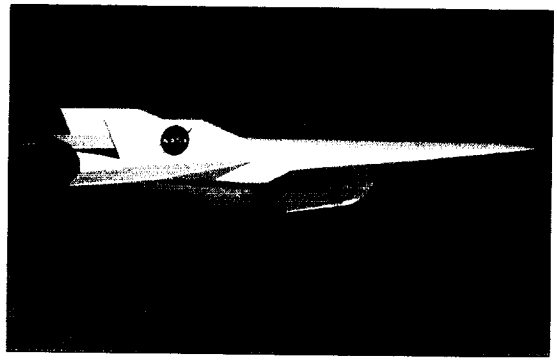


Figure 40 - Artist's Concept of Hyper-X

Objective: Next-generation design tools.

Information Power Grid (IPG): The use of the IPG prototype, a heterogeneous distributed computing environment, was demonstrated on two applications. A parameter study framework used IPG services to provide uniform access to diverse resources for study of an aerospace vehicle. A molecular design application used IPG service to provide access to idle workstations to supply 0.5 million central processing unit hours for studying nanotechnology devices and materials.

Goal: Space Transportation—Enable the full commercial potential of space and expansion of space research and exploration.

Objective: Revolutionize in-space transportation.

Performance Target: Complete NASA Solar Electric Propulsion Technology Applications Readiness (NSTAR) Mission Profile (100 percent design life) ground testing for Deep Space 1 (DS-1) (concurrent, identical firing of an NSTAR engine in a vacuum chamber with the actual firing sequence of the in-flight propulsion system).

Target Achieved: Design life, for ion engines, is described by a measure of propellant mass discharged in multiple firings. In the case of the system employed on the DS–1 mission, 100 percent design life equated to consumption of 87 kilograms of xenon propellant. This level of propellant consumption was successfully achieved on May 9, 2000, during ground-based testing of the flight-spare engine. Prior to the NSTAR project, and over a time span of more than 30 years, no ion engine to be used for primary propulsion had ever been successfully operated for more than a small fraction of its design life. The success of these tests, together with the success of the flight test on DS-1, has now made ion propulsion a legitimate option for deep space and solar system exploration missions. The end result will be missions to scientifically interesting places with shorter trip times and the use of smaller, less expensive launch vehicles.

Objective: Revolutionize space launch capabilities.

X-34 Vehicle Assembly and Flight Testing: Assembly of the first powered flight vehicle (A-2) proceeded well during FY 2000, and by year's end it was essentially complete, including integration of a flight FASTRAC (MC-1) engine. Modifications to the A-1A vehicle were completed and captive carry tests and tow tests were initiated. Additionally, hot-fire testing of the MC-1 engine was moved from Stennis Space Center to Santa Susanna, California, where testing is continuing. However, early in the year, a replanning effort was initiated to increase the probability of mission success of the X-34 project. Currently, the project is undergoing a major restructuring and replanning activity to address these concerns. Due to this risk mitigation activity, flight testing of the X-34 vehicles is on hold, pending both decisions from this process and results from the Space Launch Initiative solicitation.

X-33 Flight Testing: The X-33 is an integrated effort to flight-demonstrate key technologies and deliver advancements in (1) ground and flight operations techniques that will substantially reduce operations costs for a reusable launch vehicle; (2) lighter, reusable cryogenic tanks; (3) lightweight, low-cost composite structures; (4) advanced thermal protection systems to reduce maintenance; (5) propulsion and vehicle integration; and (6) the application of New Millennium microelectronics for vastly improved reliability and vehicle health management.

Performance Target: Conduct the flight testing of the X-33 vehicle.

Target not Achieved: The first of two liquid hydrogen (LH_2) composite tanks experienced a delamination following pressure and structural load testing at Marshall Space Flight Center in late November 1999. A joint NASA/Lockheed Martin team conducted a complete failure investigation.

The findings of this team led us to conclude that further development is required for large-scale cryogenic tanks serving as primary structure. Accordingly, a decision was made to replace the composite fuel tanks on the flight vehicle with metallic tanks. A Preliminary Design Review of the aluminum LH_2 tank was completed in June 2000 and a Critical Design Review was completed in August 2000.

In the meantime, preparations for flight testing are continuing (Figure 42). The X-33 launch site at Edwards Air Force Base has been completed and is being checked out. All of the 14 planned single-engine development tests of the XRS-2000 linear aerospike engine have been successfully completed. The two flight engines were assembled, mated, and installed in the test stand at Stennis in preparation for dual engine testing in November 2000.

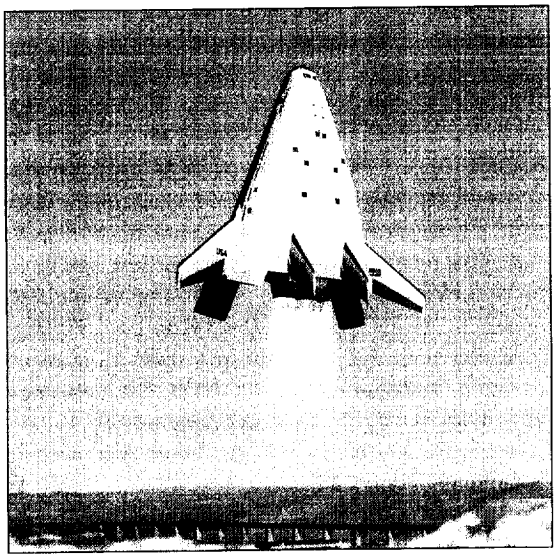


Figure 42 – Artist's Concept of X-33 Liftoff

The X-33 program will continue to build hardware and deliver it to Palmdale, California. BFGoodrich is producing the metallic thermal protection system and leeward composite panels, carbon-carbon leading-edge components, and carbon-carbon nose cap. Additionally, critical core activities will continue. At the Integrated Test Facility, software checkout and verification continues. The Software Independent Verification and Validation effort also continues. In terms of vehicle assembly, the program is fit checking body flaps and the aft part of the vehicle and increasing power checks with higher voltage.

Given the time necessary to replace the tanks and complete dual engine testing of the two flight engines, the Performance Target of flight testing the X-33 could occur no earlier than late 2003. Unless the X-33 is competitively selected as part of the Space Launch Initiative solicitation, the program will only be continued until the Cooperative Agreement expires on March 31, 2001, without final vehicle assembly. A Revised Performance Target of flight testing the X-33 will be developed following this decision.

Goal: Enable, as appropriate on a national basis, world-class aerospace research and development (R&D) services, including facilities and expertise, and proactively transfer cutting-edge technologies in support of industry and U.S. Government R&D.

Objective: Provide world-class aerospace research and development services, facilities, and expertise.

The AST Enterprise tracks programwide performance measures for its performance commitments and its customers' satisfaction.

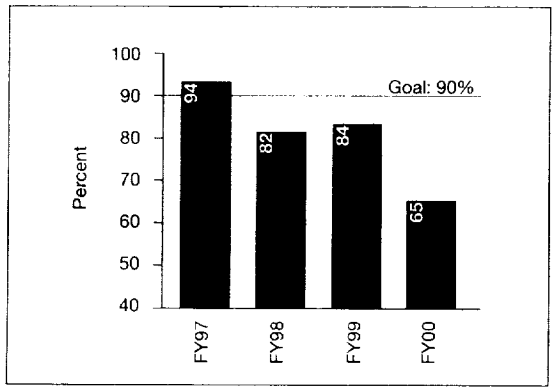


Figure 43 - Enterprise Milestones

Performance Target: Complete 90 percent of all Enterprise-controlled milestones within 3 months of schedule.

Target Not Achieved. Each Enterprise program uses measurable, customer-negotiated product and service deliverables to track annual performance against plans, including specific success criteria for milestone completion assessment. This metric aggregates the performance of all individual program milestones to provide a composite indicator of progress toward the goals and objectives of the Enterprise. The Enterprise completed 65 percent of its planned FY 2000 deliverables, within the 3-month metric, by December 31, 2000 (Figure 43). The deliverables included 16 new technologies and processes transferred to industry and other Government agencies.

Performance Target. Achieve a facility utilization customer satisfaction rating of 95 percent of respondents at "5" or better and 80 percent at "8" or better, based on exit interviews.

Simply put, the Enterprise metric is to have 80 percent of facility exit interview respondents rate satisfaction with aeronautics facilities at "8" or above (on a scale of 1 to 10) and to have 95 percent rate facilities at "5" or above.

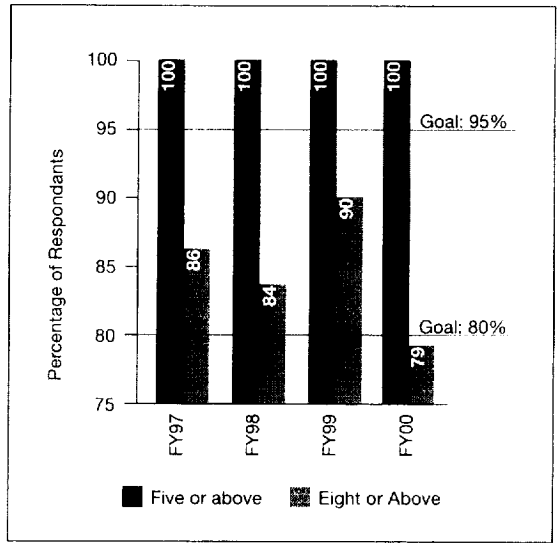


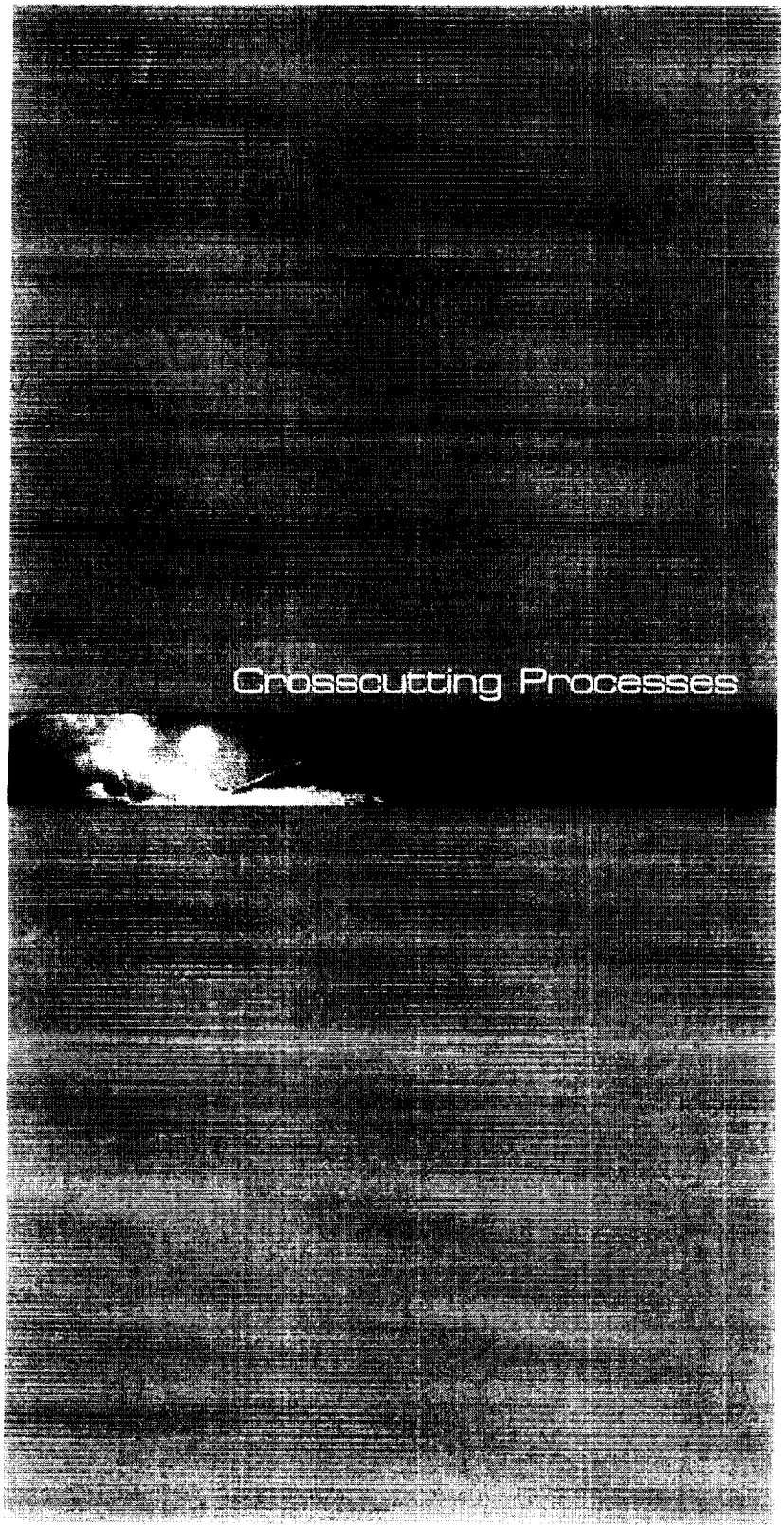
Figure 44 - Facility Utilization Satisfaction

Target Achieved. One of the major services provided to its customers by the Enterprise is access to NASA's critical R&D facilities, such as wind tunnels. Three of the NASA Research Centers (Ames, Glenn, and Langley) conduct exit interviews at selected facilities. This metric aggregates the interview results to provide an overall indicator of customer satisfaction relative to the Enterprise R&D services goal. Facility-by-facility data are available and used to improve customer satisfaction. For FY 2000, the Enterprise essentially met the "8" or above goal, scoring 79 percent and exceeded the "5" or above goal, scoring 100 percent (Figure 44).

AST research and technology programs provide important contributions to education and public

understanding of air and space transportation. A close working relationship with the educational community is a vital component of the Enterprise mission.

The development and implementation of education outreach program plans for the existing Aerospace Propulsion and Power program and the new programs and projects that were initiated in FY 2000 (Ultra-Efficient Engine Technology program, Revolutionary Concepts project, Aviation Safety program) were successfully completed. These plans have been designed in collaboration with Center Education Offices to address goals and objectives of the overall NASA education program while involving educators and students in the unique R&D activities of NASA's AST Enterprise.



The work of the Agency's Enterprises is supported by four Crosscutting Processes. These processes are common operating principles, coordinated across the Agency that enhance the returns on NASA work toward diverse programmatic and functional objectives. They are the processes NASA uses to develop and deliver products and services to customers. They are:

- Manage Strategically
- Provide Aerospace Products and Capabilities
- Generate Knowledge
- Communicate Knowledge

Through these processes, inputs, such as policies and resources, are transformed into outputs, such as knowledge.

Manage Strategically

The goal of the Manage Strategically process is to ensure that the Agency carries out its responsibilities effectively, efficiently, and safely through sound management decisions and practices. By integrating general management practices with our strategic process, all parts of the Agency can proceed together coherently, comprehensively, and expeditiously toward the achievement of a single set of strategic goals. The Agency must leverage limited resources, standardize processes where it makes sense to do so, streamline processes for timely results, and ensure a rapid, reliable, and open exchange of information.

Strategic Goals and Objectives

The goal and objectives of the Manage Strategically process for FY 2000 were:

Provide a basis for the Agency to carry out its responsibilities effectively and safely, and enable management to make critical decisions regarding implementation activities and resource allocations consistent with the goals, objectives, and strategies contained in NASA's Strategic, Implementation, and Performance Plans.

- Optimize investment strategies and systems to align human, physical, and financial resources with customer requirements, while ensuring compliance with applicable statutes and regulations
- Improve the effectiveness and efficiency of Agency acquisitions through the increased use of techniques and management that enhance contractor innovations and performance
- Improve information technology capability and services

Highlights of Accomplishments and Performance Measures

Performance targets for this process included the areas of human resources, physical resources, procurement, information technology, and financial management. Substantial progress was made in FY 2000 toward aligning the Agency's management decisions and resource allocations with national policies and statutes, Agency plans, and budget guidelines. This progress is reflected in (1) improved alignment of human, physical, and financial resources with customer requirements; (2) improved effectiveness and efficiency in acquisitions processes by using techniques and management to enhance contractor innovation and performance; and (3) improvements in information technology capability and services.

Detailed discussion of FY 2000 performance against each of the performance targets that support the goal and objectives can be found in NASA's FY 2000 Performance Report at *http://www.hq.nasa.gov/office/codez/plans.html.*

Goal: Provide a basis for the Agency to carry out its responsibilities effectively and safely, and enable management to make critical decisions regarding implementation activities and resource allocations that are consistent with the goals, objectives, and strategies contained in NASA's Strategic, Implementation, and Performance Plans.

Objective: Optimize investment strategies and systems to align human, physical, and financial resources with customer requirements, while ensuring compliance with applicable statutes and regulations.

Performance Target: Maintain a diverse NASA workforce throughout the downsizing efforts.

Target Achieved. NASA has not only maintained diversity through downsizing efforts, but has increased the representation of women, minorities, and individuals with targeted disabilities above FY 1992 levels. Since 1992, the percentage of minorities, women, and individuals with targeted disabilities has increased while the total workforce size has decreased (Figure 45). The use of buyouts enabled NASA to increase workforce diversity, because a majority of those taking buyouts were white males.

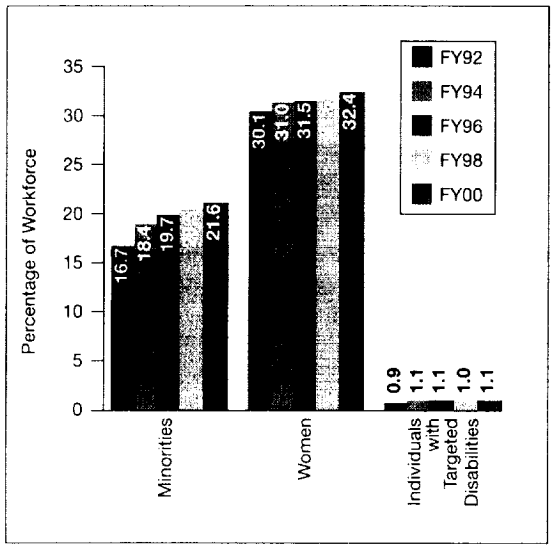


Figure 45 - Workforce Diversity

Objective: Improve the effectiveness and efficiency of Agency acquisitions through the increased use of techniques and management that enhance contractor innovations and performance.

Performance-Based Contracting (PBC) requires structuring all aspects of an acquisition around the purpose of the work to be performed, as opposed to how it is to be performed or upon broad and imprecise statements of work. PBC emphasizes quantifiable, measurable performance requirements and quality standards in developing statements of work, selecting contractors, determining contract types and incentives, and performing contract administration, including surveillance.

Performance Target: Of funds available for PBC, maintain PBC obligations at 80 percent (funds available exclude grants, cooperative agreements, actions less than $100,000, SBIR and Small Business Technology Transfer programs, FFRDCs, intragovernmental agreements, and contracts with foreign governments or international organizations).

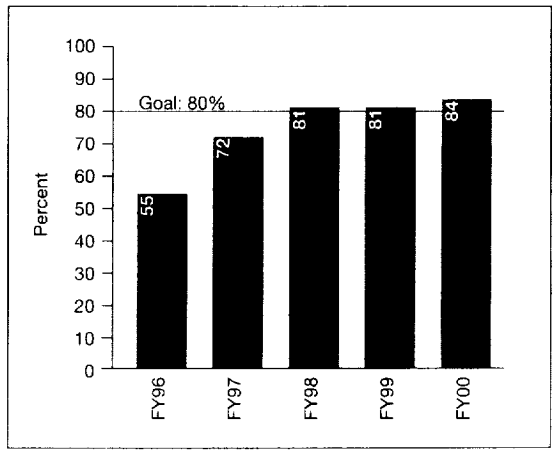


Figure 46 - PBC Obligations as Percentage of Amounts Available for PBC

Target Achieved: NASA obligated 84 percent of funds available against PBC contracts in FY 2000 (Figure 46).

Objective: Improve information technology (IT) capability and services.

Performance Target: Improve IT infrastructure service delivery to provide increased capability and efficiency while maintaining a customer rating of "satisfactory" and holding costs per resource unit to the FY 1998 baseline.

Target Achieved: As indicated by the data in Figure 47, all of the NASA IT customer satisfac-

tion and cost performance targets were met in FY 2000. Agencywide IT support was substantially improved while maintaining customer ratings of satisfied to very satisfied. Costs were held to baseline or substantially reduced. Actual ratings and per unit costs for each service are shown below compared to the baselines:

Provide Aerospace Products and Capabilities

The Provide Aerospace Products and Capabilities (PAPAC) process is the means by which NASA's Strategic Enterprises and their Centers deliver systems (ground, aeronautics, and space), technologies, data, and operational services to NASA customers. Through the use of Agency products and capabilities, customers can conduct research, explore and develop space, and improve life on Earth. This process is conducted by and enables NASA's four Strategic Enterprises and their Centers to deliver products and services to customers more effectively and efficiently.

Actual Customer Satisfaction for FY 2000	
NASA Integrated Services Network (NISN)	Satisfied
NASA ADP Consolidation Center (NACC)	Very Satisfied
Outsourcing Desktop Management Initiative (ODIN)	90.35% of customer responses were "Very Good" or better
Baseline Customer Satisfaction	
NACC and NISN	Satisfied
ODIN	90% of customer responses were "Very Good" or better
Unit Cost	
	FY 2000
Actual Average NISN $/Kbps/month	$0.65
Baseline Average NISN $/Kbps/month	$0.78
Actual Quarterly Average NACC $/Processing Resource Unit	$1,668
Baseline Quarterly NACC $/Processing Resource Unit	$3,513
Actual Average ODIN $/GP Seat	$1,831
Baseline Average ODIN $/GP Seat	$2,940

Figure 37 - IT Customer Satisfaction and Unit Cost

Strategic Goals and Objectives

PAPAC's goal and objectives for FY 2000 were:

- Enable NASA's Strategic Enterprises and their Centers to deliver products and services to customers more effectively and efficiently while extending the technology, research, and science benefits broadly to the public and commercial sectors.

  - Reduce cost and development time to deliver products and operational services
  - Improve and maintain NASA's engineering capability
  - Capture and preserve engineering and technological best practices and process knowledge to continuously improve NASA's program and project management
  - Focus on integrated technology planning and development in cooperation with commercial industry and other NASA partners and customers

Highlights of Accomplishments and Performance Measures

Detailed discussion of FY 2000 performance against each of the performance targets that support the goal and objectives can be found in NASA's FY 2000 Performance Report at *http://www.hq.nasa.gov/office/codez/plans.html*.

Goal: Enable NASA's Strategic Enterprises and their Centers to deliver products and services to customers more effectively and efficiently while extending the technology, research, and science benefits broadly to the public and commercial sectors.

Objective: Focus on integrated technology planning and development in cooperation with commercial industry and other NASA partners and customers.

Performance Target: Dedicate the percentage of the Agency's R&D budget that is established in the FY 1999 process to commercial partnerships.

Using data input by Centers, the baseline was defined in FY 1999. The National Performance Review goal is to have 10 to 20 percent of the dollar value of the total R&D program involved in partnerships.

Target Exceeded: In FY 2000, NASA contributed 19 percent of its R&D investment to commercial partnerships.

Generate Knowledge

The Generate Knowledge process is the process by which NASA acquires new scientific and technological knowledge from exploring Earth, the solar system, and the universe; from researching biological, chemical, and physical processes in the space environment; and from performing aeronautics and aerospace activities. Customers for the product of the research include scientists, engineers, technologists, natural resource managers, policymakers, educators, and the general public. Generating knowledge is central to NASA's mission and is the primary means through which we seek the answers to our fundamental questions.

Strategic Goals and Objectives

The goal and objectives of the Generate Knowledge process for FY 2000 were:

- Extend the boundaries of knowledge of science, technology, and engineering; capture new knowledge in useful and transferable media; and share new knowledge with customers.

  The objectives have been established to improve the efficiency with which we:

  - Acquire advice
  - Plan and set research priorities
  - Select, fund, and conduct research and analysis programs
  - Select and implement flight missions
  - Analyze data (initial)
  - Publish and disseminate results
  - Create archives
  - Conduct further research

Highlights of Accomplishments and Performance Measures

Detailed discussion of FY 2000 performance against each of the performance targets that support the goal and objectives can be found in NASA's FY 2000 Performance Report at *http://www.hq.nasa.gov/office/codez/plans.html.*

Goal: Extend the boundaries of knowledge of science, technology, and engineering; capture new knowledge in useful and transferable media; and share new knowledge with customers.

Objective: Select, fund, and conduct research and analysis programs.

Performance Target: For selecting, funding, and conducting research and analysis and core technology projects, SSE, OLMSA, and ESE will use broad Agency announcements (AO, NRA, and Cooperative Agreement Notice solicitations) to competitively award 80 percent or more of the resources in these programs based on peer review.

Goal: To competitively award 80 percent or more of the resources in these programs based on peer review

Enterprise	$ of Research	% Conforming	$ Conforming
SSE*	$227.9M	84.7	$193.1M
ESE	$253.7M	88.6	$225.0M
OLMSA	$274.7M	80.1	$220.1M
Total	$756.3M	84.3	$638.2M

*Although these figures for total budgets include some taxes, it is important to note that, unlike other Enterprises, SSE has all of its taxes bookkept within Research and Analysis (R&A). Therefore, these figures significantly underreport the percentage of true R&A funds that are awarded through the peer-review and merit-based competition process. If figures are adjusted to reflect only the R&A program's "fair share" of the taxes, the percentage increases to approximately 97.8 percent.

Figure 48 - FY 2000 Peer-Reviewed Research Projects

Target Achieved: ESE competitively awarded 88.6 percent of the resources in its program, based on peer review. OLMSA awarded 80.1 percent of its science resources to peer-reviewed research, and SSE awarded 84.7 percent of its science resources to peer-reviewed research. The total budgets shown below include taxes (Figure 48).

Communicate Knowledge

During the past four decades, the results of NASA's scientific activities and discoveries have proven to be extremely important to the American people and to the world. The Communicate Knowledge process seeks to increase understanding of science and technology, advance its broad application, and inspire achievement and innovation. The process augments the transfer of technology performed within the normal course of conducting research, performing missions, and executing programs and projects. This process ensures that knowledge derived from the public's investment is presented and transmitted to meet the specific needs and interests of the public, educators, and other constituency groups.

Strategic Goals and Objectives

The goal and objectives of the Communicate Knowledge process for FY 2000 were to:

- Ensure that NASA's customers receive the information derived from NASA's research efforts that they want, in the format they want, for as long as they want it.

- Highlight existing and identify new opportunities for NASA's customers, including the public, the academic community, and the Nation's students, to directly participate in space research and discovery
- Improve the external constituent communities' knowledge, understanding, and use of the results and opportunities associated with NASA's programs

Highlights of Accomplishments and Performance Measures

The Agency has had a significant impact on communicating knowledge based on its performance in the areas of providing education, transferring technology, assisting customers in locating and using technical information, and providing a historical context for its activities and achievements. Children, industry, and the public now have easier access to relevant information than ever in the past. Detailed discussion of FY 2000 performance against each of the performance targets that support the goal and objectives can be found in NASA's FY 2000 Performance Report at *http://www.hq.nasa.gov/office/codez/plans.html*.

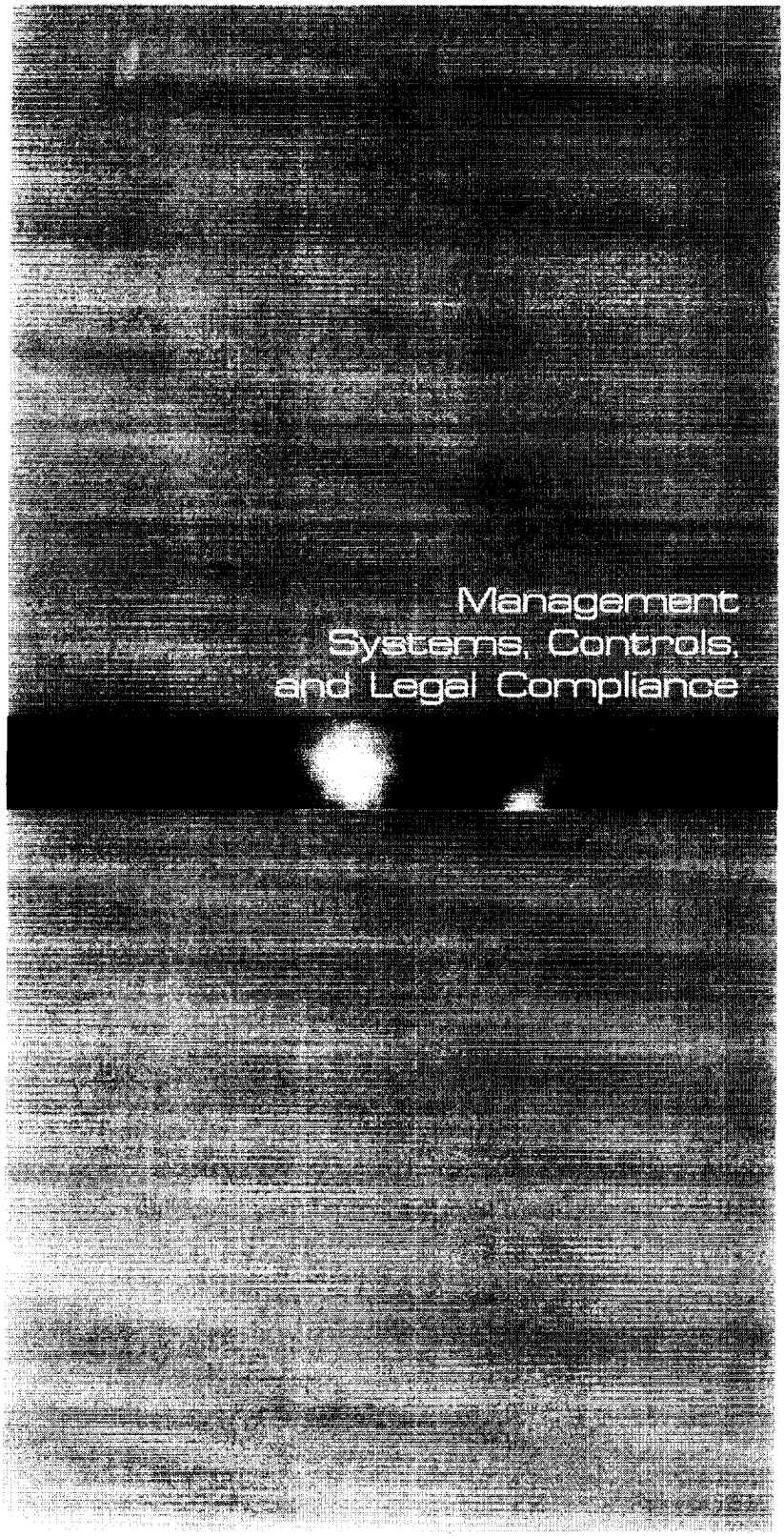
Goal: Ensure that NASA's customers receive information derived from the Agency's efforts that they want, in the format they want, for as long as they want it.

Objective: Highlight existing and identify new opportunities for NASA's customers, including the public, the academic community, and the Nation's students, to participate directly in space research and discovery

Performance Target: Seek to maintain a level of participation involvement of approximately 3 million participants from the education community, including teachers, faculty, and students.

Target Exceeded: In FY 2000, there were 3.4 million participants in NASA education programs.

Management Systems, Controls, and Legal Compliance



On the basis of NASA's comprehensive management control process, I am pleased to certify, with reasonable assurance, that NASA's systems of accounting and internal controls are in compliance with the internal control objectives in OMB's Bulletin Number 01-02. I also believe these same systems of accounting and internal controls provide reasonable assurance that the Agency is in compliance with the provisions of the Federal Managers' Financial Integrity Act.

Daniel S. Goldin
NASA Administrator

Federal Managers' Financial Integrity Act

The Federal Managers' Financial Integrity Act (FMFIA) requires agencies to provide an annual statement of assurance regarding management controls and financial systems. NASA is pleased to report continued progress in strengthening management controls. The reengineered program and project management process is in place. Certification of compliance with the International Organization for Standardization (ISO) 9001 quality management standards has been obtained Agencywide. The establishment of ISO quality management systems is a major management control initiative and provides for ongoing corrective action and continuous improvement of key management processes. Agency financial management controls and systems, taken as a whole, provide reasonable assurance that

accounting systems comply with appropriate Federal requirements. This conclusion is based on the review and consideration of a wide variety of evaluations, internal analyses, reconciliations, reports, and other information, including quality assurance evaluations, General Accounting Office (GAO) and Office of Inspector General (OIG) audits, and an independent public accountant's opinion on the financial statements and reports on the internal control structure and compliance with laws and regulations.

Reasonable controls are in place and no instances of material weaknesses or noncompliance with law or regulation have been identified. This does not mean there are no management improvement opportunities. Audits, internal reviews, and other evaluations have revealed management weaknesses in individual systems. These weaknesses have been identified by NASA as "significant areas of management concern"; correction is being aggressively pursued. This year, corrective actions were completed on two of the significant areas of management concern reported in FY 1999, and a level of effort is continuing on three previously reported significant areas of management concern. New significant areas of management concern, described below, have been added.

Status of Existing Significant Areas of Management Concern

Financial Management Systems. Due to the use of individual, non-integrated systems at Headquarters and Centers to meet statutory and regulatory reporting requirements, NASA reports its financial management systems as a significant area of management concern. While financial management systems are not integrated, NASA has implemented compensating policies and procedures that provide appropriate assurance regarding the fundamental completeness and integrity of internal accounting and administrative controls related to the financial statements.

NASA did not begin implementing the Integrated Financial Management System at the Centers in FY 2000 as planned. System testing demonstrated that the software product was not ready for deployment. After extending testing, it was concluded that the product would not meet Agency needs and the contract was terminated. The program has been reformulated, breaking implementation into individual software modules. Systems, Applications, and Products in Data Processing's (SAP's) "mySAP.com" product was selected as the Core Financial System. The design phase for the Core Financial System will begin in FY 2001, pilot Center activities will be completed in FY 2002, and the system will be implemented at remaining Centers in FY 2003. Until the Core Financial System is in place, NASA will continue to report its financial management systems as a significant area of management concern.

Equitable Environmental Cost Sharing. Controls have been established and potentially responsible parties have been identified in addressing equitable environmental cost sharing. Cost-sharing agreements will be pursued when they are determined to be the appropriate course of action. This significant area of management concern is closed.

Information Technology (IT) Security. NASA has installed a common set of network auditing and monitoring tools to scan systems for a set of known vulnerabilities; the number of vulnerabilities per system has been reduced. The common set of network monitoring tools improved detection of attacks on

systems and facilitated determination of whether an attack experienced by one Center is also being conducted against other Centers. The success of the network monitoring tools approach was demonstrated by a four-fold decrease in the ratio of successful compromises to attacks in FY 2000. NASA conducted IT Security awareness training for employees and onsite contractors and specialized IT Security training for managers. NASA also has developed and made available IT Security training modules for risk assessments and, working with the Defense Information Systems Agency (DISA), for administration of Unix systems. Drawing on material developed by DISA, IT Security training for administration of Microsoft Windows NT systems is to be available in FY 2001. In addition, the Agency received positive feedback on its IT Security posture regarding financial systems from the independent public auditors.

The Agency issued a NASA Federal Acquisition Regulation (FAR) supplement that extends its security requirements to contractors operating computer systems on its behalf. The clause promotes the same appropriate level of security for all systems, whether operated by NASA or contractors (either onsite or offsite). Recognizing that effective IT Security requires an appropriate level of investment, spending for IT Security more than tripled from FY 1999 to FY 2000, and will quadruple from FY 1999 levels in FY 2001.

IT Security plans will be completed for all Special Management Attention systems by March 31, 2001. Substantial progress was made in closing out IT Security-related recommendations of GAO, the NASA OIG, internal reviewers, and others.

Decommissioning of Plum Brook Reactor. A decommissioning plan has been submitted to the Nuclear Regulatory Commission (NRC) and NASA is awaiting comment and approval. Funding is included in the FY 2002 budget request. Until comments from NRC are received and NRC approves the decommissioning project plan, NASA will continue to report the decommissioning of the Plum Brook Reactor as a significant area of management concern.

Flight Termination Systems (FTS). NASA co-chaired the Space Policy Working Group with the National Security Agency (NSA) on redrafting U.S. national policy on FTS. Federal agencies have now approved and issued a new policy. As a result, this significant area of management concern is closed. Policies and procedures were implemented that require a range of users to conduct risk assessments and use a secure FTS on their launch vehicles or possess an exception approved by the Associate Administrator for Management Systems and the Chief Information Officer. NASA has been working with NSA on threat and vulnerability assessments conducted by NSA on traditional and secure FTS. NSA agrees that the need exists to plan for an improved version of FTS. As a result of NSA findings, the Range Commanders Council (RCC) FTS Committee has completed Phase I of a task study sponsored by NASA and the RCC for an enhanced FTS.

New Significant Areas of Management Concern

National Environmental Policy Act (NEPA) Implementation. NEPA requires evaluation of potential environmental impacts of proposed Federal actions as early as possible in the program/project planning process. Management controls need to be strengthened to ensure greater visibility and more consistent implementation of the NEPA process.

Review of existing management controls, development and advocacy of improvements, and training activities have been planned and are being initiated.

International Space Station. President Clinton designated management of the ISS a Priority Management Objective. The FY 2001 Budget states: "...NASA must continue to manage the risks of completing assembly and reduce the potential for future cost growth...by balancing requirements within available resources...address cost and schedule performance problems in its key contracts, strengthen contract management and cost controls, and further reduce risks from potential Russian shortfalls." A number of reviews have been and are being conducted that impact Space Station issues. The GAO Report on *Space Station: Prime Contract Changes* identified issues with growing costs of the ISS program and NASA's efforts to control them, the number of contract changes, and negotiated costs of change work. NASA Management is in general agreement with the content and data in the report. NASA commented that the number and total value of undefined contract changes to the original ISS contract have been steadily declining over the past three years. NASA also anticipates having many urgent changes as the ISS program continues and assures that all contract changes will continue to receive management attention. The GAO Report, *Space Station: Russian-Built Zarya and Service Module Compliance With Safety Requirements*, provided information on Russian compliance with ISS safety requirements, waivers of safety requirements, and whether NASA was due compensation from the Zarya contractor for items that did not meet safety requirements or had performance problems. NASA management concurred with the information in the report. Flight safety is the Agency's number one goal and ISS modules will only fly if they are judged to have an acceptable level of risk. NASA expressed concern that the report did not adequately characterize the rigor of the safety review process and lacked sufficient detail for the reader to appreciate all the factors that influence decisions to grant safety waivers.

Commitment to Strong Management Controls

The reporting of corrective actions for significant areas of management concern does not provide a full account of the management control improvements undertaken. NASA is committed to continuously improve the management of programs and related controls independently, as well as part of Governmentwide reengineering and reinventing processes, and to removing unnecessary, burdensome requirements and controls, while evaluating streamlined processes to ensure that reasonable controls remain in place. NASA is committed to improving every aspect of management.

Federal Financial Management Improvement Act

The Federal Financial Management Improvement Act (FFMIA) requires agencies to report on their substantial compliance with Federal financial management system requirements, applicable Federal accounting standards, and the U. S. Government Standard General Ledger at the transaction level. Based on OMB guidance, NASA is in substantial compliance with the requirements of FFMIA.

The Inspector General Act Amendments

The Inspector General (IG) Act (as amended) requires semiannual reporting on IG audits and related activities as well as Agency follow up. The report (Figures 49 and 50) is now included in this Accountability Report. It is required by Section 106 of the Inspector General Act Amendments (Public Law 100-504). It includes statistics on the total number of audit reports and dollar value of disallowed costs for FY 2000, and on the total number of audit reports and dollar value of recommendations which propose that funds be put to better use as agreed to by management decision. It also provides information on the status of audit reports open over one year as of September 30, 2000.

AUDIT REPORTS WITH DISALLOWED COSTS AND RECOMMENDATIONS THAT FUNDS BE PUT TO BETTER USE
OCTOBER 1, 1999 THROUGH SEPTEMBER 30, 2000
(In Dollars)

	A. Audit Reports with Disallowed Costs		B. Audit Reports with Recommendations That Funds Be Put To Better Use	
	Number	Value	Number	Value
A. Audit reports with management decisions on which final action had not been taken at the beginning of the reporting period	0	$0	0	$0
B. Audit reports on which management decisions were made during the reporting period	1	$13,350	3	$9,062,000
C. Total audit reports pending final action during the reporting period (total of A + B)	1	$13,350	3	$9,062,000
D. Audit reports on which final action was taken during the reporting period				
1. Value of disallowed costs collected by management	1	$13,350	3	$9,062,000
2. Value of costs disallowed that was written off by management	0	$0	0	$0
3. Total (lines D1 + D2)	1	$13,350	3	$9,062,000
E. Audit reports needing final action at the end of the reporting period (C - D3)	0	$0	0	$0

Figure 49 - Disallowed Costs and Funds Put to Better Use

Report No.	Report Date	Disallowed Costs	Better Use of Funds
IG-98-019	08/06/98	$0	$0
Aeronautics Program Grant Financial Transactions			
Management anticipates completion of corrective actions on the remaining four open recommendations shortly.			
IG-98-024	08/18/98	$1,049,000	$14,250,000
Cost Sharing for Santa Susana Field Laboratory (SSFL) Cleanup Activities			
Management is awaiting completion of Contracting Officer's review of contractor's charging practices.			
IG-98-028	09/08/98	$0	$0
Transportation Costs for Non-NASA Payloads Flown on Spacehab Models			
NASA concurred with the recommendation and is developing a pricing strategy.			
IG-98-030	09/14/98	$0	$0
Single Source Suppliers of Critical Items			
Management concurred with all recommendations. One remains open pending adding language to NASA Procedure and Guideline (NPG) 7120.5A.			
IG-98-038	09/30/98	$0	$0
Commercial Use of the SSFL			
Management notified the contractor that future commercial use of SSFL property is subject to appropriate compensation as required by FAR.			
IG-98-041	09/30/98	$0	$0
Consolidated Network Mission Operations Support Cost Savings			
Defense Contract Audit Agency (DCAA) issued its final report and requested an OIG investigation. DCAA and the Goddard Space Flight Center (GSFC) Contracting Officer are discussing findings, recommendations, and a possible negotiated approach.			
IG-99-001	11/03/98	$0	$0
X-33 Funding Issues			
Recommendations 1 and 2 are unresolved pending a meeting of management and IG to reach resolution or refer it to the Audit Followup Official (AFO) for a final management decision.			
IG-99-007	01/28/99	$0	$0
Space Station Corrective Action Plans			
Management considers this unresolved and will refer it to the AFO for final management decision.			
IG-99-009	03/09/99	$0	$0
Space Station Contingency Planning for International Partners			
Johnson Space Center Audit Closure Official signed closure documentation providing evidence that all known risks are included in the Contingency Plan.			
IG-99-016	03/24/99	$0	$0
Advanced X-ray Astrophysics Facility			
Management agreed to update NPG 7120.5 to require program managers to update Risk Management Plans.			
IG-99-019	03/29/99	$0	$0
X-33 Program Cooperative Agreement NCC8-115			
Failure of the composite hydrogen tank resulted in restructuring the X-33 Program. These activities have impacted the remaining open recommendations.			
IG-99-020	03/31/99	$0	$0
NASA Control of Export-Controlled Technologies			
All six recommendations remain open pending publication of export NASA Policy Directive (NPD) and NPG.			
IG-99-024	03/31/99	$0	$0
NASA's Full-Cost Initiative Implementation			
Two recommendations remain unresolved pending a meeting of management and IG to reach resolution or refer it to the AFO for a final management decision.			
IG-99-026	04/27/99	$0	$0
Implementation of NASA's Integrated Financial Management Project			
Due to a failure to perform, NASA management terminated the contract and negotiated settlement.			
IG-99-028	06/09/99	$0	$0
Management of NASA-Held Equipment			
Management and the OIG agreed to close 5 of 10 recommendations. Logistics Management Office is working with the OIG to close remaining recommendations.			
IG-99-032	06/23/99	$0	$0
Disaster Recovery Planning at Ames Research Center's Numerical Aerospace Simulation Facility			
Ames Research Center concurred with the recommendation and provided the OIG an updated status to develop a disaster recovery plan.			

(continued on page 84)

Figure 50 - Audits Open Over One Year

Report No.	Report Date	Disallowed Costs	Better Use of Funds
IG-99-045	09/30/99	$0	$0

X-38 Crew Return Vehicle (CRV) Operational Testing
Management notified the OIG it will take 6 years to complete a test plan for CRV operational testing and closed the audit. The OIG does not agree with this action. It will be referred to the AEO for a final management decision.

IG-99-037	08/10/99	$0	$0

Audit of Earned Value Management at NASA Earth Observing System Performance
Recommendation is resolved and will remain open pending completion and agreement on the language to be included in NPG 9501.4.

IG-99-043	08/20/99	$0	$0

Disaster Recovery Planning at Marshall Space Flight Center's (MSFC) Automated Data Processing (ADP) Consolidation Center
The OIG made nine recommendations to improve disaster recovery strategies, procedures, and testing. Management is implementing corrective actions.

IG-99-047	09/22/99	$0	$0

Safety Considerations at GSFC
Management will evaluate progress in achieving GSFC Safety Initiative objectives at the end of the first three quarters of FY 2000. Management supplied the second status report to the OIG and the final report at the end of calendar year 2000.

IG-99-051	09/24/99	$0	$0

Environmental Aspects of External Tank Contract
Management concurred with, or concurred with the intent of, both recommendations and is implementing corrective actions.

IG-99-052	09/24/99	$0	$0

X-33 Cost Estimating Processes
Management concurred with the OIG recommendations and stated they would be provided to NPG 7120.5 Program/Project Working Group.

IG-99-053	09/27/99	$0	$0

Management of Contractor Acquired Facilities at MSFC
Management concurred with all recommendations and requested reviews of leases in question by DCAA.

IG-99-054	09/28/99	$0	$0

JPL Management of Subcontractor Technical Performance
NASA Management Office (NMO) sent a memo to the OIG recommending alternative corrective action. While agreeing with the general theme of the NMO response, the OIG believes the recommendation should remain open pending policy revision.

Report No.	Report Date	Disallowed Costs	Better Use of Funds
IG-99-055	09/30/99	$0	$0

NASA Implementation of the GPRA
Management agreed with the OIG's recommendations and is revising policy guide to address Senior Management oversight.

IG-99-056	09/30/99	$0	$0

Earned Value Management
The two recommendations are resolved and will remain open pending completion and agreement on language in NPG 9501.4.

IG-99-058	09/30/99	$0	$0

Matching Funding Inputs to Obligations
The seven recommendations are resolved and agreed upon fair, deliverables included in the NASA Financial Management Manual revision dated November 2000.

IG-99-060	12/11/99	$0	$0

NASA's Implementation of a Public Key Infrastructure
Seven recommendations are resolved and open. NASA Management moved forward in implementing encryption solutions by selecting the vendor's products to meet key requirements.

IG-99-067	08/18/99	$0	$0

Assessment of the NASA Automated Systems Incident Response Capability
Report addressed adequacy of the Agency's incident reporting, response, handling, coordination, and information sharing capabilities. Management is implementing corrective actions for 11 recommendations.

IG-99-069	08/18/99	$0	$0

X-33 Program Security Assessment
OIG requested a copy of the Range Officers input on recommendation's 1, 2, and 3. OIG will contact the Range Officer and the Department of Defense with information and make a determination of the next steps. Management is following up with the OIG for current status.

IG-99-011	09/27/99	$0	$0

Assessment of Flight Termination/Command Destruct Systems
There are six recommendations in the final report with which management partially concurred. All six have now been resolved and three have been closed. The remaining three will be closed pending completion of final negotiations.

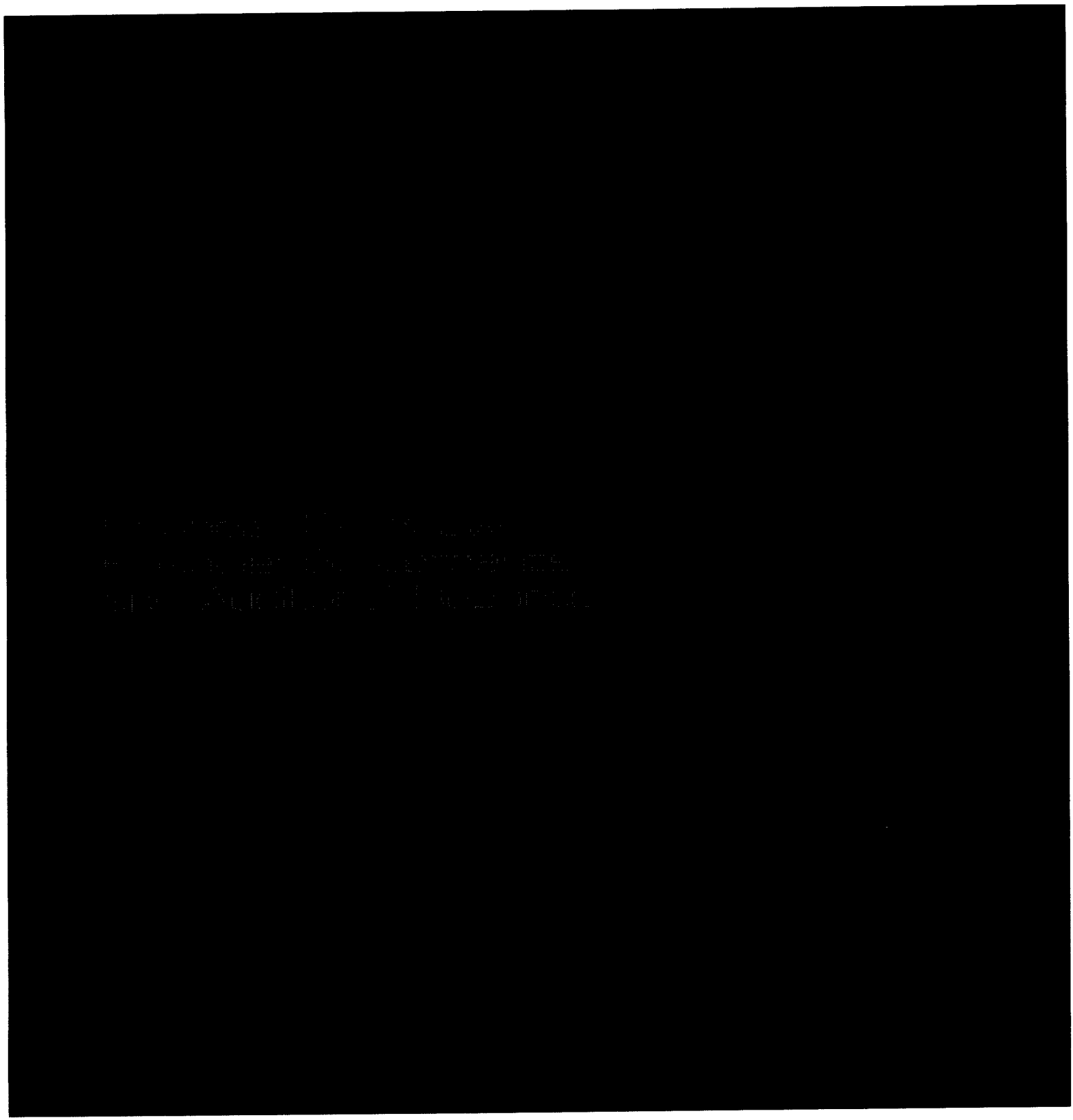
Figure 50 - Audits Open Over One Year (continued)

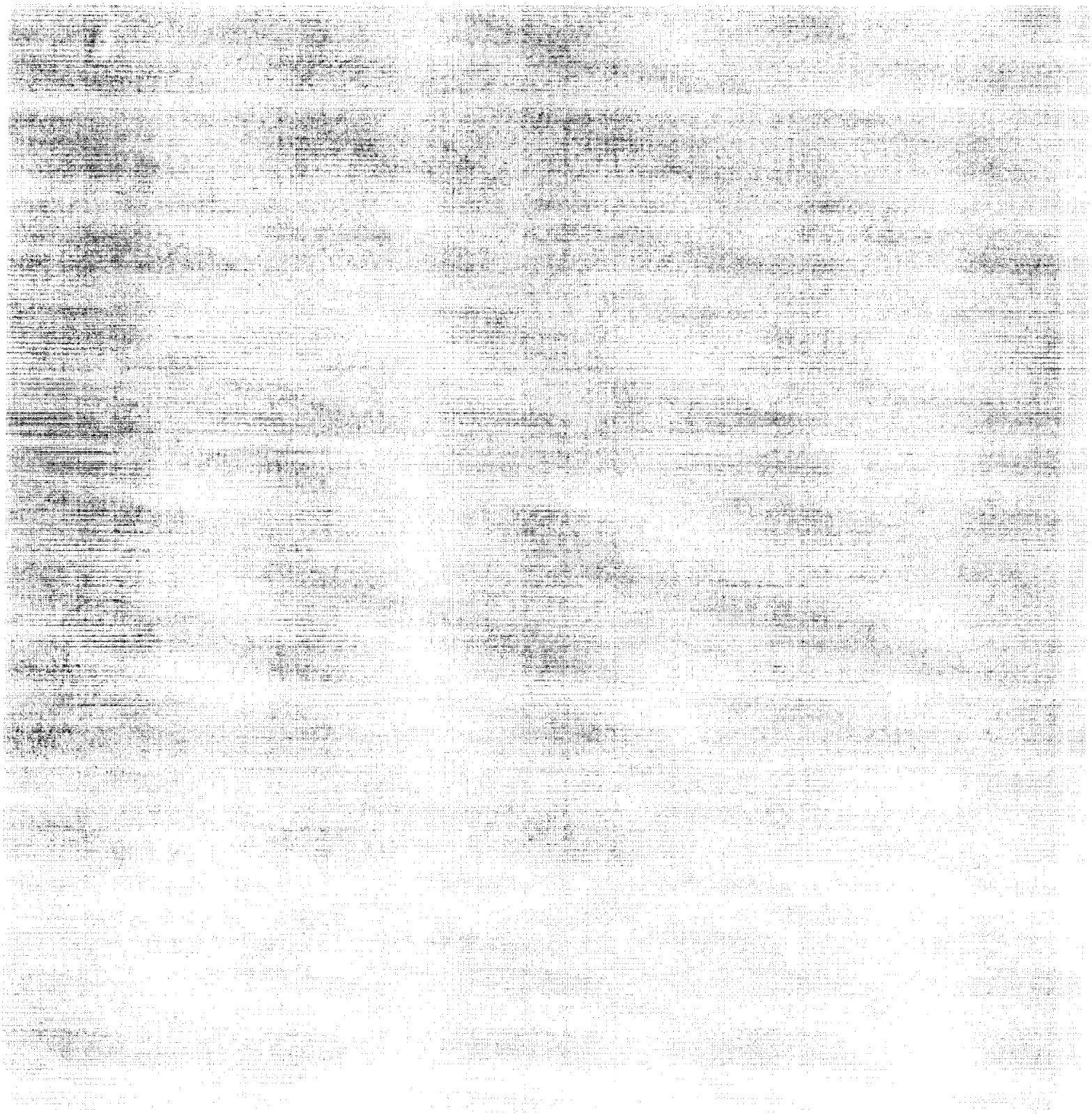
Audit Followup and Internal Management Controls

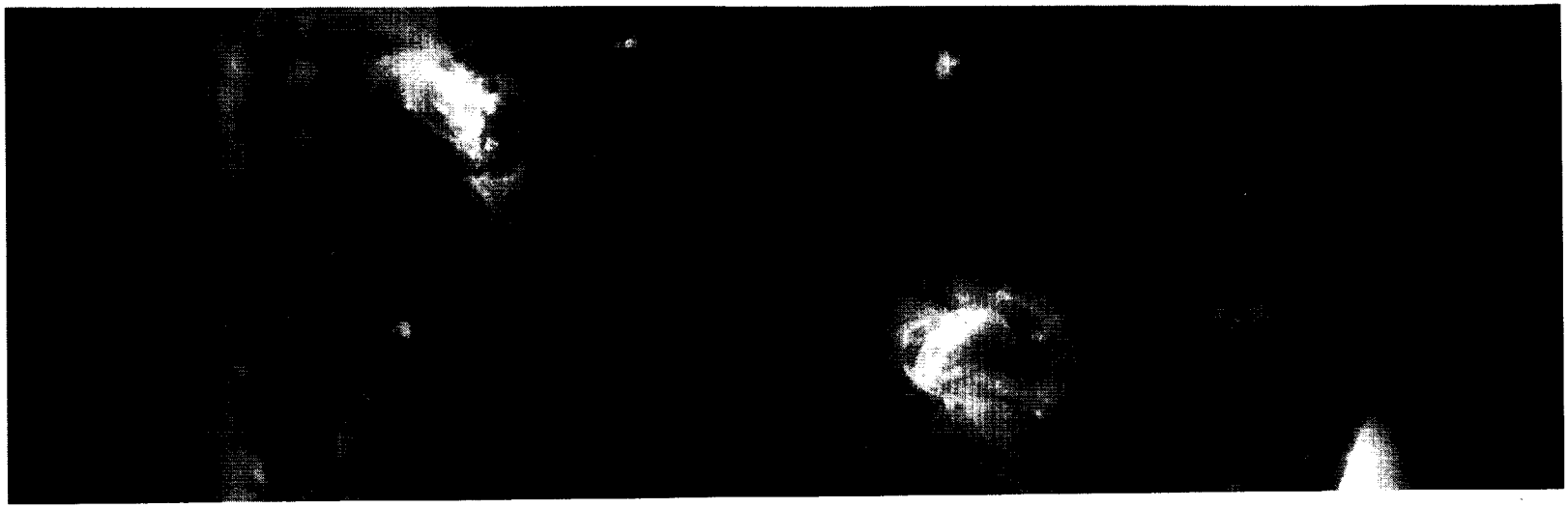
Effective audit followup and internal management controls are a high priority for all levels of management. In conjunction with the OIG, deficiencies are identified and corrected as early as possible.

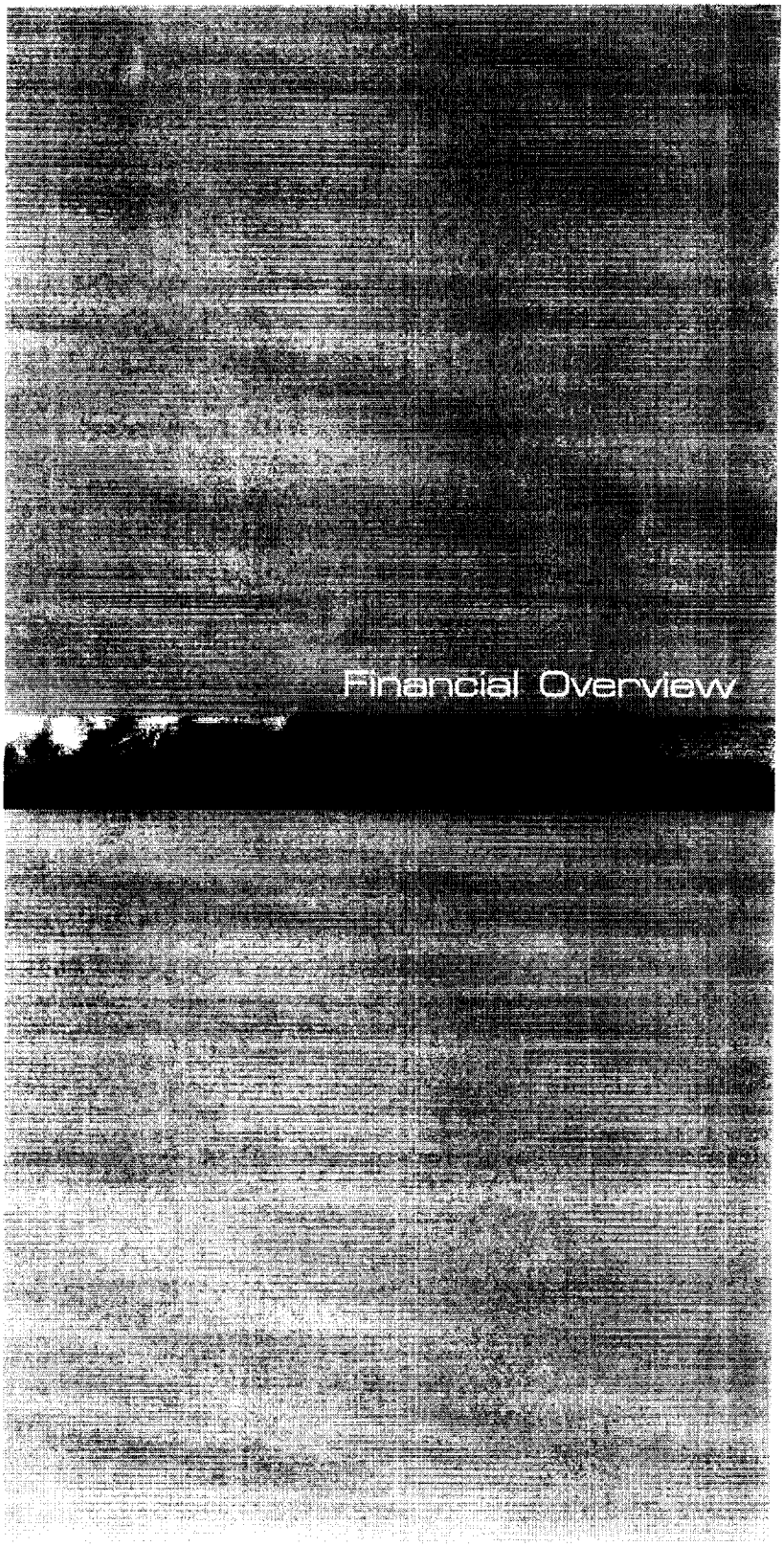
The Management Assessment Division continues to improve the audit resolution and followup process. It is strengthening its virtual team of Audit Liaison Representatives (ALRs) with improved automation and communication and working with the OIG to develop process flow charts and Agencywide roles and responsibilities for ALRs. It is also talking to and meeting with other Federal agencies to discuss how they manage audit resolution and closure.

In FY 2000, NASA management has seen a sizable increase in open OIG recommendations. The Management Assessment Division is acutely aware of this situation and is producing Agencywide metrics to identify where these open recommendations are and alerting the ALR network so additional resources can be applied to determine the cause(s) of this increase. Training modules and standard procedures have been developed to better educate management in monitoring timely responses and report followup. Finally, an electronic service is maintained to allow management and the OIG to deliver reports and other information effectively and efficiently. This service transmits audit information to the widest possible audience minutes after the document is officially released.









Summary of Financial Results, Position, and Condition

In FY 2000, NASA was funded through four appropriations that totaled $13.6 billion. NASA's financial statements received an unqualified audit opinion for the seventh consecutive year. The following is a brief description of the nature of each required financial statement and its relevance. Some significant balances or trends related to the statements are discussed to help clarify their impact upon NASA operations.

The Statement of Financial Position displayed on page 99 presents the Agency's "balance sheet", the assets available for use by NASA, the amounts owed (liabilities), and amounts that constitute NASA's equity (net position). The Statement (a "balance" sheet) reflects total assets of $34.5 billion, an increase of approximately $2.4 billion over the previous year, and liabilities of $4.4 billion, including unfunded liabilities of $1.0 billion for environmental cleanup costs.

Almost 74 percent of NASA's assets are Property, Plant, and Equipment (PP&E) that have a book value of $25.5 billion. One billion dollars of the increase in total assets is work-in-process attributable to the launch and assembly of ISS components. As the assets become operational, they begin to be capitalized and depreciated. PP&E is property located at NASA Centers, in space, and in the custody of contractors. Almost 62 percent of PP&E are assets that are Government-owned and held, while the remaining 38 percent is property that is Government owned but in the custody of contractors. The book value of NASA's Assets in Space, which are

various spacecraft operating above the atmosphere for exploration purposes, constitutes $7.6 billion, or 48 percent of Government-owned and held PP&E.

The net value of Equipment totals $4.7 billion. Of that total, approximately $2.1 billion is related to the Space Shuttle Orbiters.

Cumulative Results of Operations represents the public's investment in NASA and is akin to stockholder's equity in private industry. The public's investment in NASA is valued at $26.9 billion, an increase of $2.5 billion from the previous year. This is primarily attributable to the increase in PP&E reduced by the depreciation related to those assets. NASA's $30.1 billion net position includes $3.2 billion of unexpended appropriations (undelivered orders and unobligated amounts). Net position is presented on both the Statement of Financial Position and the Statement of Changes in Net Position.

The Statement of Net Costs displayed on page 100 presents the Agency's "income statement" (the annual cost of NASA programs) and distributes fiscal year expenses by programmatic category. A chart depicting the distribution of expenses can be found under the heading "How They Were Expensed" contained in this overview. The Net Cost of Operations is reported on the Statement of Net Cost and also on the Statement of Financing displayed on page 103.

NASA makes substantial research and development investments for the benefit of the Nation. These amounts are expensed as "incurred" in determining the net costs of operations. Total Program Expenses are reported on the Statement of Net Cost and also on the Required Supple-mentary Stewardship Information regarding Stewardship Investments: Research and Development. Research and development (R&D) includes all direct, incidental, or related costs resulting from, or necessary to, performance of R&D, regardless of whether the R&D is performed by a Federal agency or performed by private individuals and organizations under grant or contract. The R&D investments identified by program on the Required Supplementary Stewardship Information regarding Stewardship Investments: Research and Development relates back to the program expenses shown on the Statement of Net Cost.

These investments are categorized by basic research, applied research, and development. The objective of *basic research* is to gain fuller knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications toward processes or products in mind. The objective of *applied research* is to gain knowledge or understanding necessary for determining the means by which a recognized and specific need may be met. *Development* is the systematic use of the knowledge or understanding gained from research directed toward the production of useful materials, devices, systems, or methods, including design and development of prototypes and processes. It excludes quality control, routine product testing, and production.

The Statement of Changes in Net Position displayed on page 101 identifies appropriated funds used as a financing source for goods, services, or capital acquisitions. This Statement presents the accounting events which caused the net position section of the Statement of Financial Position to

change from the beginning to the end of the reporting period.

The Statement of Budgetary Resources displayed on page 102 highlights the budget authority for the Agency and provides information on how budgetary resources were made available to NASA for the year and the status of those budgetary resources at year-end. Detail regarding the amounts reported on the Statement of Budgetary Resources is included in Note 14 of the financial statements.

The outlays reported in this statement reflect the cash disbursements for the fiscal year by the U.S. Department of the Treasury for NASA (Figure 51). This trend shows that as our budget authority is reduced, our outlays decrease.

The Statement of Financing displayed on page 103 provides a compilation and reconciliation between the obligations incurred by NASA to finance operations and the net costs of operating programs. Costs that do not require resources include depreciation. Costs capitalized on the Statement of Financial Position are additions to capital assets made during the fiscal year. Obligations Incurred include amounts of orders placed, contracts awarded, services received, and similar transactions that will require payments during the same or a future period. Obligations Incurred links the Statement of Budgetary Resources to the Statement of Financing.

Required Supplementary Stewardship Information

Required Supplementary Stewardship Information (RSSI) is included to provide information (financial and non-financial) on resources and responsibilities

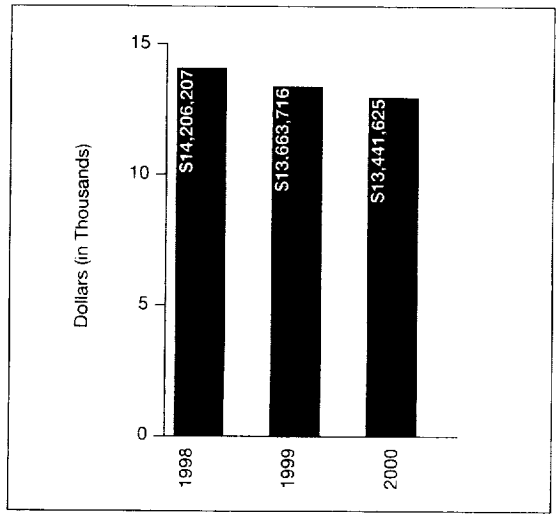


Figure 51 Total Outlays

that cannot be measured in traditional financial reports.

RSSI—Heritage Assets are property, plant, and equipment that possess one or more of the following characteristics: historical or natural significance; cultural, educational, or aesthetic value; or significant architectural characteristics. NASA reports heritage assets in terms of physical units since their existence is of primary relevance. For FY 2000, NASA reported 1,439 heritage assets.

RSSI—Stewardship Investments (R&D)—Stewardship Investments are NASA-funded investments that yield long-term benefits to the general public. Investments in research are shown in this Statement as basic research, applied research, and development (Figure 52).

In FY 2000, R&D expenses totaled approximately $7.3 billion and included activities to extend

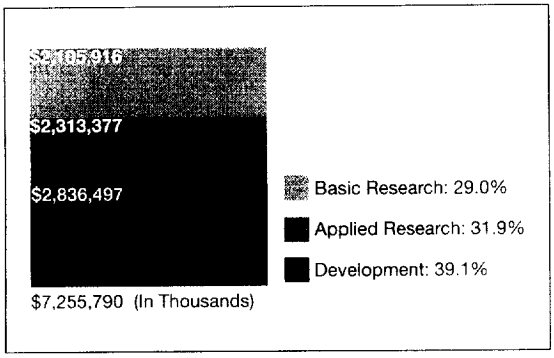


Figure 52 - Research and Development

knowledge of Earth, its space environment, and the universe, and to invest in new aeronautics and advanced space transportation technologies that support the development and application of technologies critical to the economic, scientific, and technical competitiveness of the United States.

The Office of Management and Budget (OMB) revised its rules in FY 2000 and no longer considered the ISS as investment in R&D, as it was in previous years. Therefore, in FY 2000, the ISS became part of Non-Research and Development Expenses by Program. The R&D and non-R&D expenses identified by program on the Required Supplementary Stewardship Information regarding Stewardship Investments: Research and Development relates back to the related program expenses found on the Statement of Net Cost. During FY 2000, at OMB's request, NASA's definition of these investments was more precisely defined. This clarification of category definitions causes a line-by-line analysis of the program categories to be misleading; therefore, a comparison of FY 2000 and prior year's data would be inappropriate.

Required Supplementary Information

Required Supplementary Information (RSI) is included to present a complete picture of the financial results, financial position, and financial condition. This Supplementary Information is comprised of intragovernmental activities and deferred maintenance. Intragovernmental activities are transactions that occur between Federal agencies. Deferred Maintenance is maintenance that was not performed when it should have been or was scheduled to be performed and that is delayed until a future period. Statement of Federal Financial Accounting Standard (SFFAS) No. 14, *Amendments to Deferred Maintenance Reporting*, modifies the presentation of deferred maintenance information in the Annual Financial Statement. Before the amendment, this information would have been presented in association with the Statement of Net Cost. As amended, the standards require that Deferred Maintenance information be included as RSI rather than as a note disclosure. Also, the line item for deferred maintenance is no longer required on the Statement of Net Cost with a reference to the note disclosure.

Limitations of Financial Statements

The financial statements have been prepared to report the financial position and results of operations of NASA, pursuant to the requirements of 31 U.S.C. 3515 (b). While the statements have been prepared from the books and records of NASA in accordance with the formats prescribed by OMB, the statements are in addition to the financial reports used to monitor

and control budgetary resources, which are prepared from the same books and records. The statements should be read with the realization that NASA is a component of the U.S. Government, a sovereign entity. Accordingly, unfunded liabilities reported in the statements cannot be liquidated without legislation that provides resources to do so. Ongoing operations are subjected to enactment of appropriations.

NASA Resources and How They Are Used

The charts below summarize the activity on the Statement of Net Cost and Statement of Changes in Net Position by showing the funds provided in FY 2000 and how they were used.

Where They Come From...

For FY 2000, Congress provided total appropriations of $13.6 billion to NASA (Figure 53). Budget Authority is the authority provided by Federal law to incur financial obligations that will result in outlays or expenditures. Specific forms of gross budget authority for NASA are appropriations and spending authority from offsetting collections. A rescission of budgetary authority is the result of enacted legislation canceling budget authority previously provided by law, prior to the time when the authority would otherwise expire.

NASA's Share of Federal Operations

The Statement of Budgetary Resources reflects the budget authority for the Agency and provides information on how budgetary resources were made

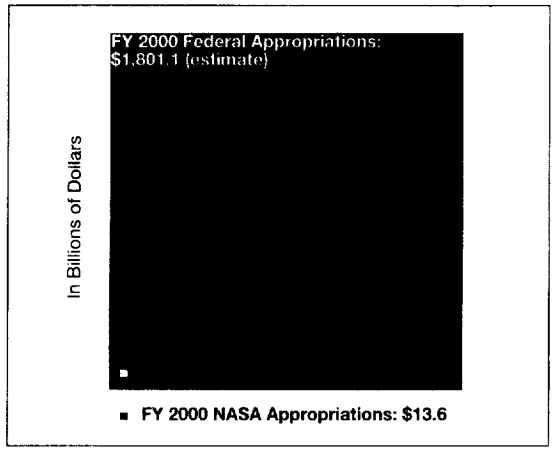


Figure 53 - FY 2000 Federal Appropriations vs. FY 2000 NASA Appropriations

available to NASA for the year and the status of those budgetary resources at year-end.

The trend illustrates that the Agency's budget has decreased over the past seven years (Figure 54). Funding was received and allocated through the following appropriations:

- Human Space Flight—This appropriation provided for the International Space Station and Space Shuttle programs, including flight support for cooperative programs with Russia and other nations.
- Science, Aeronautics, and Technology—This appropriation provided for various R&D activities: Earth and Space Science, Aeronautics, Life and Microgravity Sciences, Technology Investments, Education Programs, and Mission Communication Services.
- Mission Support—This appropriation provided for space communications services, safety and quality assurance activities, facilities main-

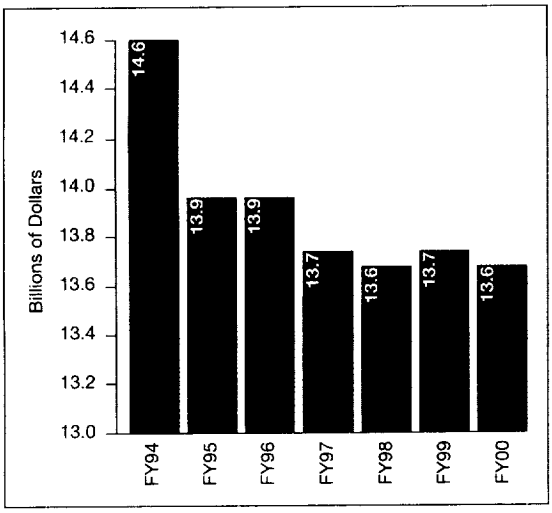


Figure 54 - Trend of NASA Budget

tenance and construction activities to preserve the core infrastructure, environmental remediation, and civil service workforce.

- Inspector General—This appropriation provided for staffing and support required to perform audits, evaluations, and investigations of programs and operations.

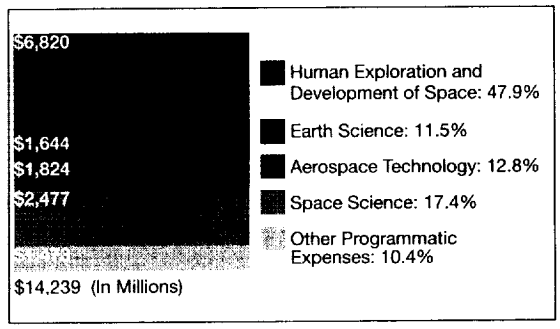
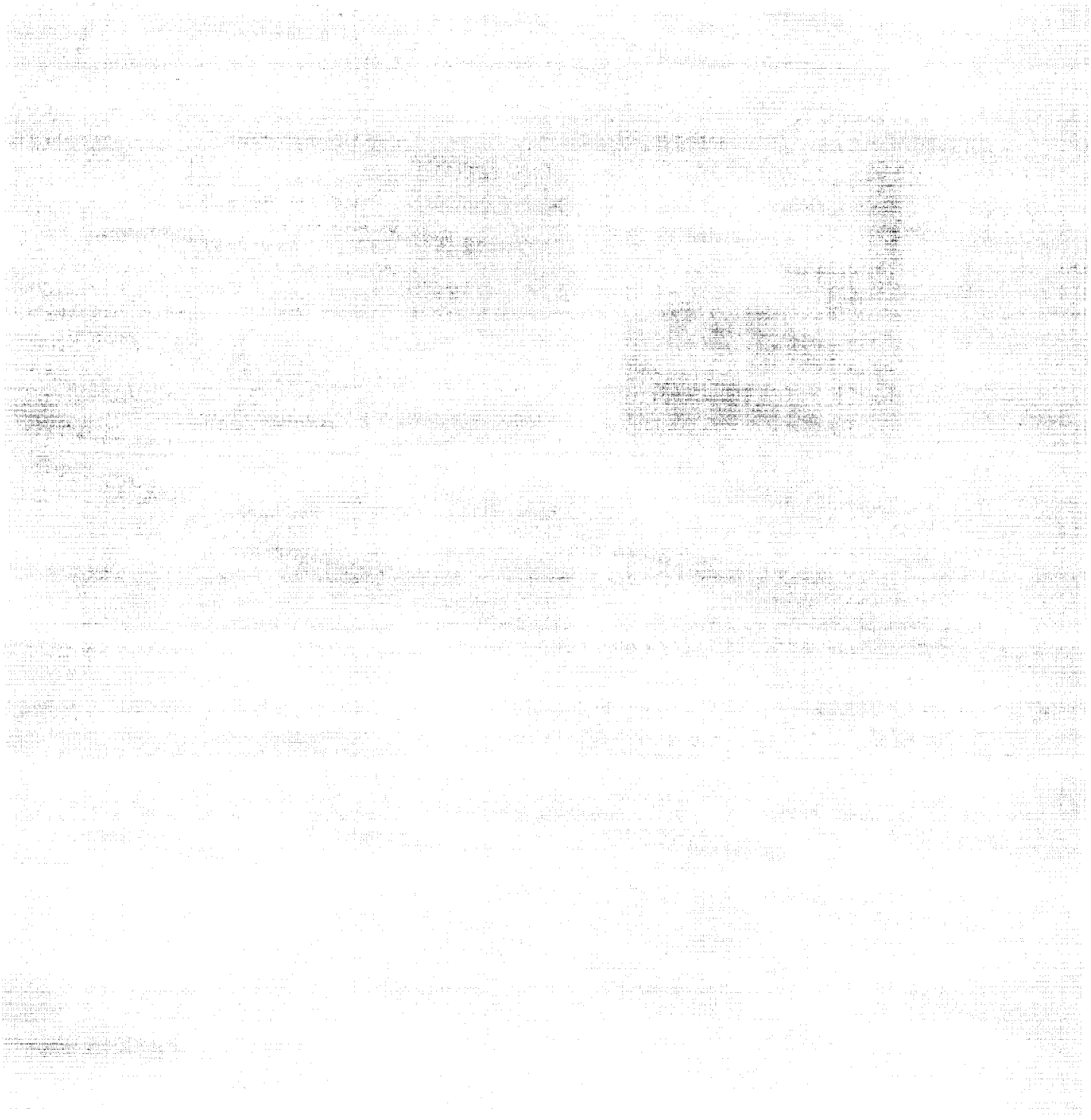
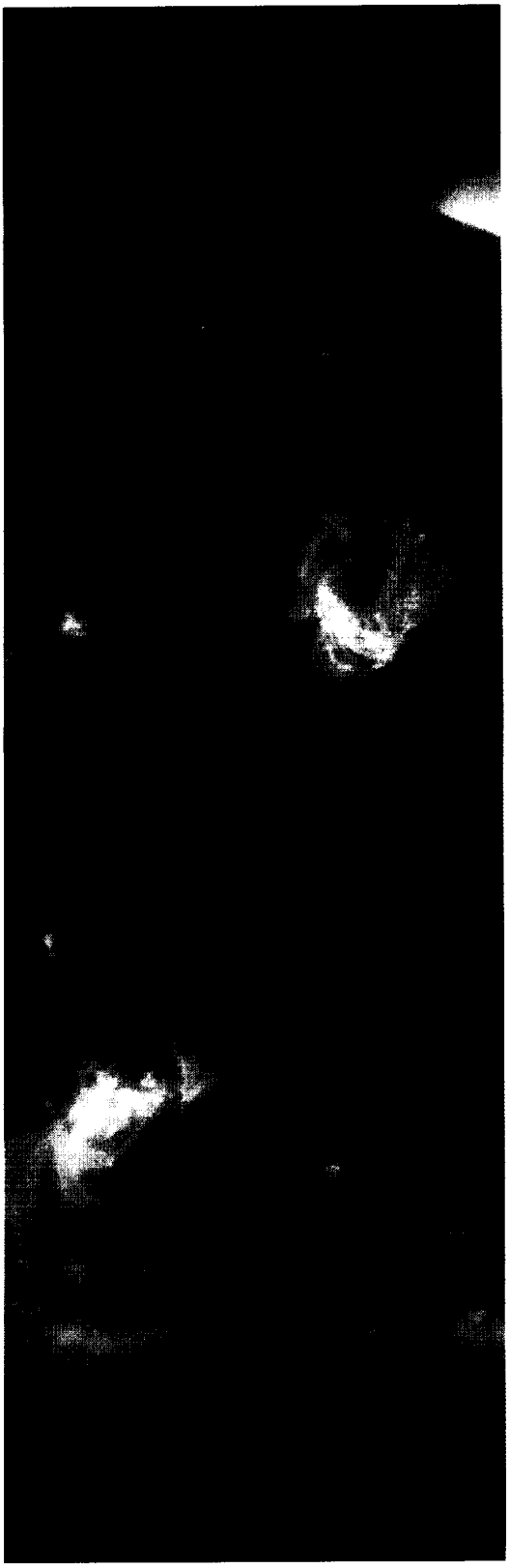


Figure 55 - Appropriations Used (Costs Expensed by Enterprise)

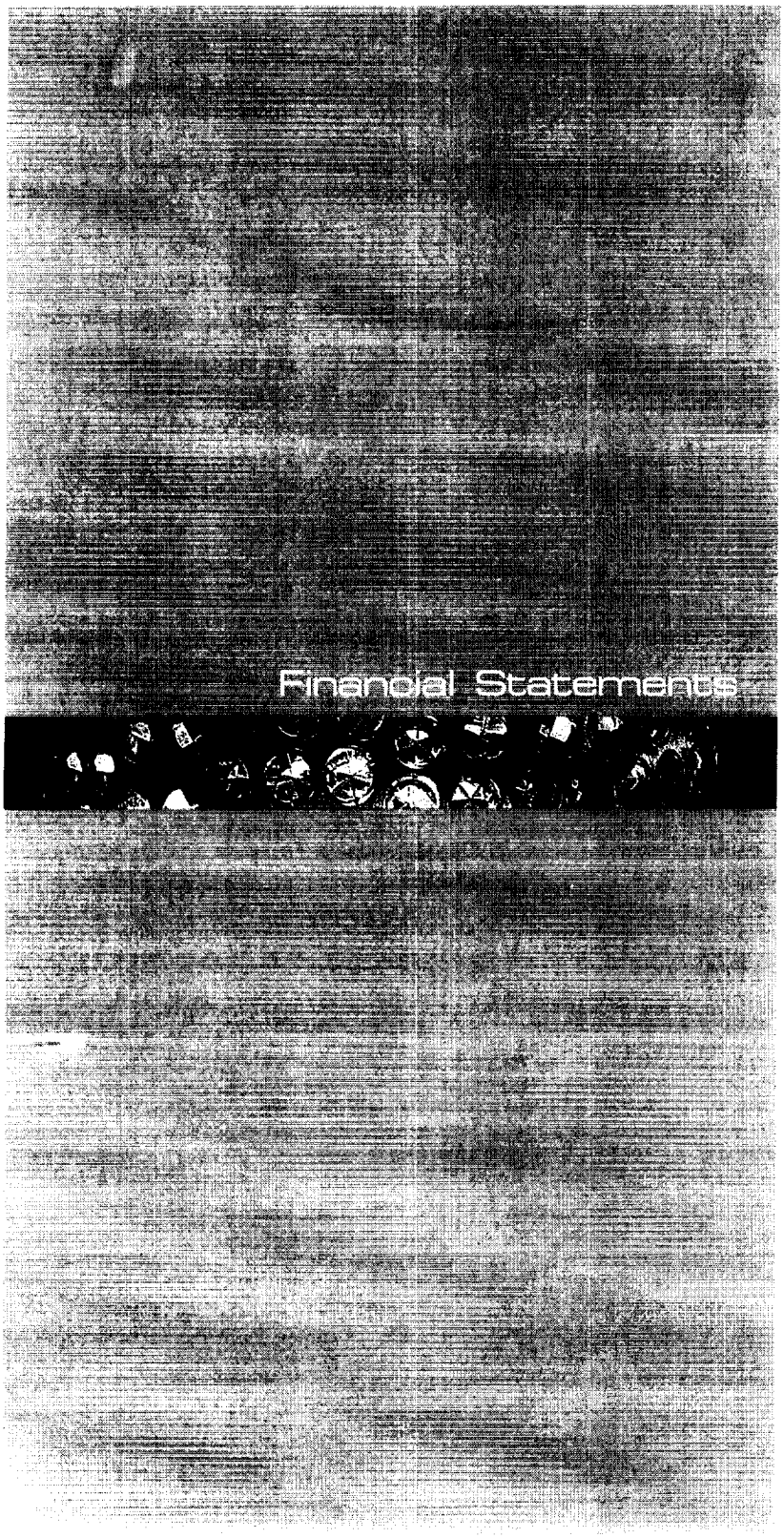
How They Were Expensed...

Funds are allocated by the appropriations mentioned above and then translated into programs. The Statement of Net Costs distributes fiscal year expenses by programmatic category (budget line item) (Figure 55).





Financial Statements



Introduction to Financial Statements

These financial statements reflect the overall financial position of NASA offices and activities, including assets and liabilities, and the results of operations, pursuant to the requirements of 31 U.S.C. 3515(b). The statements have been prepared from NASA's books and records.

These statements are in addition to separate financial reports prescribed by the Office of Management and Budget (OMB) and the U.S. Department of the Treasury (Treasury) that are used to monitor and control budgetary resources, which are prepared from the same books and records. The statements should be read with the understanding that they are a component of the U.S. Government, a sovereign entity. For example, Treasury, another Federal agency, holds NASA's Fund Balance. Also, NASA has no authority to pay liabilities not covered by budgetary resources. Liquidation of such liabilities requires enactment of an appropriation.

NASA has received consecutive "Unqualified Opinions" on its financial statements beginning with fiscal year 1994.

National Aeronautics and Space Administration
Statement of Financial Position
As of September 30
(In Thousands)

	2000	1999
Assets (Note 9):		
Intragovernmental Assets:		
Fund Balance With Treasury (Note 2)	$ 6,189,464	$ 6,211,702
Investments (Note 3)	16,727	16,730
Accounts Receivable, net (Note 4)	119,135	127,720
Advances and Prepaid Expenses	22,704	15,560
Total Intragovernmental Assets	6,348,030	6,371,712
Accounts Receivable, net (Note 4)	6,881	3,387
Inventory, Operating Materials, and Supplies (Note 5)	2,679,418	2,256,179
Property, Plant, and Equipment, net (Note 6)	25,470,264	23,478,807
Total Assets	**$ 34,504,593**	**$ 32,110,085**
Liabilities:		
Intragovernmental Liabilities:		
Accounts Payable	$ 187,390	$ 172,144
Other Liabilities (Notes 7 and 8)	72,663	48,407
Total Intragovernmental Liabilities	260,053	220,551
Accounts Payable	2,749,097	2,910,280
Other Liabilities (Notes 7 and 8)	346,349	332,948
Environmental Cleanup Costs (Notes 1 and 8)	1,021,076	1,110,412
Actuarial FECA Liability (Notes 1 and 8)	61,581	57,371
Total Liabilities	**4,438,156**	**4,631,562**
Commitments and Contingencies (Notes 1, 7, and 8)		
Net Position:		
Unexpended Appropriations (Note 11)	3,192,042	3,082,983
Cumulative Results of Operations	26,874,395	24,395,540
Total Net Position	**30,066,437**	**27,478,523**
Total Liabilities and Net Position	**$ 34,504,593**	**$ 32,110,085**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Statement of Net Cost
For the Fiscal Year Ended September 30, 2000
(In Thousands)

Program/Operating Expenses By Enterprise:	
Human Exploration and Development of Space:	
Space Shuttle	$ 3,303,230
Space Station	2,754,089
Life and Microgravity	321,283
U.S./Russian Cooperative	22,124
Payload Utilization and Operations	419,452
Total Human Exploration and Development of Space	6,820,178
Space Science:	
Space Science	2,443,934
Planetary Exploration	33,289
Total Space Science	2,477,223
Earth Science:	
Mission to Planet Earth	1,644,371
Aerospace Technology:	
Aeronautics Research and Technology	1,134,278
Space Access and Technology	512,409
Commercial Programs	177,815
Total Aerospace Technology	1,824,502
Total Enterprise Program Costs	**12,766,274**
Costs Not Assigned to Enterprises:	
Mission Communication Services	457,582
Academic Programs	111,377
Other Programs	165,401
Trust Funds	1,271
Reimbursable Expenses	737,498
Total Costs Not Assigned to Enterprises	**1,473,129**
Total Program Expenses	**14,239,403**
Costs Not Assigned to Programs:	
Change in Unfunded Expenses (Note 12)	(72,949)
Depreciation Expense	2,257,134
Funded Changes in Capitalized Property and Inventory	(4,604,770)
Total Costs Not Assigned to Programs	**(2,420,585)**
Less: Earned Revenues Not Attributed to Programs	(738,499)
Net Cost of Operations (Note 13)	**$ 11,080,319**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Statement of Changes in Net Position
For the Fiscal Year Ended September 30, 2000
(In Thousands)

Net Cost of Operations	$ (11,080,319)
Financing Sources:	
Appropriations Used	13,414,926
Net Property Transfers	56,547
Donations	333
Imputed Financing	87,368
Other Revenues	2,900
Less: Receipts Transferred to Treasury	(2,900)
Net Results of Operations	2,478,855
Net Change in Cumulative Results of Operations	2,478,855
Change in Unexpended Appropriations	109,059
Change in Net Position	2,587,914
Net Position—Beginning of Period	27,478,523
Net Position—End of Period	**$ 30,066,437**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Statement of Budgetary Resources
For the Fiscal Years Ended September 30
(In Thousands)

Budgetary Resources (Notes 14 and 15):		**2000**		**1999**
Budget Authority	$	13,654,160	$	13,661,697
Unobligated Balances—Beginning of Period		864,342		1,065,239
Spending Authority from Offsetting Collections		705,619		707,485
Adjustments		(39,550)		(3,921)
Total Budgetary Resources	**$**	**15,184,571**	**$**	**15,430,500**
Status of Budgetary Resources:				
Obligations Incurred	$	14,484,100	$	14,566,158
Unobligated Balances—Available		616,935		747,646
Unobligated Balances—Not Available		83,536		116,696
Total Status of Budgetary Resources	**$**	**15,184,571**	**$**	**15,430,500**
Outlays:				
Obligations Incurred	$	14,484,100	$	14,566,158
Less: Spending Authority from Offsetting Collections and Adjustments		(797,676)		(749,593)
Obligations Incurred, Net		**13,686,424**		**13,816,565**
Obligated Balance, Net—Beginning of Period		5,253,158		5,100,309
Less: Obligated Balance, Net—End of Period		(5,497,957)		(5,253,158)
Total Outlays	**$**	**13,441,625**	**$**	**13,663,716**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Statement of Financing
For the Fiscal Year Ended September 30, 2000
(In Thousands)

Obligations and Nonbudgetary Resources:	
Obligations Incurred	$ 14,484,100
Less: Spending Authority from Offsetting Collections and Adjustments	(797,676)
Financing Imputed for Cost Subsidies	87,368
Total Obligations as Adjusted and Nonbudgetary Resources	**13,773,792**
Resources That Do Not Fund Net Cost of Operations:	
Change In Amount of Goods, Services, and Benefits Ordered But Not Yet Received or Provided	(223,522)
Change in Unfilled Orders	(50,865)
Costs Capitalized in the Statement of Financial Position	(4,604,770)
Financing Sources that Fund Costs of Prior Periods	(90,392)
Other	1,499
Total Resources That Do Not Fund Net Cost of Operations	**(4,968,050)**
Costs That Do Not Require Resources:	
Depreciation	2,257,134
Total Costs That Do Not Require Resources	**2,257,134**
Change in Financing Sources Yet to be Provided	17,443
Net Cost of Operations	**$ 11,080,319**

The accompanying notes are an integral part of this statement.

National Aeronautics and Space Administration
Notes to Financial Statements
For the Fiscal Years Ended September 30, 2000 and 1999

1. Summary of Accounting Policies and Operations:

Reporting Entity

NASA is an independent Agency established to plan and manage the future of the Nation's civil aeronautics and space program. NASA has established four strategic enterprises—Space Science, Earth Science, Human Exploration and Development of Space, and Aerospace Technology, to implement the Agency's mission and communicate with external customers. These financial statements reflect all NASA activities, including those of its nine Centers, Headquarters, and NASA's Jet Propulsion Laboratory. The Jet Propulsion Laboratory is a Federally Funded Research and Development Center owned by NASA, but managed by an independent contractor. Financial management of NASA operations is the responsibility of Agency officials at all organizational levels. The accounting system consists of ten distinct operations located at the Centers. Although each Center is independent of the other and has its own chief financial officer, they operate under Agencywide financial management policies. These accounting systems provide basic information necessary to meet internal and external budget and financial reporting requirements and provide fund control and accountability. All significant intra-entity activities have been eliminated.

Basis of Presentation

These financial statements present NASA's financial position as of September 30, 2000 and 1999, the related Statements of Budgetary Resources for the fiscal years then ended, and the related Statements of Net Cost, Changes in Net Position, and Financing for the fiscal year ended September 30, 2000, as required by the Chief Financial Officers Act of 1990 and the Government Management Reform Act of 1994. They were prepared from the books and records of NASA, in accordance with Federal Generally Accepted Accounting Principles and NASA's accounting policies and practices summarized in this note. These financial statements were prepared under the accrual basis of accounting, where expenses and revenues are recorded in the period in which they are incurred or earned, respectively.

Implementation of New Accounting Standards

In fiscal year 2000, NASA implemented the provisions of Statement of Federal Financial Accounting Standards (SFFAS) No. 15 "Management's Discussion and Analysis" (MD&A). SFFAS No. 15 requires reporting an entity's performance measures, financial statements, systems and controls, compliance with the laws and regulations, and actions taken or planned to address problems. In essence, the MD&A provides the public with an overview of NASA's missions and accomplishments.

In fiscal year 2001, NASA will implement SFFAS No. 10, "Accounting for Internal Use Software." This standard establishes accounting standards for the cost of software developed or obtained for internal use. The provisions of this standard are effective for fiscal year 2001. Management has instituted steps to collect the necessary information to ensure effective implementation of the standard with the September 30, 2001, financial statements. Management does not believe implementation will have a material impact on future financial statements.

Budgets and Budgetary Accounting

NASA is funded by four appropriations that require individual treatment in the NASA accounting and control system. Reimbursements to NASA's appropriations total approximately $740 and $800 million for fiscal years 2000 and 1999, respectively. As part of its reimbursable program, NASA launches devices into space and provides tracking and data relay services for the U.S. Department of Defense, the National Oceanic and Atmospheric Administration, and the National Weather Service.

On the Statement of Budgetary Resources, Unobligated Balances—Available represent the amount remaining in appropriation accounts that are available for obligation in future fiscal years. Unobligated Balances—Not Available represent the amount remaining in appropriation accounts that can only be used for adjustments to previously recorded obligations.

Use of Estimates

The preparation of financial statements in conformity with generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from these estimates.

Fund Balance With Treasury

NASA's cash receipts and disbursements are processed by the U.S. Department of the Treasury (Treasury). Fund Balance with Treasury includes appropriated funds, trust funds, deposit funds, and budget clearing accounts.

Investments in U.S. Government Securities

NASA's intragovernmental non-marketable securities include the following investments:

(1) National Aeronautics and Space Administration Endeavor Teacher Fellowship Trust Fund established from public donations in tribute to the crew of the Space Shuttle Challenger.

(2) Science Space and Technology Education Trust Fund established from public donations for programs to improve science and technology education.

Accounts Receivable

Most receivables are for reimbursement of research and development costs related to satellites and launch services. The allowance for uncollectible accounts is based upon NASA's evaluation of its accounts receivable, considering the probability of failure to collect based upon current status, financial and other relevant characteristics of debtors, and the relationship with the debtor. Under a cross-servicing arrangement, most accounts receivable over 180 days delinquent are turned over to the Treasury for collection (the receivable remains on NASA's books until Treasury determines that the receivable is uncollectible).

Advances to Others

NASA provides funds to its recipients under the University Contracts and Grants Program by drawdowns on letters of credit or through the use of predetermined payment schedules. Recipients are required to schedule drawdowns to coincide with actual, immediate cash requirements, in accordance with Treasury regulations. Quarterly reporting by recipients to NASA is provided on Federal Cash Transaction Reports (SF 272). The California Institute of Technology, which manages NASA's Jet Propulsion Laboratory, is a major recipient of funds under letter of credit procedures. Detailed monitoring and accountability records are maintained. Monitoring includes audits by the Defense Contract Audit Agency (DCAA) and NASA's Office of Inspector General.

Prepaid Expenses

Payments in advance of the receipt of goods and services are recorded as prepaid expenses at the time of prepayment and recognized as expenses when related goods and services are received.

Inventory, Operating Materials, and Supplies

Materials held by NASA Centers and contractors that are repetitively procured, stored, and issued on the basis of demand are considered Inventory, Operating Materials, and Supplies. These items are recorded on the weighted average, first-in, first-out basis.

Property, Plant, and Equipment

NASA-owned property, plant, and equipment is held by the Agency and its contractors and grantees. Property with a unit cost of $100,000 or more and a useful life of 2 years or more is capitalized; all other property is expensed when purchased. Capitalized costs

include all costs incurred by NASA to bring the property to a form and location suitable for its intended use. NASA continues to maintain physical accountability for all property, plant, and equipment regardless of cost.

Under provisions of the Federal Acquisition Regulation (FAR), contractors are responsible for control over and accountability for Government-owned property in their possession. NASA's contractors and grantees report on NASA property in their custody annually.

In accordance with SFFAS No. 6, "Accounting for Property, Plant, and Equipment," these financial statements report depreciation expense using the straight-line method. Useful lives were established as follows: 40 years for buildings; 15 years for other structures and facilities; 15 years for space hardware; 15 years for leasehold improvements; 7 years for special test equipment and tooling; 5 to 20 years for other equipment depending on its nature; and 25 years for Space Shuttle orbiters. Useful lives for assets in space are generally their basic mission lives, ranging from 2 to 20 years.

Advances from Others

Advances from others represent amounts advanced by other Federal and non-Federal entities for goods and services to be provided. Previously, NASA deposited these funds into deposit accounts with the Treasury and recorded these amounts as liabilities for deposits and clearing funds. Beginning in fiscal year 2000, OMB requested new procedures for deposit funds, requiring NASA to deposit these funds into appropriation accounts, thus rescinding NASA's exemption. This process moved approximately $90 million from the deposit fund to appropriation accounts. Advances from others are included in other liabilities in the accompanying financial statements.

Liabilities Covered by Budgetary Resources

Accounts payable includes amounts recorded for receipt of goods or services furnished to NASA. Additionally, NASA accrues costs and recognizes liabilities based on information provided monthly by contractors on NASA Contractor Financial Management Reports (NASA Forms 533M and Q). The DCAA performs independent audits to ensure reliability of reported costs and estimates. To provide further assurance, financial managers are required to test the accuracy of cost accruals generated from the NF 533s monthly, and NASA Headquarters independently analyzes the validity of the Centers' data.

Liabilities and Contingencies Not Covered by Budgetary Resources

Liabilities not covered by budgetary resources include certain environmental matters, legal claims, pensions and other retirement benefits (ORB), workers' compensation, annual leave (see discussion below), and closed appropriations.

Liabilities not covered by budgetary resources consist primarily of environmental cleanup costs as required by Federal, state, and local statutes and regulations and unfunded annual leave. Parametric models are used to estimate the total cost of cleaning up these sites over future years. The estimates also include a 5-year minimum operational period within the remedial action phase unless Centers indicate the exact number of years if different than 5 years. In addition, a 5-year monitoring period was added to the estimate for ground water, surface water/sediment, and ecological monitoring. NASA estimates the total cost of environmental cleanup is estimated to be approximately $1 billion and $1.1 billion as of September 30, 2000, and 1999, respectively, and has recorded an unfunded liability in its financial statements for these amounts. The fiscal year 2000 estimate reflects a reduction of $89 million from 1999 primarily due to the identification of new factual information used in the parametric models. This estimate could be affected in the future by changes due to inflation, deflation, technology, or applicable laws and regulations. Therefore, the estimated environmental liability could range from $654 million to $1.3 billion because of future changes. The estimate represents an amount that will be spent to remediate currently known sites, subject to the availability of appropriated funds. Other responsible parties that may be required to contribute to the remediation funding could share this liability. NASA was appropriated $37 million and $40 million for the fiscal years ended September 30, 2000, and 1999, respectively, for environmental compliance and restoration. Included in the recorded liability is $22 million for fiscal years ended September 30, 2000, and 1999, for cleanup of current operations.

NASA is a party in various administrative proceedings, court actions (including tort suits), and claims brought by or against it. In the opinion of NASA management and legal counsel, the ultimate resolution of these proceedings, actions, and claims will not materially affect the financial position, net cost, changes in net position, budgetary resources, or financing of NASA. NASA recorded a liability of $1 million and $351,000 for these matters as of September 30, 2000, and 1999, respectively.

NASA contingencies, related to proceedings, actions, and claims, where management believes, after consultation with legal counsel, it is possible but not probable that some cost will be incurred range from zero to $133 million and zero to $429 million as of September 30, 2000, and 1999, respectively. Accordingly, no balances have been recorded in the financial statements for these contingencies.

A liability for $76 million and $72 million was recorded, as of September 30, 2000, and 1999, respectively, for workers' compensations claims related to the Federal Employees' Compensation Act (FECA), which is administered by the U.S. Department of Labor (DOL). FECA provides income and medical cost protection to covered Federal civilian employees injured on the job, employees who have incurred a work-related occupational disease, and beneficiaries of employees whose death is attributable to a job-related injury or occupational disease. The FECA program initially pays valid claims and subsequently seeks reimbursement from the Federal agencies employing the claimants.

The FECA liability includes the actuarial liability of $62 million and $57 million as of September 30, 2000, and 1999, respectively, for estimated future costs of death benefits, workers' compensation, and medical and miscellaneous costs for approved compensation cases. The present value of these estimates at the end of fiscal year 2000 was calculated by the DOL using a discount rate of 6.15 percent for fiscal year 2001, 6.28 percent for 2002, and 6.3 percent for 2003 and thereafter. The present value of these estimates at the end of fiscal year 1999 was calculated by the DOL using a discount rate of 5.5 percent for fiscal year 2000 and 2001, 5.55 percent for fiscal year 2002, and 5.6 percent for fiscal year 2003 and thereafter. The FECA liability does not include the estimated future costs for claims incurred but not reported as of September 30, 1999.

NASA has approximately $48 million and $38 million as of September 30, 2000, and 1999, respectively, recorded in accounts payable related to closed appropriations for which there is a contractual commitment to pay. These payables will be funded from appropriations that are available for obligation at the time a billing is processed, in accordance with Public Law 101-510.

Annual, Sick, and Other Leave

Annual leave is accrued as it is earned; the accrual is reduced as leave is taken. Each year, the balance in the accrued annual leave account is adjusted to reflect current pay rates. To the extent current or prior year appropriations are not available to fund annual leave earned but not taken, funding will be obtained from future financing sources. Sick leave and other types of non-vested leave are expensed as taken.

Employee Benefits

NASA employees participate in the Civil Service Retirement System (CSRS), a defined benefit plan, or the Federal Employees Retirement System (FERS), a defined benefit and contribution plan. For CSRS employees, NASA makes contributions of 8.51 percent of pay. For FERS employees, NASA makes contributions of 10.7 percent to the defined benefit plan, contributes 1 percent of pay to a retirement savings plan (contribution plan), and matches employee contributions up to an additional 4 percent of pay. For FERS employees, NASA also contributes the employer's matching share for Social Security.

SFFAS No. 5, "Accounting for Liabilities of the Federal Government," requires Government agencies to report the full cost of employee benefits for CSRS, FERS, the Federal Employee Health Benefit, and the Federal Employees Group Life Insurance programs. NASA used the applicable cost factors and inputted financing sources from the Office of Personnel Management Financial Management Letter F-00-07 in these financial statements.

Statement of Budgetary Resources

A reconciliation of amounts reported in the Statement of Budgetary Resources and amounts input to the President's Budget of the United States Government for Fiscal Year 2000 Actuals was performed. The Fiscal Year 2002 President's Budget of the United States Government has not been published, as of the release of this Accountability Report, therefore a final comparison could not be performed.

Reclassifications

Certain reclassifications have been made to prior year amounts to conform to the current year presentation.

2. Fund Balance With Treasury:
(In Thousands)

As of September 30, 2000

Fund Balances:	Obligated	Unobligated Available	Unobligated Not Available	Total
Appropriated Fund	$ 5,497,877	$ 616,935	$ 69,044	$ 6,183,856
Trust Funds	80	—	936	1,016
Total	$ 5,497,957	$ 616,935	$ 69,980	6,184,872
Clearing and Deposit Accounts				4,592
Total Fund Balance With Treasury				$ 6,189,464

As of September 30, 1999

Fund Balances:	Obligated	Unobligated Available	Unobligated Not Available	Total
Appropriated Fund	$ 5,265,238	$ 747,595	$ 102,625	$ 6,115,458
Trust Funds	—	51	676	727
Total	$ 5,265,238	$ 747,646	$ 103,301	6,116,185
Clearing and Deposit Accounts				95,517
Total Fund Balance With Treasury				$ 6,211,702

Obligated balances represent the cumulative amount of obligations incurred, including accounts payable and advances from reimbursable customers, for which outlays have not yet been made. Unobligated available balances represent the amount remaining in appropriation accounts that are available for obligation in the next fiscal year. Unobligated balances not available represent the amount remaining in appropriation accounts that can be used for adjustments to previously recorded obligations. Unobligated balances not available are the result of settling obligated balances for less than what was obligated. Unobligated trust fund balances not available represent amounts that must be apportioned by the OMB before being used to incur obligations.

Clearing accounts are used for unidentified remittances presumed to be applicable to budget accounts but are being held in the clearing account because the specific appropriation account is not yet known. Deposit account balances represent amounts withheld from employees' pay for U.S. Savings Bonds and state tax withholdings which will be transferred in the next fiscal year.

3. Investments:
(In Thousands)

As of September 30, 2000

	Par Value	Amortization Method	Discounts and Premiums, Net	Net Amount Invested
Intragovernmental Non-Marketable Securities	$ 13,583	Interest method	$ 3,144	$ 16,727

As of September 30, 1999

	Par Value	Amortization Method	Discounts and Premiums, Net	Net Amount Invested
Intragovernmental Non-Marketable Securities	$ 13,442	Interest method	$ 3,288	$ 16,730

Intragovernmental securities are non-marketable Treasury securities issued by the Bureau of Public Debt.

Interest rates range from 4 percent to 9 percent and from 5 percent to 9 percent for the fiscal years ended September 30, 2000, and 1999, respectively.

4. Accounts Receivable, net:
(In Thousands)

As of September 30, 2000

	Accounts Receivable	Allowance for Uncollectible Accounts	Net Amount Due
Intragovernmental	$ 119,135	$ —	$ 119,135
Governmental	7,377	(496)	6,881
Total	$ 126,512	$ (496)	$ 126,016

As of September 30, 1999

	Accounts Receivable	Allowance for Uncollectible Accounts	Net Amount Due
Intragovernmental	$ 127,720	$ —	$ 127,720
Governmental	4,508	(1,121)	3,387
Total	$ 132,228	$ (1,121)	$ 131,107

5. **Inventory, Operating Materials, and Supplies:**
(In Thousands)

	As of September 30	
	2000	1999
Held for Use	$ 2,676,969	$ 2,253,538
Held In Reserve for Future Use	2,449	2,641
Total	$ 2,679,418	$ 2,256,179

These amounts are held for use in current operations. Excess, obsolete, and unserviceable items have been removed from these amounts.

NASA Centers are responsible for continually reviewing inventory, operating materials, and supplies on-hand to identify items that are no longer needed for operational purposes or that need to be replaced.

6. **Property, Plant, and Equipment, net:**
(In Thousands)

	As of September 30, 2000		
	Cost	Accumulated Depreciation	Net Asset Value
Government-owned/Government-held:			
Land	$ 277,880	$ —	$ 277,880
Structures, Facilities, and Leasehold Improvements	5,157,227	(3,179,885)	1,977,342
Assets in Space	20,906,360	(13,307,872)	7,598,488
Equipment	2,577,041	(1,829,533)	747,508
Capitalized Leases	16,785	(1,378)	15,407
Work-in-Process	5,166,156	—	5,166,156
Total	34,101,449	(18,318,668)	15,782,781
Government-owned/Contractor-held:			
Land	10,349	—	10,349
Structures, Facilities, and Leasehold Improvements	743,252	(472,297)	270,955
Equipment	10,486,694	(6,502,595)	3,984,099
Work-in-Process	5,422,080	—	5,422,080
Total	16,662,375	(6,974,892)	9,687,483
Total Property, Plant, and Equipment	$ 50,763,824	$ (25,293,560)	$ 25,470,264

6. **Property, Plant, and Equipment, net (continued):**
(In Thousands)

	As of September 30, 1999		
	Cost	Accumulated Depreciation	Net Asset Value
Government-owned/Government-held:			
Land	$ 108,799	$ —	$ 108,799
Structures, Facilities, and Leasehold Improvements	5,133,020	(3,070,906)	2,062,114
Assets in Space	20,352,345	(13,027,849)	7,324,496
Equipment	1,727,611	(935,865)	791,746
Work-in-Process	4,045,224	—	4,045,224
Total	31,366,999	(17,034,620)	14,332,379
Government-owned/Contractor-held:			
Land	10,349	—	10,349
Structures, Facilities, and Leasehold Improvements	734,103	(453,506)	280,597
Equipment	10,483,683	(5,955,700)	4,527,983
Work-in-Process	4,327,499	—	4,327,499
Total	15,555,634	(6,409,206)	9,146,428
Total Property, Plant, and Equipment	$ 46,922,633	$ (23,443,826)	$ 23,478,807

Assets in Space are various spacecraft which operate above the atmosphere for exploration purposes. Equipment includes special tooling, special test equipment, and Agency-peculiar property, such as the Space Shuttle and other configurations of spacecraft: engines, unlaunched satellites, rockets, and other scientific components unique to NASA space programs. Structures, Facilities, and Leasehold Improvements include buildings with collateral equipment, and capital improvements such as airfields, power distribution systems, flood control, utility systems, roads, and bridges. NASA also has use of certain properties at no cost. These properties include land at the Kennedy Space Center withdrawn from the public domain and land and facilities at the Marshall Space Flight Center under a no cost, 99-year lease with the U.S. Department of the Army. Work-in-Process is the cost incurred for property, plant, and equipment items not yet completed. Work-in-Process includes equipment and facilities that are being constructed, the most significant of which is the International Space Station.

7. Other Liabilities:
(In Thousands)

As of September 30, 2000

	Current	Non-Current	Total
Intragovernmental Liabilities:			
Advances From Others	$ 32,424	$ —	$ 32,424
Workers' Compensation	6,200	8,195	14,395
Accounts Payable for Closed Appropriations	117	9,521	9,638
Liability for Deposit and Clearing Funds	3,823	—	3,823
Accrued Funded Payroll	11,081	—	11,081
Liability for Receipt Accounts	717	—	717
Lease Liabilities	134	451	585
Total Intragovernmental	54,496	18,167	72,663
Governmental Liabilities			
Unfunded Annual Leave	—	134,207	134,207
Accrued Funded Payroll	99,831	—	99,831
Advances From Others	57,475	—	57,475
Accounts Payable for Closed Appropriations	3,656	34,611	38,267
Lease Liabilities	9,783	137	9,920
Liability for Receipt Accounts	2,539	—	2,539
Contract Holdbacks	2,152	—	2,152
Contingent Liabilities	—	1,213	1,213
Liability for Deposit and Clearing Funds	745	—	745
Total Governmental	176,181	170,168	346,349
Total Other Liabilities	$ 230,677	$ 188,335	$ 419,012

As of September 30, 1999

	Current	Non-Current	Total
Intragovernmental Liabilities:			
Liability for Deposit and Clearing Funds	$ 20,392	$ —	$ 20,392
Accrued Funded Payroll	9,288	—	9,288
Accounts Payable for Closed Appropriations	4	2,555	2,559
Workers' Compensation	7,660	7,791	15,451
Liability for Receipt Accounts	717	—	717
Total Intragovernmental	38,061	10,346	48,407
Governmental Liabilities			
Liability for Deposit and Clearing Funds	75,443	—	75,443
Contract Holdbacks	3,593	—	3,593
Contingent Liabilities	—	351	351
Accrued Funded Payroll	83,015	—	83,015
Lease Liabilities	637	—	637
Accounts Payable for Closed Appropriations	3,884	31,936	35,820
Unfunded Annual Leave	—	131,362	131,362
Liability for Receipt Accounts	2,727	—	2,727
Total Governmental	169,299	163,649	332,948
Total Other Liabilities	$ 207,360	$ 173,995	$ 381,355

The liability for Deposit and Clearing funds includes funds on deposit with the U.S. Department of the Treasury for employees' savings bonds and state tax withholdings.

8. Liabilities Not Covered by Budgetary Resources:
(In Thousands)

	As of September 30, 2000		
	Current	Non-Current	Total
Intragovernmental Liabilities:			
Workers' Compensation	$ 6,200	$ 8,195	$ 14,395
Accounts Payable for Closed Appropriations	117	9,521	9,638
Liability for Receipt Accounts	717	—	717
Total Intragovernmental	7,034	17,716	24,750
Governmental Liabilities:			
Unfunded Annual Leave	—	134,207	134,207
Accounts Payable for Closed Appropriations	3,656	34,611	38,267
Contingent Liabilities	—	1,213	1,213
Lease Liability	9,759	—	9,759
Liability for Receipt Accounts	2,539	—	2,539
Environmental Cleanup Costs	22	1,021,054	1,021,076
Actuarial FECA Liability	—	61,581	61,581
Total Governmental	15,976	1,252,666	1,268,642
Total Liabilities Not Covered by Budgetary Resources	$ 23,010	$ 1,270,382	$ 1,293,392

	As of September 30, 1999		
	Current	Non-Current	Total
Intragovernmental Liabilities:			
Accounts Payable for Closed Appropriations	$ 4	$ 2,555	$ 2,559
Workers' Compensation	7,660	7,791	15,451
Liability for Receipt Accounts	717	—	717
Total Intragovernmental	8,381	10,346	18,727
Governmental Liabilities:			
Accounts Payable for Closed Appropriations	3,884	31,936	35,820
Unfunded Annual Leave	—	131,362	131,362
Contingent Liabilities	—	351	351
Liability for Receipt Accounts	2,727	—	2,727
Lease Liability	294	—	294
Environmental Cleanup Costs	22	1,110,390	1,110,412
Actuarial FECA Liability	—	57,371	57,371
Total Governmental	6,927	1,331,410	1,338,337
Total Liabilities Not Covered by Budgetary Resources	$ 15,308	$ 1,341,756	$ 1,357,064

See Note 1 for further discussion of liabilities not covered by budgetary resources.

9. Non-Entity Assets:
(In Thousands)

As of September 30, 2000

Asset	Intragovernmental	Due from the Public	Total Non-Entity Assets
Accounts Receivable, net	$ 1,078	$ 2,178	$ 3,256

As of September 30, 1999

Asset	Intragovernmental	Due from the Public	Total Non-Entity Assets
Accounts Receivable, net	$ 135	$ 3,309	$ 3,444

Accounts receivable related to closed appropriations, which will be deposited in miscellaneous receipts, are included in Non-Entity Assets. These amounts are not separately identified on NASA's Statement of Financial Position as the amounts are immaterial.

10. Leases:

(In Thousands)

	As of September 30	
	2000	**1999**
Entity as Lessee:		
Capital Leases-		
Summary of Assets Under Capital Lease:		
Equipment	$ 16,785	$ 1,356
Accumulated Amortization of Liability	(6,280)	(719)
	$ 10,505	$ 637

NASA capital leases consist of assorted automated data processing and copier equipment with non-cancelable terms longer than one year, a fair market value of $100,000 or more, a useful life of two years or more, and agreement terms equivalent to an installment purchase.

Future Minimum Lease Payments:	Fiscal Year	
	2001	$ 10,351
	2002	279
	2003	150
	2004	159
	Future Lease Payments	10,939
	Less: Imputed Interest	(434)
	Net Capital Lease Liability	$ 10,505

Operating Leases-

NASA's FY 2000 operating leases are for an airplane hangar, warehouse storage, copiers, and land.

Future Minimum Lease Payments:	Fiscal Year	
	2001	$ 2,153
	2002	2,181
	2003	2,181
	2004	997
	2005	997
	Total	$ 8,509

Entity as Lessor:

Operating Leases-

NASA leases and allows use of its land, facilities, and equipment by the public and other Government agencies for a fee.

Future Projected Receipts:	Fiscal Year	
	2001	$ 302
	2002	285
	2003	281
	2004	13
	Total	$ 881

11. Unexpended Appropriations:
(In Thousands)

	As of September 30	
	2000 Appropriated Funds	1999 Appropriated Funds
Unexpended Appropriations:		
Undelivered Orders	$ 2,506,063	$ 2,232,712
Unobligated:		
Available	616,935	747,646
Not Available	69,044	102,625
Total	$ 3,192,042	$ 3,082,983

12. Change in Unfunded Expenses
(In Thousands)

Unfunded Expense Transaction Type	Current Fiscal Year Increase (Decrease)
Closed appropriations accounts payable	$ 9,526
Actuarial FECA liability	4,210
Annual leave	2,845
Probable contingent liabilities	862
Workers' Compensation	(1,056)
Environmental cleanup	(89,336)
Total Current Fiscal Year Change in Unfunded Expenses	$ (72,949)

The change in unfunded expenses represents a net decrease during fiscal year 2000 of the amounts estimated to be paid from future appropriations.

13. Gross Cost and Earned Revenue By Budget Functional Classification:
(In Thousands)

Functional Classification	Gross Cost	Earned Revenue	Net Cost
General Science, Space, and Technology	$ 13,055,311	$ (688,955)	$ 12,366,356
Transportation	1,182,821	(48,543)	1,134,278
Costs Not Assigned to Programs	(2,420,585)	—	(2,420,585)
Trust Funds	1,271	(1,001)	270
Total	$ 11,818,818	$ (738,499)	$ 11,080,319

14. **Budgetary Resources:**
(In Thousands)

	As of September 30, 2000				
	Science, Aeronautics and Technology	**Human Space Flight**	**Mission Support**	**Other**	**Total**
Budgetary Resources:					
Budget Authority	$ 5,608,200	$ 5,510,900	$ 2,514,758	$ 20,302	$ 13,654,160
Unobligated Balances - Beginning of Period	312,072	370,469	115,172	66,629	864,342
Spending Authority from Offsetting Collections	430,723	163,677	112,615	(1,396)	705,619
Adjustments	16,122	(19,068)	23,942	(60,546)	(39,550)
Total Budgetary Resources	**$ 6,367,117**	**$ 6,025,978**	**$ 2,766,487**	**$ 24,989**	**$ 15,184,571**
Status of Budgetary Resources:					
Obligations Incurred	$ 6,018,977	$ 5,852,290	$ 2,611,373	$ 1,460	$ 14,484,100
Unobligated Balances—Available	307,091	167,068	135,680	7,096	616,935
Unobligated Balances—Not Available	41,049	6,620	19,434	16,433	83,536
Total Status of Budgetary Resources	**$ 6,367,117**	**$ 6,025,978**	**$ 2,766,487**	**$ 24,989**	**$ 15,184,571**
Outlays:					
Obligations Incurred	$ 6,018,977	$ 5,852,290	$ 2,611,373	$ 1,460	$ 14,484,100
Less: Spending Authority from Offsetting Collections and Adjustments	(472,777)	(167,609)	(157,559)	269	(797,676)
Obligations Incurred, Net	**5,546,200**	**5,684,681**	**2,453,814**	**1,729**	**13,686,424**
Obligated Balance, Net— Beginning of Period	2,977,072	1,626,554	585,803	63,729	5,253,158
Less: Obligated Balance, Net— End of Period	(3,045,601)	(1,813,384)	(623,441)	(15,531)	(5,497,957)
Total Outlays	**$ 5,477,671**	**$ 5,497,851**	**$ 2,416,176**	**$ 49,927**	**$ 13,441,625**

14. Budgetary Resources (continued):
(In Thousands)

	As of September 30, 1999				
	Science, Aeronautics and Technology	**Human Space Flight**	**Mission Support**	**Other**	**Total**
Budgetary Resources:					
Budget Authority	$ 5,653,900	$ 5,480,000	$ 2,511,100	$ 16,697	$ 13,661,697
Unobligated Balances - Beginning of Period	495,565	284,892	147,409	137,373	1,065,239
Spending Authority from Offsetting Collections	505,420	169,639	61,716	(29,290)	707,485
Adjustments	22,236	4,979	(3,007)	(28,129)	(3,921)
Total Budgetary Resources	**$ 6,677,121**	**$ 5,939,510**	**$ 2,717,218**	**$ 96,651**	**$ 15,430,500**
Status of Budgetary Resources:					
Obligations Incurred	$ 6,365,049	$ 5,569,040	$ 2,602,047	$ 30,022	$ 14,566,158
Unobligated Balances—Available	280,575	368,361	85,768	12,942	747,646
Unobligated Balances—Restricted	31,497	2,109	29,403	53,687	116,696
Total Status of Budgetary Resources	**$ 6,677,121**	**$ 5,939,510**	**$ 2,717,218**	**$ 96,651**	**$ 15,430,500**
Outlays:					
Obligations Incurred	$ 6,365,049	$ 5,569,040	$ 2,602,047	$ 30,022	$ 14,566,158
Less: Spending Authority from Offsetting Collections and Adjustments	(527,656)	(174,618)	(70,070)	22,751	(749,593)
Obligations Incurred, Net	**5,837,393**	**5,394,422**	**2,531,977**	**52,773**	**13,816,565**
Obligated Balance, Net— Beginning of Period	2,925,024	1,649,421	449,234	76,630	5,100,309
Less: Obligated Balance, Net— End of Period	(2,977,072)	(1,626,554)	(585,804)	(63,728)	(5,253,158)
Total Outlays	**$ 5,785,345**	**$ 5,417,289**	**$ 2,395,407**	**$ 65,675**	**$ 13,663,716**

15. Revisions of Statement of Budgetary Resources:
(In Thousands)

Certain information presented in the Statement of Budgetary Resources for the year ended September 30, 1999, has been revised as of September 30, 2000, due to a misunderstanding by management of the components of certain line items. Recoveries of prior year obligations, as previously recorded, included cancellations or downward adjustments of obligations incurred in prior fiscal years as well as disbursements made during fiscal year 1999 from expired appropriation accounts. Recoveries of prior year obligations, as revised, include only cancellations or downward adjustments of obligations incurred in prior fiscal years. The following illustrates the certain balances on the Statement of Budgetary Resources for the year ended September 30, 1999, as previously reported and revised:

Line items that were affected:	**As previously reported**	**As revised**
Budgetary Authority	$ 13,650,336	$ 13,661,697
Adjustments		
Rescissions	—	(11,361)
Recoveries of Prior Year Obligations	685,805	42,108
Cancellation of Expired Accounts	(34,668)	(34,668)
Total Budgetary Resources	16,074,729	15,430,500
Obligations Incurred	15,210,387	14,566,158
Total Status of Budgetary Resources	16,074,729	15,430,500
Spending Authority from Offsetting Collections	708,017	707,485

This revision had no material impact on net or total outlays, net obligations incurred, net cost of operations, or net position as of and for the year ended September 30, 1999. In addition, this revision was not considered material to the budgetary resources of NASA for the year ended September 30, 1999.

National Aeronautics and Space Administration
Required Supplementary Stewardship Information
Heritage Assets
For the Fiscal Year Ended September 30, 2000

Federal agencies are required to classify and report heritage assets, in accordance with the requirements of Statement of Federal Financial Accounting Standards No. 8, "Supplementary Stewardship Reporting."

Heritage assets are property, plant, and equipment that possess one or more of the following characteristics: historical or natural significance; cultural, educational, or aesthetic value; or significant architectural characteristics.

Since the cost of heritage assets is not often relevant or determinable, NASA does not attempt to value them or to establish minimum value thresholds for designation of property, plant, or equipment as heritage assets. The useful lives of heritage assets are not reasonably estimable for depreciation purposes.

Since the most relevant information about heritage assets is their existence, they are reported in terms of physical units, as follows:

	1999	Additions	Withdrawals	2000
Buildings and Structures	25	7	(4)	28
Air and Space Displays and Artifacts	388	15	(10)	393
Miscellaneous Items	1,099	10	(91)	1,018
Total Heritage Assets	1,512	32	(105)	1,439

NASA heritage assets are considered collectible, except for its fixed assets. Heritage assets were generally acquired through construction by NASA or its contractors, and are expected to remain in this category, except where there is legal authority for transfer or sale. NASA's heritage assets are generally in fair condition, suitable only for display.

Many of the buildings and structures are designated as National Historic Landmarks. Numerous air and spacecraft and related components are on display at various locations to enhance public understanding of NASA programs. NASA eliminated their cost from its property records when they were designated as heritage assets. A portion of the amount reported for deferred maintenance is for heritage assets.

For more than 30 years, the NASA Art Program, an important heritage asset, has documented America's major accomplishments in aeronautics and space. During that time, more than 200 artists have generously contributed their time and talent to record their impressions of the U.S. aerospace program in paintings, drawings, and other media. Not only do these art works provide a historic record of NASA projects, they give the public a new and fuller understanding of advancements in aerospace. Artists are in fact given a special view of NASA through the "back door." Some have witnessed astronauts in training or scientists at work. The art collection, as a whole, depicts a wide range of subjects, from Space Shuttle launches to aeronautics research, the Hubble Space Telescope, and even virtual reality.

Artists commissioned by NASA receive a small honorarium in exchange for donating a minimum of one piece to the NASA archive, which now numbers more that 700 works of art. In addition, more than 2,000 works have been donated to the National Air and Space Museum.

National Aeronautics and Space Administration
Required Supplementary Stewardship Information
Stewardship Investments: Research and Development
For the Fiscal Years Ended September 30
(In Thousands)

Program/Application:	2000	1999	1998
Space Station (a)			
Applied Research	$ —	$ 99,678	$ 137,529
Development	—	2,456,172	2,362,996
	—	2,555,850	2,500,525
Life and Microgravity			
Basic	107,951	162,858	221,217
Applied Research	166,746	119,548	157,727
Development	46,586	14,239	20,365
	321,283	296,645	399,309
Payload Utilization and Operations			
Applied Research	419,452	375,970	401,528
	419,452	375,970	401,528
Space Science			
Basic	829,870	757,812	1,049,037
Applied Research	—	827,405	429,895
Development	1,647,353	992,372	857,453
	2,477,223	2,577,589	2,336,385
Earth Science			
Basic	494,956	358,782	331,095
Applied Research	97,018	130,625	156,835
Development	1,052,397	1,252,260	1,254,677
	1,644,371	1,741,667	1,742,607
Aeronautics Research and Technology			
Basic	144,053	356,546	438,923
Applied Research	906,288	910,027	937,011
Development	83,937	20,595	—
	1,134,278	1,287,168	1,375,934
Space Access and Technology			
Applied Research	512,409	569,775	678,036
	512,409	569,775	678,036
Commercial Programs			
Basic	—	99,080	—
Applied Research	171,591	45,341	98,198
Development	6,224	23,510	45,788
	177,815	167,931	143,986
Mission Communication Services			
Basic	457,582	—	—
Development	—	430,503	444,933
	457,582	430,503	444,933

National Aeronautics and Space Administration
Required Supplementary Stewardship Information
Stewardship Investments: Research and Development
For the Fiscal Years Ended September 30
(In Thousands)

Program/Application (continued):

	2000	1999	1998
Academic Programs			
Basic	71,504	93,339	90,468
Applied Research	39,873	19,657	19,481
Development	—	13,823	37,634
	111,377	126,819	147,583
Total Research and Development Expenses by Program	**$ 7,255,790**	**$ 10,129,917**	**$ 10,170,826**
Non-Research and Development Expenses by Program			
Space Shuttle	$ 3,303,230	$ 3,285,407	$ 3,369,846
Space Station	2,754,089	—	—
Space Communication Services	—	184,978	254,440
U.S./Russian Cooperative	22,124	151,396	152,625
Other Programs	165,401	28,922	218,109
Trust Funds	1,271	832	1,457
Reimbursable Expenses	737,498	817,810	715,407
Total Non-Research and Development Expenses by Program	**6,983,613**	**4,469,345**	**4,711,884**
Total Program Expenses	**$ 14,239,403**	**$ 14,599,262**	**$ 14,882,710**

NASA makes substantial research and development investments for the benefit of the United States. These amounts are expensed as incurred in determining the net cost of operations.

NASA's research and development programs include activities to extend our knowledge of the Earth, its space environment and the universe, and to invest in new aeronautics and advanced space transportation technologies that support the development and application of technologies critical to the economic, scientific, and technical competitiveness of the United States.

Investment in research and development refers to those expenses incurred to support the search for new or refined knowledge and ideas and for the application or use of such knowledge and ideas for the development of new or improved products and processes with the expectation of maintaining or increasing national economic productive capacity or yielding other future benefits. Research and development is composed of:

Basic research: Systematic study to gain knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications toward processes or products in mind;

Applied research: Systematic study to gain knowledge or understanding necessary for determining the means by which a recognized and specific need may be met; and

Development: Systematic use of the knowledge and understanding gained from research for the production of useful materials, devices, systems, or methods, including the design and development of prototypes and processes.

See Management's Discussion and Analysis elsewhere in this Accountability Report for highlighted program descriptions and performance measures.

(a) The OMB revised its rules in fiscal year 2000, and no longer considered Space Station as Investment in Research and Development, as it was in previous years. Therefore, in fiscal year 2000, Space Station became part of Non-Research and Development Expenses by Program.

National Aeronautics and Space Administration
Required Supplementary Information
As of and for Fiscal Year Ended September 30, 2000
(In Thousands)

Intragovernmental Assets:

Agency	Fund Balance with Treasury	Investments	Accounts Receivable	Advances and Prepaid Expense
Treasury	$ 6,189,464	$ 16,727	$ 154	$ —
Air Force	—	—	34,232	74
Army	—	—	14,471	3
Commerce	—	—	37,921	1,034
Navy	—	—	9,880	5,233
National Science Foundation	—	—	300	14,042
Secretary of Defense	—	—	16,063	1,288
Transportation	—	—	3,440	898
Other	—	—	2,674	132
Total:	**$ 6,189,464**	**$ 16,727**	**$ 119,135**	**$ 22,704**

Intragovernmental Liabilities:

Agency	Accounts Payable	Closed Accounts Payable	Workers' Compensation	Liability for Deposit and Clearing Funds
Air Force	$ 63,494	$ 9,033	$ —	$ 2,302
Army	24,816	22	—	56
Commerce	20,926	8	—	(77)
Energy	12,634	10	—	619
Labor	15	—	14,395	—
Navy	21,223	456	—	51
National Science Foundation	9,946	35	—	8
Secretary of Defense	5,458	60	—	408
Transportation	4,530	—	—	73
Other	24,348	14	—	383
Total:	**$ 187,390**	**$ 9,638**	**$ 14,395**	**$ 3,823**

Agency	Advances from Others	Lease Liabilities	Accrued Funded Payroll	Liability for Receipt Accounts
Air Force	$ 5,384	$ —	$ —	$ 315
Commerce	26,267	—	—	3
Energy	3	—	—	18
Office of Personnel Management	—	—	11,081	—
Secretary of Defense	2	—	—	146
Transportation	355	—	—	120
Veteran's Affairs	—	585	—	—
Other	413	—	—	115
Total:	**$ 32,424**	**$ 585**	**$ 11,081**	**$ 717**

Exchange Revenue

Commerce	$ 319,763
Air Force	182,108
Other	170,308
Total Exchange Revenue	**$ 672,179**

National Aeronautics and Space Administration
Required Supplementary Information
As of September 30, 1999
(In Thousands)

Intragovernmental Assets:

Agency	Fund Balance with Treasury	Investments	Accounts Receivable	Advances and Prepaid Expense
Treasury	$ 6,211,702	$ 16,730	$ 45	$ –
Air Force	–	–	20,263	80
Army	–	–	13,616	–
Commerce	–	–	38,246	1,131
Navy	–	–	12,280	14,155
Secretary of Defense	–	–	34,990	120
Other	–	–	8,280	74
Total:	**$ 6,211,702**	**$ 16,730**	**$ 127,720**	**$ 15,560**

Intragovernmental Liabilities:

Agency	Accounts Payable	Closed Accounts Payable	Workers' Compensation	Liability for Deposit and Suspense Funds
Air Force	$ 81,130	$ 1,470	$ –	$ 11,344
Army	14,402	1	–	480
Commerce	14,636	313	–	2,171
Energy	15,518	8	–	19
Labor	15	–	15,451	–
Navy	17,185	455	–	576
Secretary of Defense	10,636	262	–	4,073
Transportation	2,518	–	–	993
Other	16,104	50	–	736
Total:	**$ 172,144**	**$ 2,559**	**$ 15,451**	**$ 20,392**

Agency	Accounts Payable	Liability for Receipt Accounts
Air Force	$ –	$ 316
Army	–	16
Commerce	–	3
Energy	–	18
Labor	–	–
Navy	–	1
Office of Personnel Management	9,288	–
Secretary of Defense	–	146
Transportation	–	120
Other	–	97
Total:	**$ 9,288**	**$ 717**

National Aeronautics and Space Administration
Required Supplementary Information
Deferred Maintenance
For the Fiscal Year Ended September 30, 2000

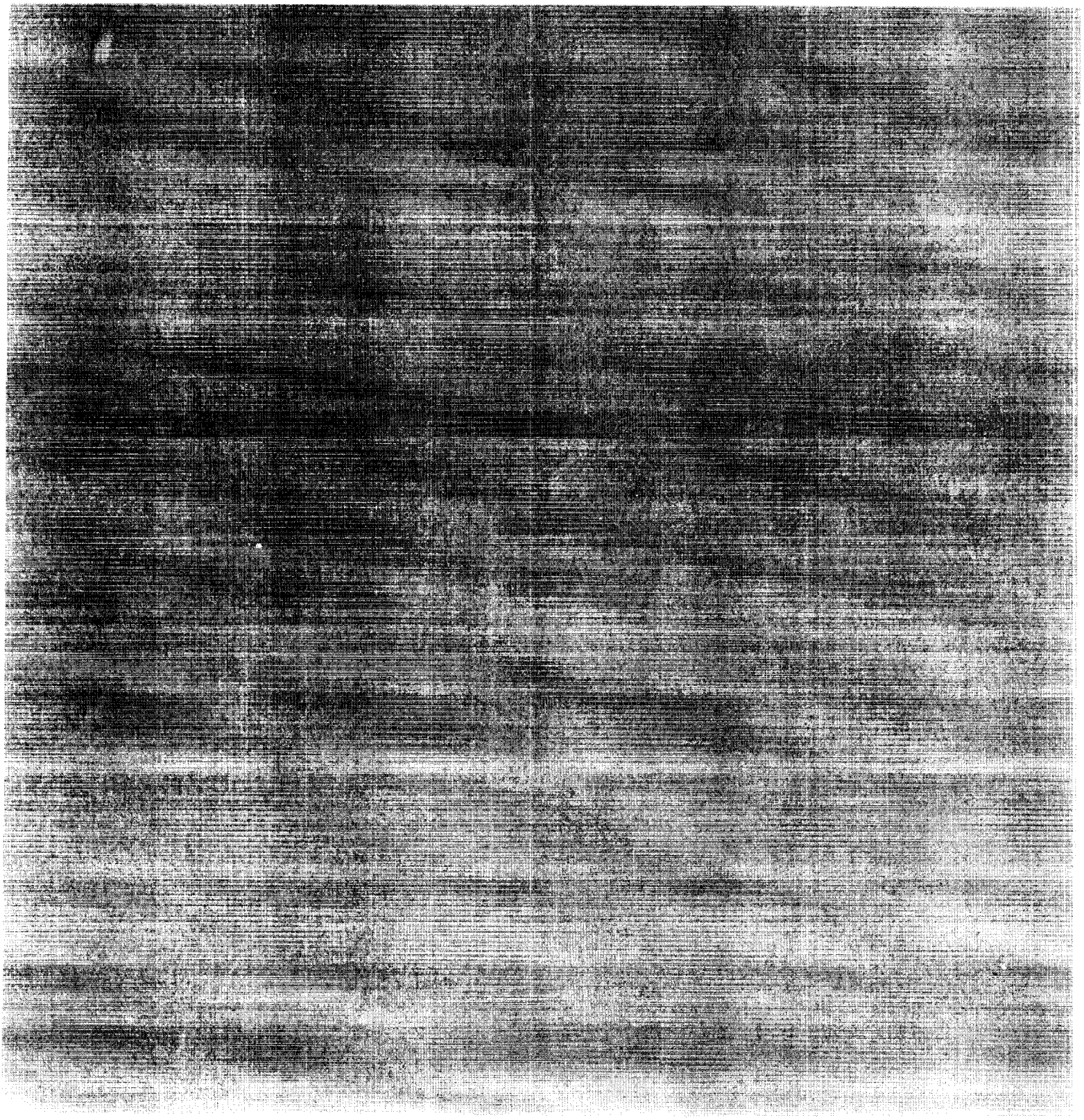
NASA has deferred maintenance only on its facilities, including structures. There is no significant deferred maintenance on other physical property, such as equipment, assets in space, or work-in-process, leasehold improvements and assets under capital lease. Contractor-held property is subject to the same considerations.

The condition assessment survey method is used for facilities to determine asset condition and maintenance required. Several methods are used for evaluating facility condition: (1) 100 percent inspection and condition assessment on a five-year cycle; (2) metrics to support long-term trend analyses; and (3) application of industry standards. Further, in 1997, NASA conducted a NASA-wide Facility Investment Study to identify future repairs and maintenance activities throughout the Agency. Acceptable operating condition is in accordance with standards comparable to those used in private industry, including the aerospace industry.

There have been no changes to Agency condition assessment procedures in the past several years. NASA's estimate of its backlog of maintenance and repair is approximately $1.16 billion. This estimate was derived from the 1997 NASA-wide Facility Investment Study and was adjusted as of September 30, 2000, to reflect inflation and the amounts budgeted to correct the existing facility deficiencies identified in the 1997 study.

During fiscal year 2000, a proposal was developed by the Federal Facilities Council Standing Committee on Operations and Maintenance. The methodolgy described in the amendment will be utilized by NASA in reporting deferred maintenance in its FY 2001 Accountability Report.

Deferred maintenance related to heritage assets is included in the deferred maintenance for general facilities. Maintenance is not deferred on assets that require immediate repair to restore them to safe working condition and have an Office of Safety and Mission Assurance Risk Assessment Classification Code 1 (see NASA STD 8719.7).



Auditors' Reports

National Aeronautics and
Space Administration
Headquarters
Washington, DC 20546-0001

Reply to Attn of: W

FEB 27 2001

TO: A/Administrator
B/Chief Financial Officer

FROM: W/Inspector General

SUBJECT: Audit of the National Aeronautics and Space Administration's Fiscal Year 2000 Financial Statements

We contracted with Arthur Andersen LLP, an independent certified public accounting firm, to audit the NASA Fiscal Year (FY) 2000 Financial Statements. The contract required that the audit be done in accordance with government auditing standards and with Office of Management and Budget Bulletin 01-02, "Audit Requirements for Federal Financial Statements."

In its audit report dated February 6, 2001, Arthur Andersen issued an unqualified opinion on NASA's financial statements. Additionally, Arthur Andersen found no material weaknesses[1] in internal controls, and no reportable conditions[2] of non-compliance with the laws and regulations it tested. However, Arthur Andersen identified one reportable condition involving controls over contractor-held property reporting. The condition is described in their Report of Independent Public Accountants on Internal Control.

[1] A material weakness is a reportable condition in which the design or operation of one or more of the internal control structure elements does not reduce to a relatively low level the risk that errors or irregularities in amounts that would be material in relation to the financial statements being audited may occur and not be detected within a timely period by employees in the normal course of performing their assigned functions.

[2] A reportable condition is a matter that, in the auditor's judgment, should be communicated because it represents a significant deficiency in the design or operation of internal control, that could adversely affect the organization's ability to meet internal control objectives of 1) reliable financial reporting, 2) compliance with laws and regulations, and 3) reliable performance reporting.

To ensure the quality of the audit work performed, we monitored the progress of the audit at key points and reviewed Arthur Andersen's report and related working papers to ensure compliance with applicable standards using guidance generally accepted by the President's Council on Integrity and Efficiency. Our review, as differentiated from an audit in accordance with generally accepted government auditing standards, was not intended to enable us to express, and we do not express, opinions on NASA's financial statements or on conclusions about the effectiveness of internal controls or conclusions on compliance with laws and regulations. Arthur Andersen is responsible for the enclosed auditor's report (see Enclosure) and for the conclusions expressed in the report. Our quality control review of Arthur Andersen's FY 2000 audit is ongoing. However, at this time, nothing has come to our attention to indicate that Arthur Andersen's FY 2000 audit did not comply with standards. On February 22, 2001, we received a draft U. S. General Accounting Office (GAO) report that cites concerns about Arthur Andersen's work on the audit of NASA's FY 1999 financial statements. We plan to respond to the GAO report by March 6, 2001, as requested.

Please contact Mr. Russell A. Rau, Assistant Inspector General for Auditing, at (202) 358-1232, or me at (202) 358-1220, if you have any questions concerning our review.

Roberta L. Gross

Enclosure

ARTHURANDERSEN

Report of Independent Public Accountants on Financial Statements

To the Inspector General of the
National Aeronautics and Space Administration:

We have audited the accompanying Statement of Financial Position of the National Aeronautics and Space Administration (NASA) as of September 30, 2000 and 1999, the related Statement of Budgetary Resources (as revised - see Note 15) for the fiscal years then ended, and the related Statements of Net Cost, Changes in Net Position, and Financing for the fiscal year ended September 30, 2000. These financial statements are the responsibility of NASA's management. Our responsibility is to express an opinion on these financial statements based on our audits.

We conducted our audits in accordance with auditing standards generally accepted in the United States, the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States, and Office of Management and Budget (OMB) Bulletin No. 01-02, "Audit Requirements for Federal Financial Statements." Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

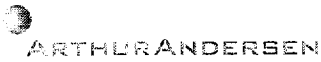
In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of NASA as of September 30, 2000 and 1999, its budgetary resources for the fiscal years then ended, and its net cost, changes in net position, and financing for the fiscal year ended September 30, 2000, in conformity with accounting principles generally accepted in the United States.

The Required Supplementary Stewardship Information and Required Supplementary Information are not a required part of the basic financial statements but are supplementary information required by OMB Bulletin No. 97-01. We have applied certain limited procedures that consisted principally of inquiries of management regarding the methods of measurement and presentation of the supplementary information. However, we did not audit the information and express no opinion on it.

We have also issued separate reports dated February 6, 2001, on NASA's internal control and on its compliance with laws and regulations.

Arthur Andersen LLP

Vienna, Virginia
February 6, 2001



Report of Independent Public Accountants on Internal Control

To the Inspector General of the
National Aeronautics and Space Administration:

We have audited the Statement of Financial Position of the National Aeronautics and Space Administration (NASA) as of September 30, 2000 and 1999, the related Statement of Budgetary Resources (as revised - see Note 15) for the fiscal years then ended, and the related Statements of Net Cost, Changes in Net Position, and Financing for the fiscal year ended September 30, 2000, and have issued our report thereon dated February 6, 2001.

We conducted our audits in accordance with auditing standards generally accepted in the United States, the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States, and Office of Management and Budget (OMB) Bulletin No. 01-02 "Audit Requirements for Federal Financial Statements." Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement.

In planning and performing our audit of the financial statements of NASA for the fiscal yea ended September 30, 2000, we obtained an understanding of NASA's internal control over financial reporting, we obtained an understanding of the design of relevant policies and procedures and whether they have been placed in operation, and we assessed control risk and performed tests of controls in order to determine our auditing procedures for the purpose of expressing our opinion on the financial statements and not to provide assurance on the internal control over financial reporting. Accordingly, we do not express such an opinion on the internal control over financial reporting.

The management of NASA is responsible for establishing and maintaining an internal control structure. In fulfilling this responsibility, estimates and judgments by management are required to assess the expected benefits and related costs of internal control structure policies and procedures. The objectives of an internal control structure are to provide management with reasonable, but not absolute, assurance that assets are safeguarded against loss from unauthorized use or disposition and that transactions are executed in accordance with management's authorization and recorded properly to permit the preparation of financial statements in accordance with accounting principles generally accepted in the United States. Because of inherent limitations in any internal control structure, errors or irregularities may nevertheless occur and not be detected. Also, projection of any evaluation of the structure to future periods is subject to the risk that procedures may become inadequate because of changes in conditions or that the effectiveness of the design and operation of policies and procedures may deteriorate.

We noted a matter involving the internal controls over contractor-held property that we consider to be a reportable condition under standards established by the American Institute of Certified Public Accountants. Reportable conditions are matters coming to our attention relating to significant deficiencies in the design or operation of the internal control that, in our judgments, could adversely affect NASA's ability to record, process, summarize, and report financial data consistent with the assertions by management in the financial statements. A material weakness is a condition in which the design or operation of one or more of the internal control components does not reduce to a relatively low level the risk that misstatements in amounts that would be material in relation to the financial statements being audited may occur and not be detected within a timely period by employees in the normal course of performing their assigned functions. We noted a matter discussed in the following paragraph involving the internal control over contractor-held property that we consider to be a reportable condition. This matter will be more fully described in a separate letter to the Inspector General and the Administrator of NASA dated February 6, 2001.

NASA's internal controls over reporting of contractor-held property require improvement to ensure that contractor-held property is reported in accordance with NASA and Federal accounting requirements. Specifically, NASA should enhance existing procedures designed to educate contractor personnel and NASA property administrators on property accounting and reporting requirements. Furthermore, NASA should develop specific procedures to validate amounts being capitalized by the contractors and to detect errors in the property reporting process.

Our consideration of the internal control over financial reporting would not necessarily disclose all matters in the internal control over financial reporting that might be reportable conditions, and, accordingly, would not necessarily disclose all reportable conditions that are also considered to be material weaknesses as defined above. However, we believe the reportable condition described above is not a material weakness.

In addition to the reportable condition above, we will note in a separate letter dated February 6, 2001 certain matters involving the internal control over financial reporting and its operation that we have reported to the Inspector General and the Administrator of NASA. The nature of the matters noted in this letter suggest the need for continued improvements in several areas of the agency's IT internal control environment. It should be noted that the agency has made progress in addressing and closing a significant number of issues noted in past reviews. Several of the unresolved control issues noted may represent a degree of technical non-compliance with various federal regulations (i.e. provisions of OMB Circular A-130 et al). However, we believe those weaknesses, when considered in the context of the agency's ability to prepare its financial statements in accordance with applicable accounting principles, are not of a nature that would result in financial misstatements that would be material and not be detected within a timely period by

employees in the normal course of performing their assigned functions. Accordingly, we do not intend to disclose or report any of these issues as either a material weakness or reportable condition.

While our IT controls review work included obtaining an understanding of IT internal controls sufficient to plan the audit and determine the nature, timing and extent of audit procedures to be performed, it was not designed to provide assurance on NASA's internal IT control environment or to identify all significant deficiencies in internal IT control. It is possible that weaknesses or potentially reportable conditions related to NASA's IT environment exist that would not be detected by our procedures due to the limited scope of our IT controls review.

In addition, we considered NASA's internal control over Required Supplementary Information and Required Supplementary Stewardship Information by obtaining an understanding of NASA's internal controls, determining whether those internal controls had been placed in operation, assessing control risk and performing tests of controls as required by OMB Bulletin No. 01-02. Our procedures were not designed to provide assurance on these internal controls. Accordingly, we do not express such an opinion on the internal control over Required Supplementary Information and Required Supplementary Stewardship Information.

Lastly, with respect to internal controls related to performance measures and management's discussion and analysis reported in the fiscal year 2000 Accountability Report, we obtained an understanding of the design of significant internal controls related to the existence and completeness assertions, as required by OMB Bulletin No. 01-02. Our procedures were not designed to provide assurance on the internal control related to performance measures and management's discussion and analysis.

This report is intended solely for the use of the Inspector General, the Administrator and management of NASA, OMB and Congress, and is not intended to be and should not be used by anyone other than these specified parties.

Arthur Andersen LLP

Vienna, Virginia
February 6, 2001

ARTHUR ANDERSEN

Report of Independent Public Accountants on Compliance with Laws and Regulations

To the Inspector General of the
National Aeronautics and Space Administration:

We have audited the Statement of Financial Position of the National Aeronautics and Space Administration (NASA) as of September 30, 2000 and 1999, the related Statement of Budgetary Resources (as revised - see Note 15) for the fiscal years then ended, and the related Statements of Net Cost, Changes in Net Position, and Financing for the fiscal year ended September 30, 2000, and have issued our report thereon dated February 6, 2001.

We conducted our audits in accordance with auditing standards generally accepted in the United States, the standards for financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States, and Office of Management and Budget (OMB) Bulletin No. 01-02, "Audit Requirements for Federal Financial Statements." Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement.

Compliance with laws and regulations applicable to NASA is the responsibility of NASA's management. As part of obtaining reasonable assurance about whether the statements referred to above are free of material misstatement, we performed tests of NASA's compliance with provisions of certain laws and regulations, noncompliance with which could have a direct and material effect on the determination of financial statement amounts, and certain other laws and regulations specified in OMB Bulletin No. 01-02, including the requirements referred to in the Federal Financial Management Improvement Act (FFMIA) of 1996.

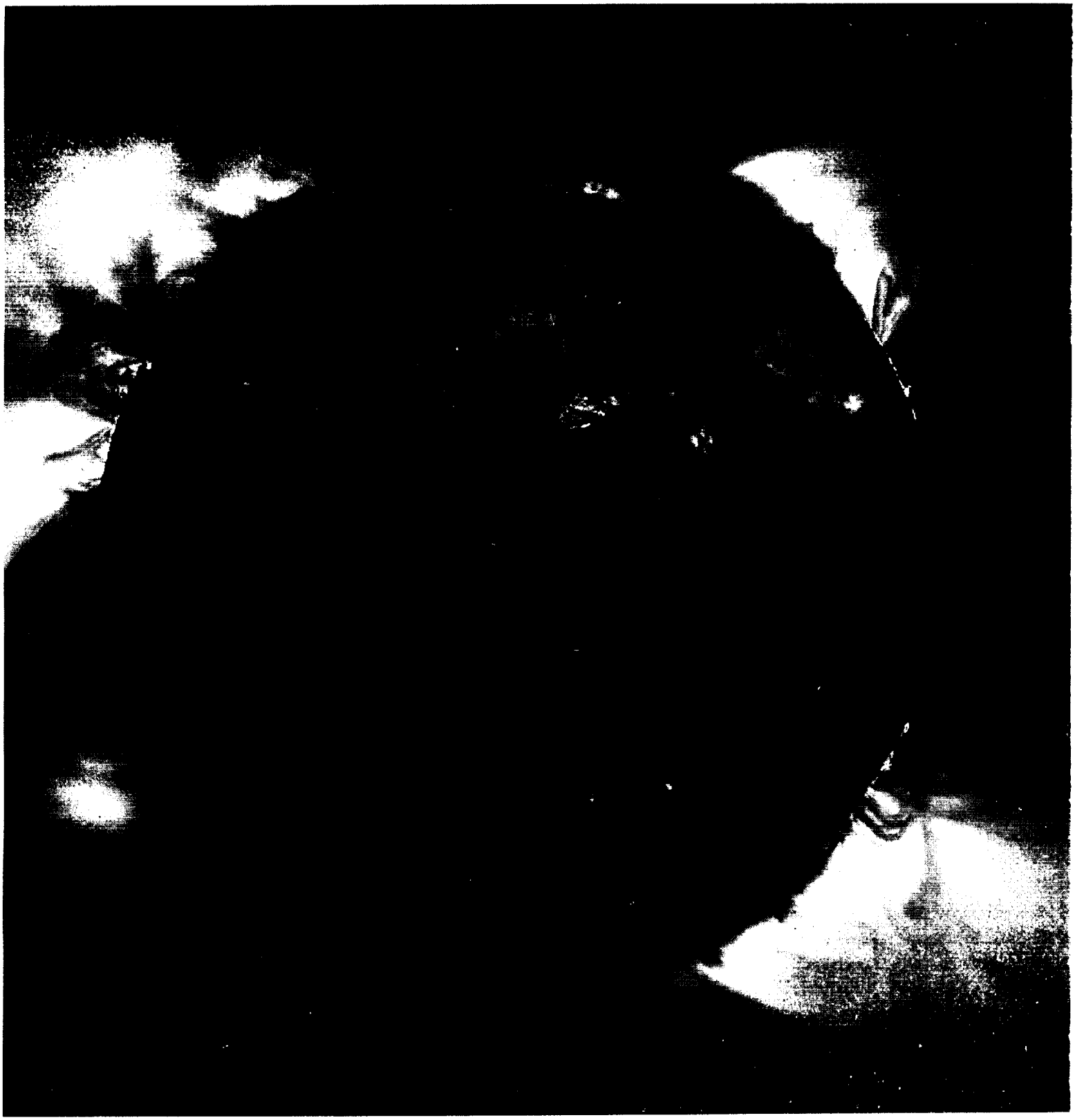
Under FFMIA, we are required to report whether NASA's financial management systems substantially comply with 1) Federal financial management systems requirements, 2) applicable Federal accounting standards and 3) the requirement to record transactions consistent with the United States Government Standard General Ledger at the transaction level. To meet this requirement, we performed tests of compliance using the implementation guidance for FFMIA included in Appendix D of OMB Bulletin No. 01-02, as supplemented by revised implementation guidance for FFMIA issued by OMB on January 4, 2001. However, the objective of our audit of the financial statements was not to provide an opinion on compliance with provisions of certain laws and regulations. Accordingly, we do not express such an opinion.

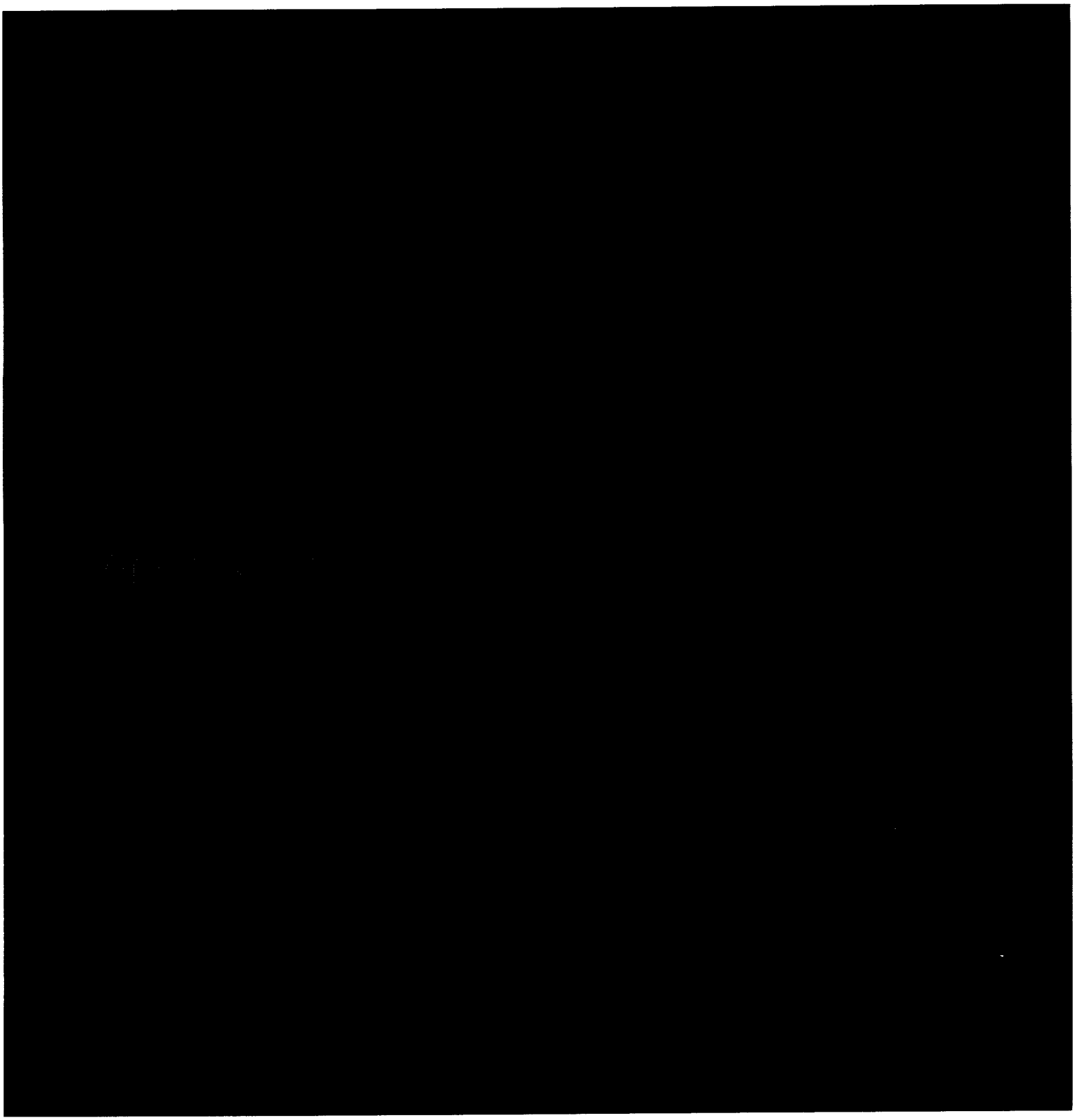
The results of our tests disclosed no instances of noncompliance that are required to be reported herein under *Government Auditing Standards* or OMB Bulletin No. 01-02. Additionally, the results of our tests disclosed no instances in which NASA's financial management systems did not substantially comply with the three requirements of FFMIA described in the preceding paragraph.

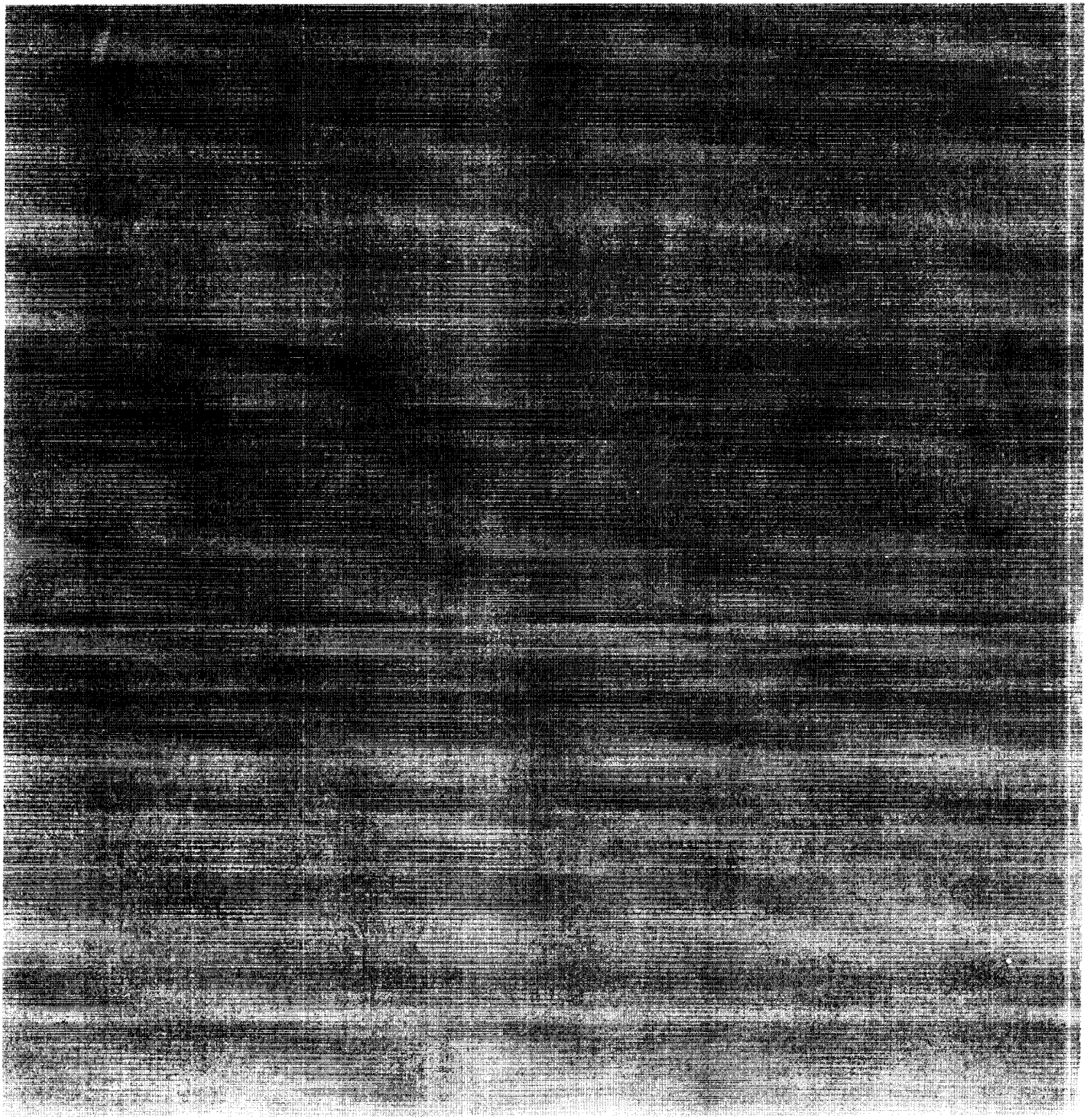
This report is intended solely for the information and use of the Inspector General, the Administrator and management of NASA, OMB and Congress, and is not intended to be and should not be used by anyone other than those specified parties.

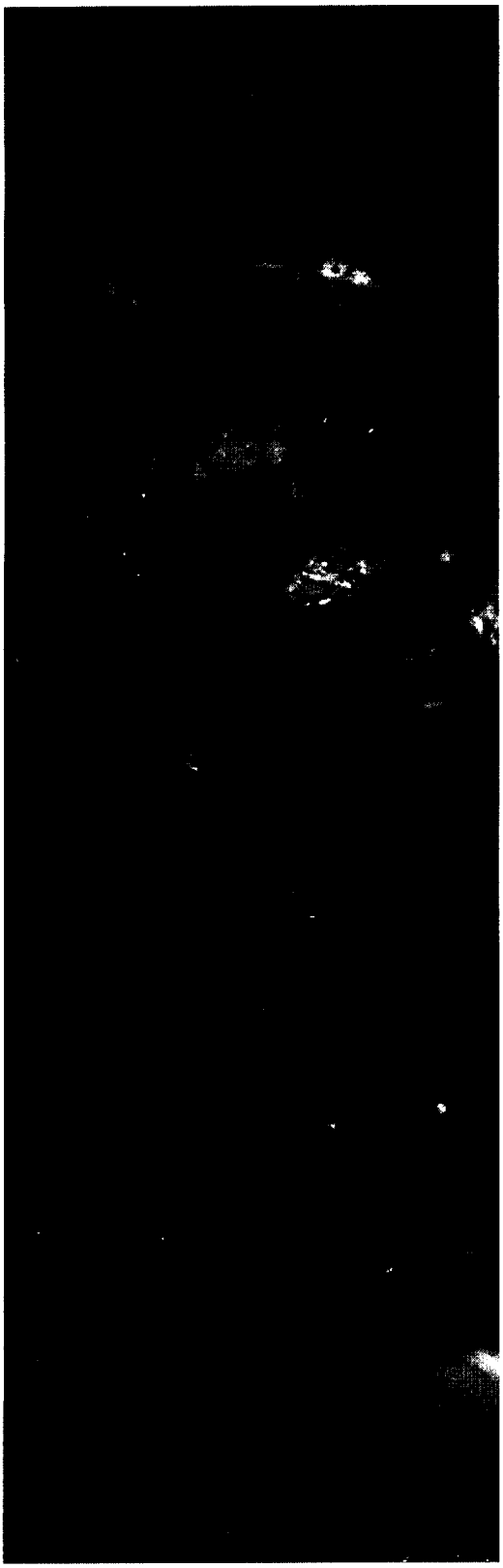
Arthur Andersen LLP

Vienna, Virginia
February 6, 2001









Acronyms

ACE	Advanced Composition Explorer
ADP	Automated Data Processing
aFAST	Active Final Approach Spacing Tool
AFO	Audit Followup
ALR	Audit Liaison Representative
AO	Announcement of Opportunity
ARC	Ames Research Center
AST	Aerospace Technology (Enterprise)
AVOSS	Aircraft Vortex Spacing System
AXAF	Advanced X-ray Astrophysics Facility (Former name of Chandra X-ray Observatory)
BMS	Bristol-Myers Squibb
CAMMP	Center for Advanced Microgravity Materials Processing
CAU	Cockpit Avionics Upgrade
CCACS	Center for Commercial Applications of Combustion in Space
CFO	Chief Financial Officer
CME	Coronal Mass Ejection
CRV	Crew Return Vehicle
CSC	Commercial Space Center
CSRS	Civil Service Retirement System
CXO	Chandra X-Ray Observatory
DAAC	Distributed Active Archive Center
dB	Decibel
DCAA	Defense Contract Audit Agency
DISA	Defense Information Systems Agency
DOL	Department of Labor
EAPU	Electric Auxiliary Power Unit
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
E/PO	Education and Public Outreach
ERAST	Experimental Research Aircraft and Sensor Technology
ESE	Earth Science Enterprise
ESIP	Earth Science Information Partner
EVA	Extravehicular Activity
FAR	Federal Acquisition Regulation
FASAB	Federal Accounting Standards Advisory Board
FEMA	Federal Emergency Management Agency
FERS	Federal Employees Retirement System
FFMIA	Federal Financial Management Improvement Act
FFRDC	Federally Funded Research and Development Centers
FMFIA	Federal Managers' Financial Integrity Act
FTE	Full Time Equivalent
FTS	Flight Termination Systems
FY	Fiscal Year
GAO	General Accounting Office
GPRA	Government Performance and Results Act
GSFC	Goddard Space Flight Center
HBCU	Historically Black Colleges and Universities
HEDS	Human Exploration and Development of Space
HP	Hewlett-Packard
HSI	Hispanic Serving Institutions
HST	Hubble Space Telescope
ICAO	International Civil Aviation Organization
IFA	In-Flight Anomaly
IFMS	Integrated Financial Management System
IG	Inspector General
IMAGE	Imager for Magnetopause-to-Aurora Global Exploration
IPA	Independent Public Accountant
IPG	Information Power Grid
ISO	International Standards Organization
ISS	International Space Station
IT	Information Technology
JPL	Jet Propulsion Laboratory

LED	Light-Emitting Diode
LH_2	Liquid Hydrogen
LLP	Limited Liability Partnership
MD&A	Management's Discussion and Analysis
MEDS	Multifunctional Electronic Display Subsystem
MEIT	Multi-Element Integration Testing
MGS	Mars Global Surveyor
MODIS	Moderate Resolution Imaging Spectroradiometer
MPL	Mars Polar Lander
MSFC	Marshall Space Flight Center
NACC	NASA ADP Consolidation Center
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NIH	National Institutes of Health
NISN	NASA Integrated Services Network
NO_x	Nitrogen Oxide
NEAR	Near Earth Asteroid Rendezvous
NMO	NASA Management Office
NPD	NASA Policy Directive
NPG	NASA Procedure and Guideline
NRA	NASA Research Announcement
NRC	Nuclear Regulatory Commission
NSA	National Security Agency
NSTAR	NASA Solar Electric Propulsion Technology Applications Readiness
ODIN	Outsourcing Desktop Management Initiative
OIG	Office of Inspector General
OLMSA	Office of Life and Microgravity Sciences and Applications
OMB	Office of Management and Budget
ORB	Other Retirement Benefits
PAPAC	Provide Aerospace Products and Capabilities
PBC	Performance-Based Contracting
PP&E	Property, Plant and Equipment
R&A	Research and Analysis
R&D	Research and Development
RCC	Range Commanders Council
RSI	Required Supplementary Information
RSSI	Required Supplementary Stewardship Information
SAGE	Stratospheric Aerosol and Gases Experiment
SAMPEX	Solar, Anomalous, and Magnetospheric Particle Explorer
SAP	Systems, Applications, and Products in Data Processing
SBIR	Small Business Innovation Research
SF	Standard Form
SFFAS	Statement of Federal Financial Accounting Standards
SIM	Space Interfermometry Mission
SMEX	Small Explorer project
SOHO	Solar and Heliospheric Observatory
SOLVE	SAGE III Ozone Loss and Validation Experiment
SPD	Space Product Development
SRTM	Shuttle Radar Topography Mission
SSE	Space Science Enterprise
SSFL	Santa Susana Field Laboratory
SSRMS	Space Station Remote Manipulator System
STB	System Testbed
STEREO	Solar Terrestrial Relations Observatory
STS	Space Transportation System
TB	Terabyte
TCU	Tribal Colleges and Universities
TDRS	Tracking and Data Relay Satellite
THESEO	Third European Stratospheric Experiment on Ozone
TOMS-EP	Total Ozone Mapping Spectrometer Earth Probe
TRACE	Transition Region and Coronal Explorer
TRMM	Tropical Rainfall Measuring Mission

US	United States
USC	United States Code
USGS	United States Geological Survey

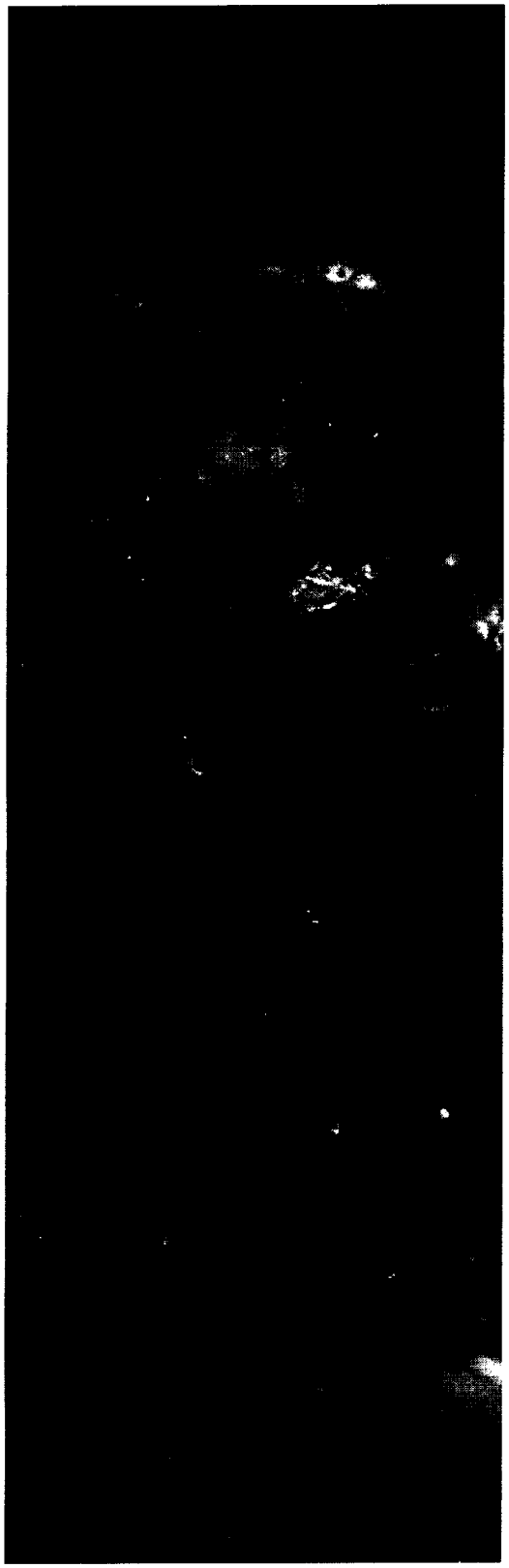


Illustration Index


Figure 1 -
NASA Mission and Vision

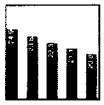


Figure 2 -
Personnel FTE


Figure 3 -
NASA Organization


Figure 4 -
NASA Centers of Excellence


Figure 5 -
Fundamental Questions


Figure 6 -
Galaxies in Collision
Captured by Chandra


Figure 7 -
Eskimo Nebula

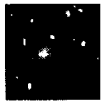


Figure 8 -
Galactic Lenses


Figure 9 -
Galactic Silhouettes

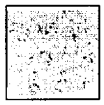


Figure 10 -
Detailed Map of the Early Universe

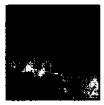


Figure 11 -
TRACE Fountains of Fire


Figure 12 -
NEAR Image of Eros


Figure 13 -
Water on Mars


Figure 14 -
SOHO Image of Coronal Mass Ejection

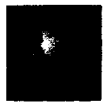


Figure 15 -
Artist's Concept of Planets
Smaller Than Saturn


Figure 16 -
Program Cost Status
Versus Cost Commitment


Figure 17 -
Image of Pasadena, California, Using
Elevation Data from SRTM


Figure 18 -
MODIS Plant Productivity


Figure 19 -
Landsat 7 Montana Wildland Fires

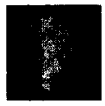


Figure 20 -
Greenland Ice Sheets


Figure 21 -
Antarctic Ozone "Hole"


Figure 22 -
Arctic Ozone Losses

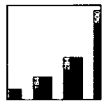


Figure 23 -
Data Volume Archived at
the DAACs (In Terabytes)

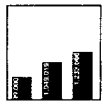


Figure 24 -
Number of Distinct Users
Accessing the DAACs

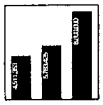


Figure 25 -
Number of Products Delivered
by the DAACs

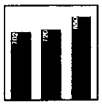


Figure 26 -
Scientific Investigations


Figure 27 -
The Hubble Space Telescope


Figure 28 -
Crew of STS-99


Figure 29 -
The Glass Cockpit (MEDS)


Figure 30 -
Preparation of *Atlantis*
for Mission STS-101


Figure 31 -
Launch of STS-106


Figure 32 -
Space Shuttle In-Flight Anomalies
per Mission

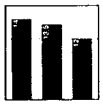


Figure 33 -
Space Shuttle Manifest
Preparation Time


Figure 34 -
International Space Station


Figure 35 -
ISS Expedition 1 Crew

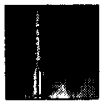


Figure 36 -
Launch of the
Zvezda Service Module


Figure 37 - U.S. Laboratory Module


Figure 38 -
Runway Incursion Avoidance Technology


Figure 39 -
Turbine Engine Propeller Test


Figure 40 -
Artist's Concept of Hyper-X


Figure 41 -
Proteus Aircraft


Figure 42 -
Artist's Concept of X-33 Liftoff

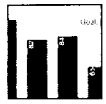


Figure 43 -
Enterprise Milestones


Figure 44 -
Facility Utilization Satisfaction

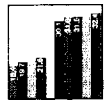


Figure 45 -
Workforce Diversity


Figure 46 -
PBC Obligations as Percentage
of Amounts Available for PBC


Figure 47 -
IT Customer Satisfaction
and Unit Cost

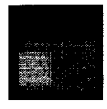


Figure 48 -
FY 2000 Peer-Reviewed
Research Projects

Figure 49 -
Disallowed Costs and Funds
Put to Better Use

Figure 50 -
Audits Open Over One Year

Figure 51 -
Total Outlays

Figure 52 -
Research and Development

Figure 53 -
FY 2000 Federal Budget
vs. FY 2000 NASA Budget

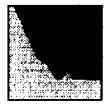


Figure 54 -
Trend of NASA Budget

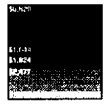
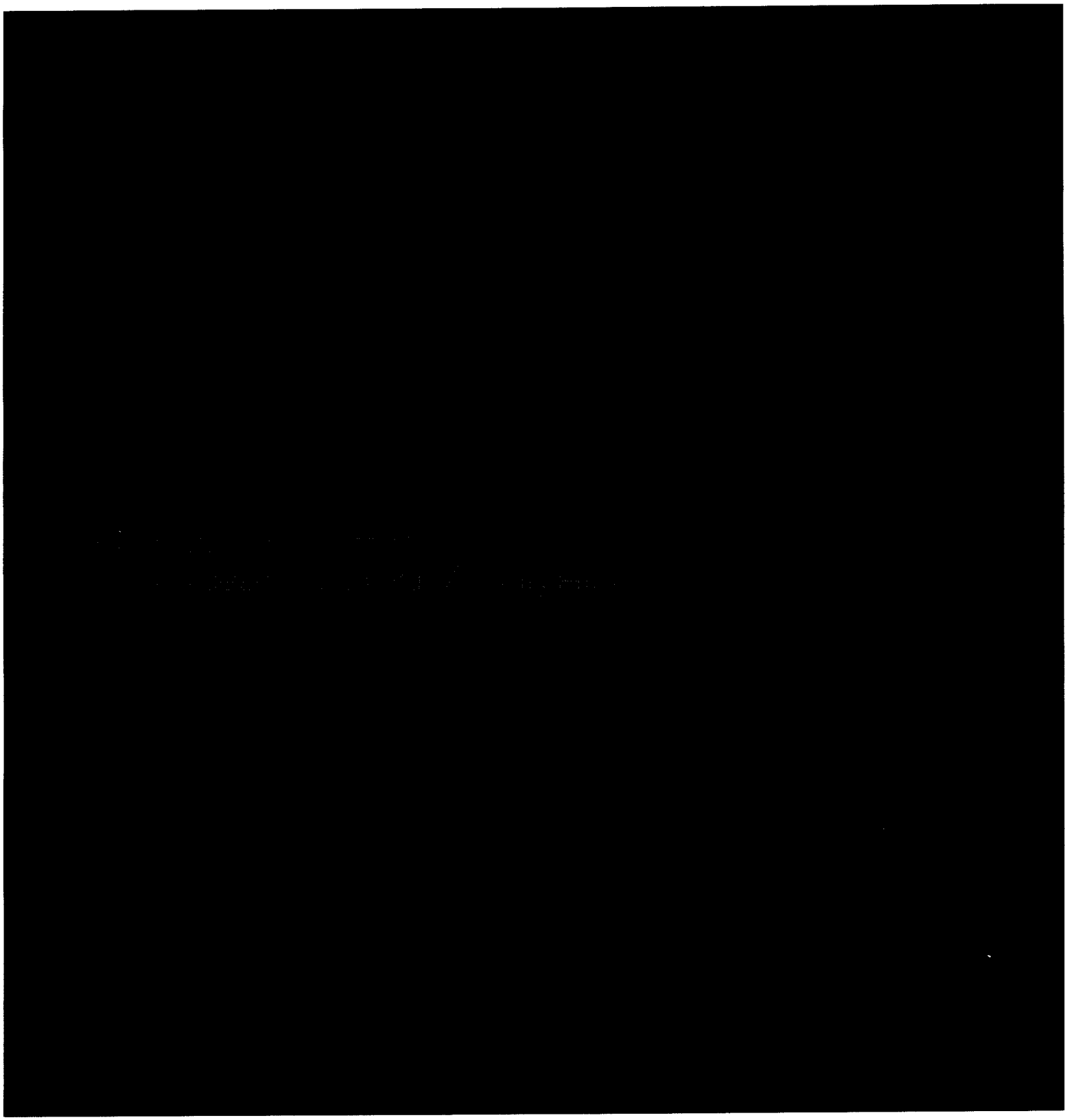
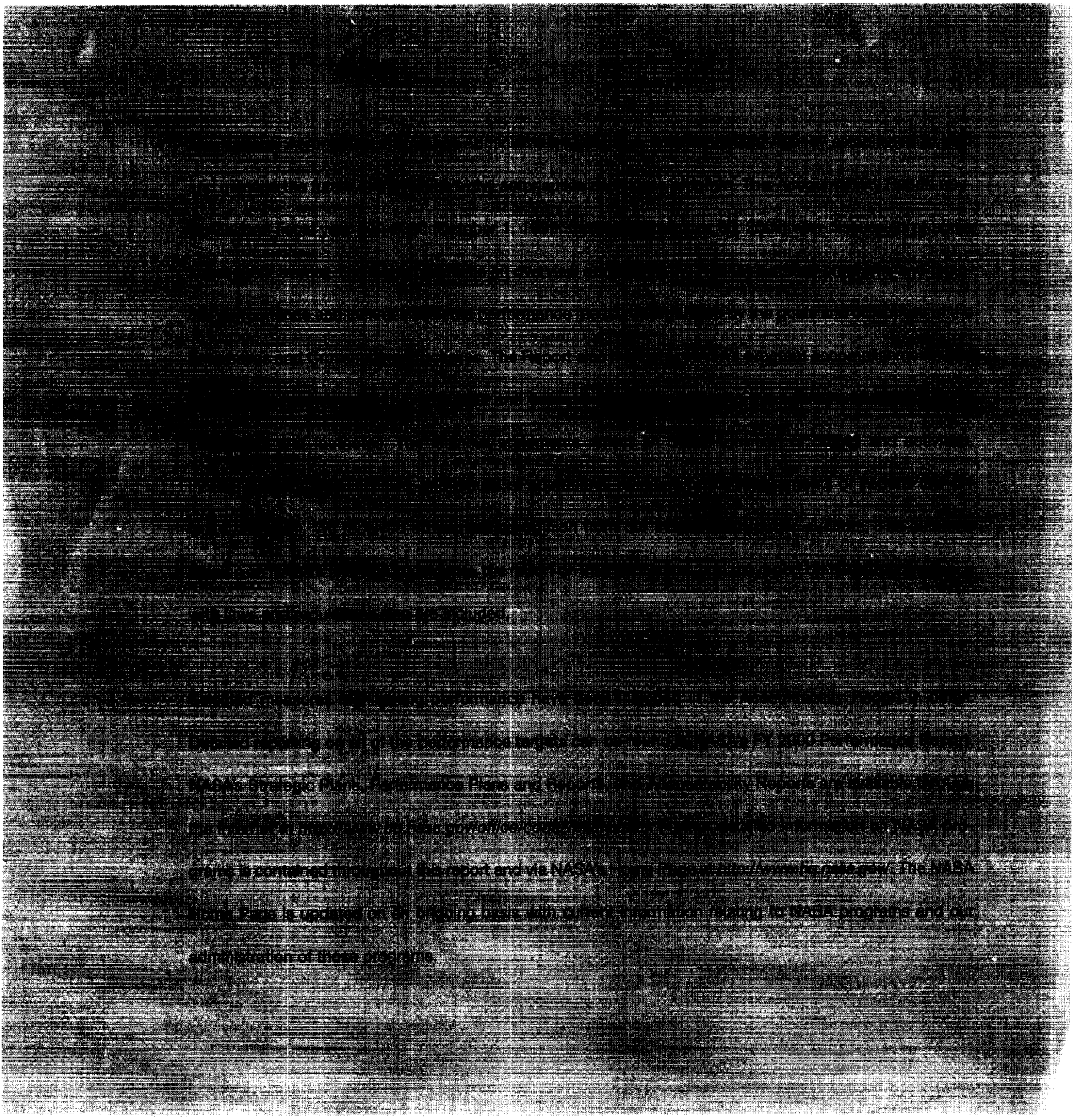
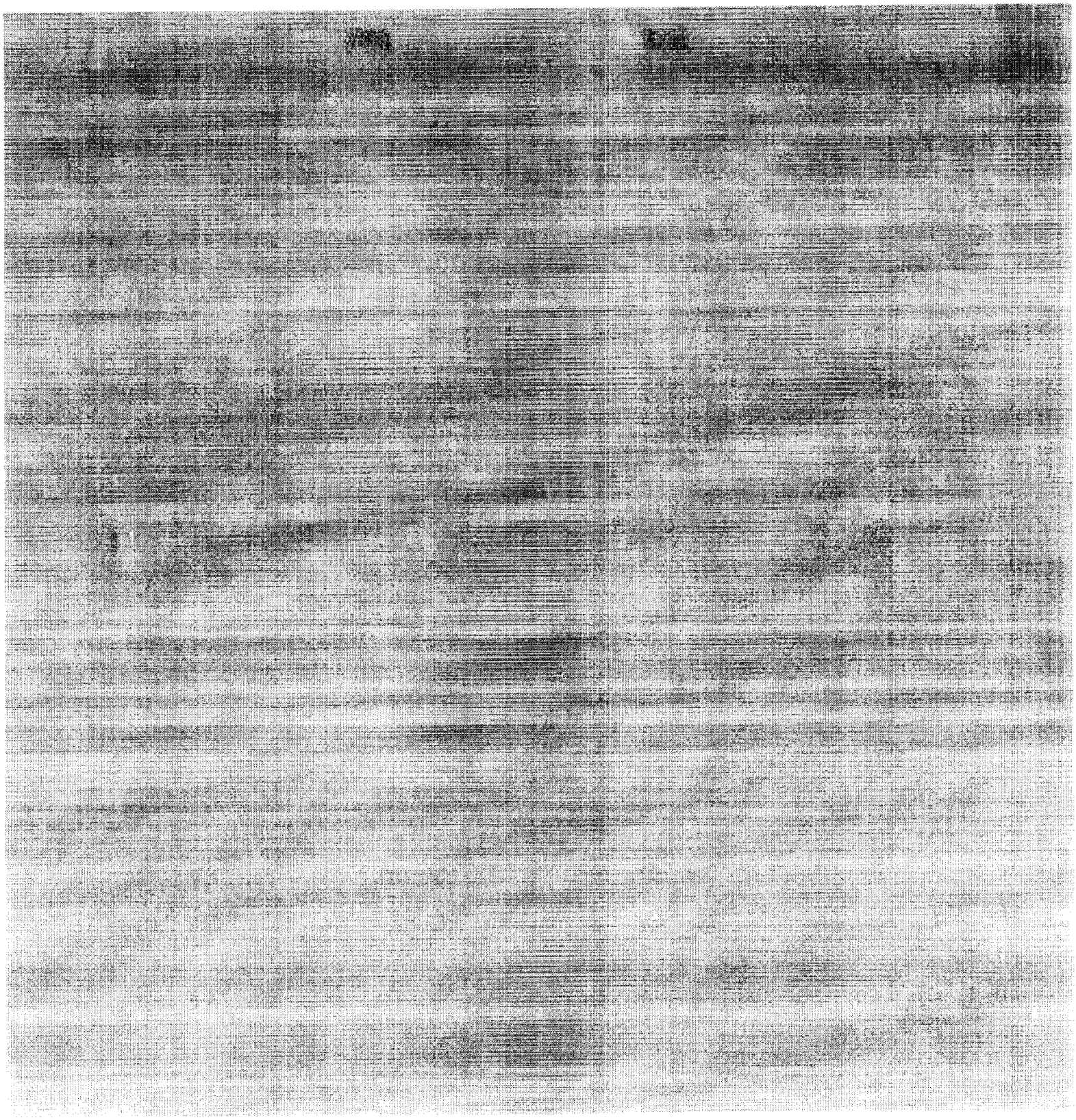
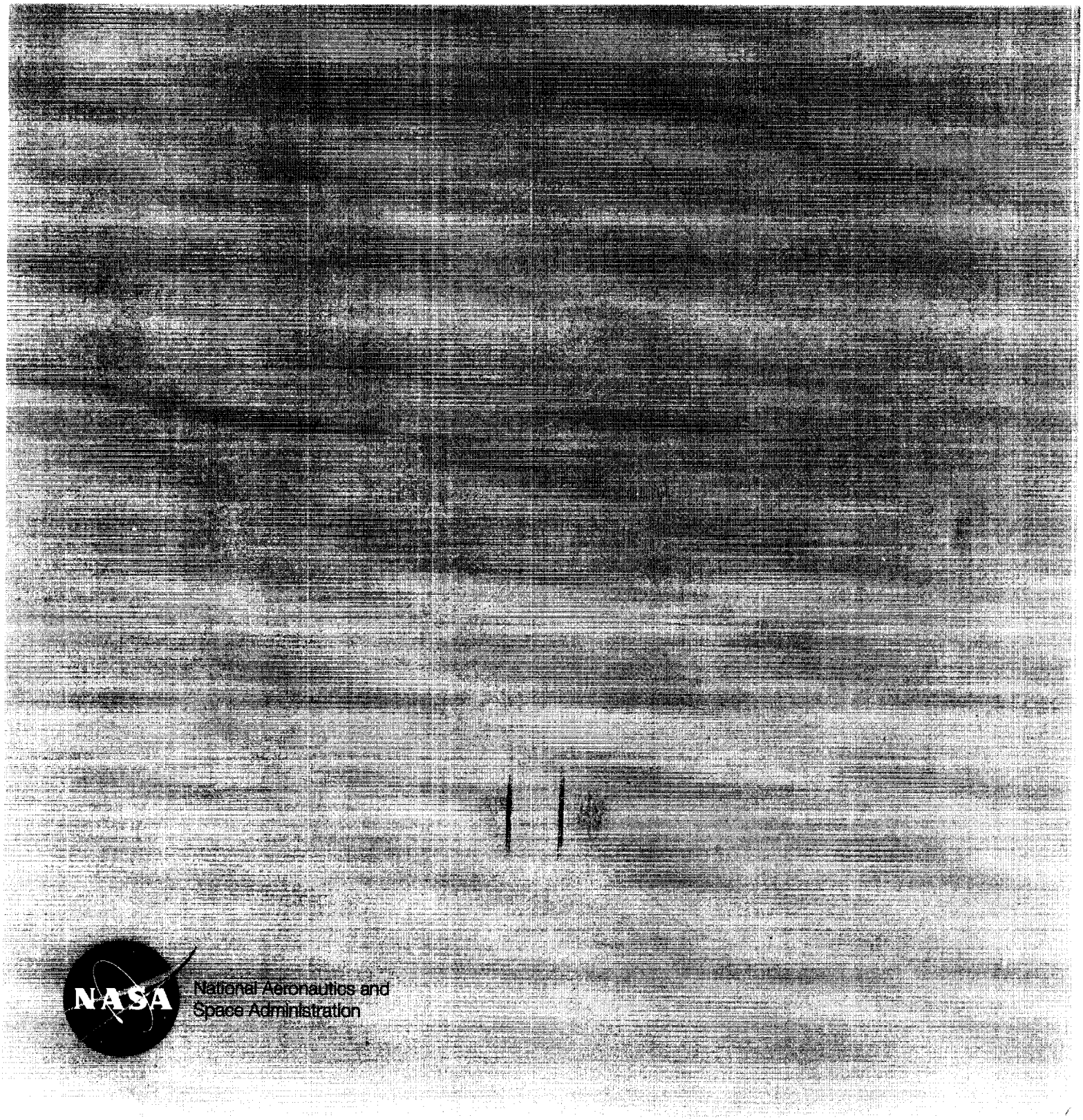


Figure 55 -
Appropriations Used
(Costs Expensed by Enterprise)









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