NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Federal Funds

General and special funds:

HUMAN SPACE FLIGHT

For necessary expenses, not otherwise provided for, in the conduct and support of human space flight research and development activities, including research, development, operations, and services; maintenance; construction of facilities including repair, rehabilitation, and modification of real and personal property, and acquisition or condemnation of real property, as authorized by law; space flight, spacecraft control and communications activities including operations, production, and services; and purchase, lease, charter, maintenance and operation of mission and administrative aircraft, [$5,480,000,000] *$5,638,000,000,* to remain available until September 30, [2000] *2001.*

For necessary expenses of the International Space Station, to become available on October 1 of the fiscal year specified and remain available for that and the following fiscal year, as follows: for fiscal year 2001, $2,328,000,000; for fiscal year 2002, $2,091,000,000; for fiscal year 2003, $1,721,000,000; and for fiscal year 2004, $1,573,000,000. (Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1999.)

Program and Financing (in millions of dollars)

Identification code 80–0111–0–1–252	1998 actual	1999 est.	2000 est.
Obligations by program activity:			
Direct program:			
00.01 Space station	2,360	2,397	2,474
00.03 Payload and utilization operations	223	184	168
00.04 Space shuttle	2,932	2,896	2,987
09.01 Reimbursable program	61	209	205
10.00 Total new obligations	5,576	5,686	5,834
Budgetary resources available for obligation:			
21.40 Unobligated balance available, start of year	226	271	274
22.00 New budget authority (gross)	5,621	5,689	5,843
23.90 Total budgetary resources available for obligation	5,847	5,960	6,117
23.95 Total new obligations	−5,576	−5,686	−5,834
24.40 Unobligated balance available, end of year	271	274	283
New budget authority (gross), detail:			
Current:			
40.00 Appropriation	5,507	5,480	5,638
42.00 Transferred from other accounts	53	.....	.....
43.00 Appropriation (total)	5,560	5,480	5,638
Permanent:			
Spending authority from offsetting collections:			
68.00 Offsetting collections (cash)	66	209	205
68.10 From Federal sources: Change in receivables and unpaid, unfilled orders	−5	.....	.....
68.90 Spending authority from offsetting collections (total)	61	209	205
70.00 Total new budget authority (gross)	5,621	5,689	5,843
Change in unpaid obligations:			
Unpaid obligations, start of year:			
72.40 Obligated balance, start of year	1,700	1,662	1,613
72.95 From Federal sources: Receivables and unpaid, unfilled orders	28	23	23
72.99 Total unpaid obligations, start of year	1,728	1,685	1,636
73.10 Total new obligations	5,576	5,686	5,834
73.20 Total outlays (gross)	−5,617	−5,735	−5,733
Unpaid obligations, end of year:			
74.40 Obligated balance, end of year	1,662	1,613	1,714
74.95 From Federal sources: Receivables and unpaid, unfilled orders	23	23	23
74.99 Total unpaid obligations, end of year	1,685	1,636	1,737
Outlays (gross), detail:			
86.90 Outlays from new current authority	3,768	3,655	3,761
86.93 Outlays from current balances	1,778	1,871	1,767
86.97 Outlays from new permanent authority	37	209	205
86.98 Outlays from permanent balances	34	.....	.....
87.00 Total outlays (gross)	5,617	5,735	5,733
Offsets:			
Against gross budget authority and outlays:			
Offsetting collections (cash) from:			
88.40 Non-Federal sources	−26	−19	−58
88.45 Offsetting governmental collections	−40	−190	−147
88.90 Total, offsetting collections (cash)	−66	−209	−205
88.95 From Federal sources: Change in receivables and unpaid, unfilled orders	5	.....	.....
Net budget authority and outlays:			
89.00 Budget authority	5,560	5,480	5,638
90.00 Outlays	5,551	5,526	5,528

This appropriation provides funding for human space flight activities, including development of the Space Station, the Space Station research program, and operation of the Space Shuttle. This includes support of planned cooperative activities with Russia, upgrades to the performance and safety of the Space Shuttle, and required construction projects in direct support of Space Station and Space Shuttle programs.

Performance Objectives

Space Station.—The International Space Station (ISS) will be an international laboratory in low Earth orbit on which American, Russian, Canadian, European, and Japanese astronauts will conduct unique scientific and technological investigations in a microgravity environment. The goal of the Station is to support activities requiring the unique attributes of humans in space and establish a permanent human presence in Earth orbit. The proposed budget provides multi-year funding through an advanced appropriation for the continued development of the vehicle and its research components and for current operations, assembly and utilization of the Station. With the first launches successfully completed, the budget includes funding to keep subsequent assembly missions on schedule for completion in 2004 and provide a long-term solution to the safe return of the full complement of Station crewmembers in the event of an emergency.

In 1998, preparations for the successful launches of the first two components of the Station—the FGB control module and the first node—were completed. The elements were launched in November and December, assembled in orbit and activated. Flight hardware elements for the next four U.S. assembly launches—the Z1 truss, the control moment gyros, the first photo-voltaic array and battery sets, initial thermal radiators, communication equipment, the U.S. Laboratory, and the Multi-Purpose Logistics Carrier—were delivered in preparation for multi-element integrated testing (MEIT). Crew training, payload processing, hardware element processing, and mission operations were supported. In 1999, fabrication of flight hardware, qualification testing, assembly, integration and mission operations will all continue. The laboratory module will be delivered and MEIT for flights through 6A, the outfitting of the lab module, will be initiated. Two logistics flights will be launched to the Station, as will the Russian Service Module. In 2000, plans are to launch seven U.S. missions to Station, including the lab module. The Russian launch of a Soyuz vehicle will achieve the capability

General and special funds—Continued

HUMAN SPACE FLIGHT—Continued

of permanent occupation of the Station with rotating crews of three. Phase 2 of the Station assembly will be completed with the launch of the airlock, and preparations will continue for the start of Phase 3 and increasing research utilization in 2001.

As part of the FY 1999 operating plan, Russian Program Assurance (RPA) was re-established within the Space Station budget line. The RPA funding provides contingency activities to address ISS program requirements resulting from delays or shortfalls on the part of Russia in meeting its commitments to the ISS program. The first step in the contingency plan is to protect against a potential further delay in the Russian Service Module (SM) and its capabilities. The ISS program is purchasing, from the U.S. Naval Research Laboratory (NRL), an interim control module (ICM) to provide backup attitude control and reboost functions for the ISS. Additionally, the Shuttle fleet is being configured for reaction control system (RCS) interconnectivity modifications to enable greater Shuttle reboost capability to the ISS. A permanent U.S. propulsion capability is being developed for implementation in the 2002 timeframe. This includes a propulsion module, carriers, and activities to support propulsion logistics.

Payload and Utilization Operations.—Spacelab program funds support the mission planning and hardware preparation activities required to support the Spacelab payloads and experiment infrastructure. In 1998, one Spacelab module mission (Neurolab) was flown, along with one pallet mission. The Spacelab program was completed in 1998 following the Neurolab mission. In FY 1998, Multi-Purpose Experiment Support Structures (MPESS), pallets and other common support equipment were transferred to the Payload Processing budget. All other Spacelab hardware has been dispositioned.

Activities funded by the Payload Processing budget support the required technical expertise and facilities to perform the payload buildup, test and checkout, integration, servicing, transportation and installation in the launch vehicle. In FY 1999, launch and landing payload support activities will be provided for six Space Shuttle missions, including two pallet missions, the AXAF launch, and three assembly flights for the ISS. In FY 2000, launch and landing payload support activities will be provided for eight Space Shuttle missions, including seven ISS assembly and utilization flights. During this period, eight pallets will be used in Space Shuttle missions, including the third HST servicing mission and three of the ISS assembly flights. In FY 1999 and 2000 over 20 major and secondary payloads will be supported, including major hardware for ISS assembly.

The Expendable Launch Vehicle (ELV) Mission Support budget provides funds for acquiring requisite launch services to meet all NASA requirements and for technical insight of commercially provided launch services. Advanced mission design/analysis and leading edge integration services are provided for the full range of NASA missions under consideration for launch on ELVs. During FY 1998, two Pegasus launches, SNOE and TRACE, were launched along with one Titan 11 provided by the USAF; and the pathfinder activity was accomplished for the first launch of an Atlas-Centaur from a new launch site at Vandenberg Air Force Base. Support for 13 missions, including EOS-AM-1, Landsat-7, and four planetary missions are planned for launch in FY 1999 and integration and technical management of 24 payloads are planned for launch in FY 2000 and FY 2001 are supported.

Advanced Projects pursues advanced technology developments for future human space flight requirements. Under this program, the X-38 experimental vehicle is being designed to demonstrate the technology and processes required to produce a crew return vehicle for the ISS. Beginning in FY 1999, funding for Advanced Projects other than X-38 and X-38 transition costs were terminated. The Engineering and Technical Base provides basic engineering and technical capabilities to support the NASA mission assigned to the program carried out by the Human Space Flight Centers. These funds support a core capability dedicated to multi-program laboratories, test facilities and associated systems, including a skill base to respond to research, testing and simulation needs.

Space Shuttle.—The Space Shuttle is a partially reusable space vehicle that provides several unique capabilities to the United States space program. These include retrieving payloads from orbit for reuse, servicing and repairing satellites in space, safely transporting humans to and from space, launching International Space Station components and providing an assembly platform in space, and operating and returning space laboratories. The six flights manifested for FY 1999 include a major microgravity payload, the Space Shuttle's first assembly flight of the International Space Station, two additional space station assembly and supply flights, the deployment of the Advanced X-Ray Astophysics Facility (AXAF), and the Shuttle Radar Topography mission, a joint DOD/NASA Radar payload to digitally map the Earth.

Eight flights will be flown during FY 2000, including seven International Space Station Space assembly flights. In addition, the Space Shuttle will make its third visit to the Hubble Space Telescope for replacement of mission critical components and routine servicing and upgrading some of its instrument sensors with state-of-the art detectors and cameras. Upgrades to the Shuttle to increase its safety, reliability and maintainability will be continued.

Account Structure.—As directed in the FY 1999 VA/HUD-Independent Appropriations Act (P.L. 105–276), NASA is prepared to support a revised account structure for "Human Space Flight." The new structure would split "Human Space Flight" into two accounts, "International Space Station" and "Launch Vehicles and Payload Operations." A crosswalk between the "Human Space Flight" account and these two new accounts is provided below.

Crosswalk to Two Account Structure
(In millions of dollars of BA)

	1998 actual	*1999 est.*	*2000 est.*
International Space Station	2,441	2,305	2,483
Launch Vehicles and Payload Operations	3,118	3,175	3,155

However, because almost all scheduled future Space Shuttle flights support International Space Station development and because common operations and facilities will increase as the International Space Station moves into its operational phase, the two-account structure would be an obstacle to more integrated and efficient management of these programs and lower costs. For these reasons, the Administration proposes maintaining the single "Human Space Flight" account.

Object Classification (in millions of dollars)

Identification code 80–0111–0–1–252		1998 actual	1999 est.	2000 est.
	Direct obligations:			
22.0	Transportation of things	8	8	8
23.3	Communications, utilities, and miscellaneous charges	45	45	46
24.0	Printing and reproduction	3	3	3
25.1	Advisory and assistance services	1,669	1,658	1,703
25.2	Other services	334	332	341
25.3	Purchases of goods and services from Government accounts	101	100	103
25.4	Operation and maintenance of facilities	125	124	128
25.5	Research and development contracts	2,841	2,821	2,900
25.7	Operation and maintenance of equipment	51	51	52
26.0	Supplies and materials	77	76	79
31.0	Equipment	84	83	86
32.0	Land and structures	153	152	156
41.0	Grants, subsidies, and contributions	24	24	24
99.0	Subtotal, direct obligations	5,515	5,477	5,629

99.0	Reimbursable obligations	61	209	205
99.9	Total new obligations	5,576	5,686	5,834

SCIENCE, AERONAUTICS AND TECHNOLOGY

For necessary expenses, not otherwise provided for, in the conduct and support of science, aeronautics and technology research and development activities, including research, development, operations, and services; maintenance; construction of facilities including repair, rehabilitation, and modification of real and personal property, and acquisition or condemnation of real property, as authorized by law; space flight, spacecraft control and communications activities including operations, production, and services; and purchase, lease, charter, maintenance and operation of mission and administrative aircraft, [$5,653,900,000] *$5,424,700,000*, to remain available until September 30, [2000] *2001. (Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1999.)*

(in millions of dollars)

Identification code 80–0110–0–1–999		1998 actual	1999 est.	2000 est.
	Obligations by program activity:			
	Direct program:			
00.01	Space science	1,980	2,131	2,189
00.02	Life and microgravity science	240	250	257
00.06	Earth science	1,553	1,387	1,455
00.07	Mission communication services	404	345	404
00.08	Academic programs	136	150	104
00.09	Aero-space technology	1,483	1,226	1,038
09.01	Reimbursable program	508	599	577
10.00	Total new obligations	6,304	6,088	6,024
	Budgetary resources available for obligation:			
21.40	Unobligated balance available, start of year	508	401	566
22.00	New budget authority (gross)	6,198	6,253	6,002
23.90	Total budgetary resources available for obligation	6,706	6,654	6,568
23.95	Total new obligations	−6,304	−6,088	−6,024
24.40	Unobligated balance available, end of year	401	566	544
	New budget authority (gross), detail:			
	Current:			
40.00	Appropriation	5,690	5,654	5,425
	Permanent:			
	Spending authority from offsetting collections:			
68.00	Offsetting collections (cash)	559	599	577
68.10	From Federal sources: Change in receivables and unpaid, unfilled orders	−51	.....	.....
68.90	Spending authority from offsetting collections (total)	508	599	577
70.00	Total new budget authority (gross)	6,198	6,253	6,002
	Change in unpaid obligations:			
	Unpaid obligations, start of year:			
72.40	Obligated balance, start of year	3,222	2,997	2,620
72.95	From Federal sources: Receivables and unpaid, unfilled orders	305	254	254
72.99	Total unpaid obligations, start of year	3,527	3,251	2,874
73.10	Total new obligations	6,304	6,088	6,024
73.20	Total outlays (gross)	−6,574	−6,465	−5,864
73.40	Adjustments in expired accounts	−6	.....	.....
	Unpaid obligations, end of year:			
74.40	Obligated balance, end of year	2,997	2,620	2,781
74.95	From Federal sources: Receivables and unpaid, unfilled orders	254	254	254
74.99	Total unpaid obligations, end of year	3,251	2,874	3,035
	Outlays (gross), detail:			
86.90	Outlays from new current authority	2,861	2,550	2,447
86.93	Outlays from current balances	3,160	3,316	2,840
86.97	Outlays from new permanent authority	230	599	577
86.98	Outlays from permanent balances	323	.....	.....
87.00	Total outlays (gross)	6,574	6,465	5,864
	Offsets:			
	Against gross budget authority and outlays:			
	Offsetting collections (cash) from:			
88.40	Non-Federal sources	−38	−41	−41
88.45	Offsetting governmental collections	−521	−558	−536
88.90	Total, offsetting collections (cash)	−559	−599	−577
88.95	From Federal sources: Change in receivables and unpaid, unfilled orders	51	.....	.....
	Net budget authority and outlays:			
89.00	Budget authority	5,690	5,654	5,425
90.00	Outlays	6,015	5,866	5,287

This appropriation provides for the research and development activities of the National Aeronautics and Space Administration. Funds are included for the construction, maintenance, and operation of programmatic facilities. Space Science, Earth Science, Life and Microgravity Science, Aeronautics, and Space Transportation programs are included in the 21st Century Research Fund.

Performance Objectives

Space Science.—The Space Science program seeks to answer fundamental questions concerning: the galaxy and the universe; the connection between the Sun, Earth and heliosphere; the origin and evolution of planetary systems; and, the origin and distribution of life in the universe. The Space Science program is comprised of a base program of research and development activities, including research and flight mission activities, and major space-based facilities.

In 1998, the Space Science program produced many notable scientific accomplishments. Measurement of light from distant exploding stars led teams to conclude that the universe will expand forever at an increasing rate. This discovery was characterized by the editors of Science magazine, the journal of the American Association for the Advancement of Science, as the top scientific advance of 1998. The Rossi X-ray Timing Explorer (RXTE) discovered a new type of star, known as a magnetar, which generates extremely powerful magnetic fields. The Hubble Space Telescope (HST) continued to produce many discoveries, including the first potential direct image of an extrasolar planet, and, working with RXTE and the Beppo-Sax mission, detected the largest explosion since the Big Bang. The Keck telescope imaged the formation of a new solar system. Within our own solar system, the Mars Global Surveyor mission photographed portions of Mars with unprecedented clarity, revealing ancient riverbeds and numerous geological structures. The Lunar Prospector spacecraft detected the presence of water ice on the moon. This discovery has important implications for future exploration mission concepts. The Solar and Heliospheric Observatory produced spectacular images of comets plunging into the Sun, and also detected solar quakes. Also in the field of solar science, the Transition Region and Coronal Explorer produced the sharpest images to date of magnetic reconnections on the Sun. Near the end of FY 1998, and in early FY 1999, the New Millenium Deep Space-1 mission, the Submillimeter Wave Astronomy Satellite, the Mars Climate Orbiter, and the Mars Polar Lander were launched successfully. These launches both capped off a highly successful year and initiated a period in which nine Space Science missions will be launched over a seven-month period. Other missions to be launched in this period include the Stardust mission, the Wide Field Infrared Explorer, the Far Ultraviolet Spectroscopy Explorer, and the Advanced X-Ray Astrophysics Facility.

To capitalize on these enormous successes during the past year, the NASA budget request for FY 2000 once again highlights Space Science. Space Science continues to focus on the Origins program and fundamental questions regarding the creation of the universe and planetary systems and the possibility of life on Earth. Planning continues for the deployment

General and special funds—Continued

SCIENCE, AERONAUTICS AND TECHNOLOGY—Continued

of powerful telescopes to detect Earth-like planets beyond our solar system, for the 2003 launch of a mission to directly observe subsurface oceans on Europa, and for future missions to seek evidence of past or present life on Mars. The Space Science program is responsible for Agency-wide core technology development, and additional funding is provided in this program to enhance these Origins missions and enable other future missions through the Administration's IT initiative and other high-leverage technologies. These technologies will increase the return of the Space Science program and other NASA programs many fold through revolutionary capabilities in the areas of networking, intelligent systems, nanotechnology, communications, lighweight structures, miniaturization, mobility, and propulsion for robotic spacecraft and rovers.

The Advanced X-ray Astrophysics Facility (AXAF) will be launched in April 1999. Development activities continue on the Relativity (Gravity Probe-B) mission, which is scheduled for launch in 2000. The Space Infrared Telescope Facility (SIRTF) initiated development in April 1998, with launch planned for December 2001. Development activities on the Thermosphere, Ionosphere, Mesosphere Energetics and Dynamics (TIMED) mission continue in 1999, with launch planned in 2000. Development activities on the Stratospheric Observatory for Infrared Astronomy (SOFIA) continue as planned. The upgraded Hubble Space Telescope (HST) is providing new insights into our universe. Funding for HST continues to support operations, as well as preparation for the third servicing mission in 2000.

In Explorer missions, development activities continue in the Far Ultraviolet Spectroscopy Explorer (FUSE), scheduled for launch in 1999. Development is also underway for the Microwave Anisotropy Probe (MAP) and Imager for Magnetosphere-to-Aurora Global Exploration (IMAGE) Medium-Class Explorer (MIDEX) missions. MAP will be launched in November 2000, IMAGE in January 2000. Three Small (SMEX) missions started development in FY 1998: the High Energy Spectroscopic Imager (HESSI) is to launch in 2000; the Galaxy Evolution Explorer (GALEX) will launch in 2001; and the Two Wide-Angle Neutral Atom Spectrometers (TWINS) has been selected as mission of opportunity, to be launched in 2002 and 2004. These missions emphasize reduced mission costs and accelerated launch schedules.

The Mars Global Surveyor entered Mars orbit in September 1997, the Mars Climate Orbiter was launched in December 1998 and the Mars Polar Lander was launched in January 1999. Funds are requested for the development of future Mars missions to be launched in 2001 and beyond. The third Discovery-class mission, Lunar Prospector, launched in 1998, and has completed its primary mission. The fourth Discovery mission, Stardust, is on schedule for launch in February 1999. Two Discovery missions selected in 1997 are proceeding on schedule: the Comet Nucleus Tour (CONTOUR) will begin development in FY 2000 and will be launched in 2002; the Genesis solar wind sample return mission has begun development and will be launched in 2001.

The New Millenium program is providing flight demonstrations of critical new technologies which will reduce the mass and cost of future science and spacecraft subsystems, while maintaining or improving mission capabilities. The Deep Space-1 mission was launched in October 1998 and has validated its technologies. The Deep Space-2 mission was launched along with the Mars Polar Lander in January 1999, and will arrive at Mars in December 1999.

Life and Microgravity Science.—This program uses the microgravity environment of space to conduct basic and applied research to understand the effect of gravity on living systems and to conduct research in the areas of fluid physics, combustion science, fundamental physics materials science and biotechnology. In FY 1999, the program has flown one science mission (STS-95) on a Spacelab carrier with ISS precursor science experiments. STS-95 included commercially sponsored research as well as research on the effects of aging conducted with the National Institute on Aging. FY 1999 has also seen the beginning of ISS assembly. In FY 2000 the U.S. laboratory module for the ISS will be launched, which will allow initial Life and Microgravity hardware and experiments to be established aboard the ISS and will begin a new era of research. As assembly of the ISS continues to advance, ISS Crew Health Care System (CHECS) components will be utilized to provide on-orbit medical, environmental, and countermeasure capabilities for all ISS crew members. In early FY 2001, the program will fly a dedicated Space Shuttle research mission which will extend previous Space Shuttle research results and help the program as well as the community to prepare for increasing research operations on the ISS.

Earth Science.—The purpose of NASA's Earth Science (ES) enterprise is to understand the total Earth system and the effects of natural and human-induced changes on the global environment. ES is pioneering the new interdisciplinary field of research called Earth system science, which recognizes that the Earth's land surface, oceans, atmosphere, ice sheets and *biota* are both dynamic and highly interactive. Earth system science is an area of research with the potential for immense benefit to the nation, yielding new knowledge and tools for weather forecasting, agriculture, urban and land use planning, and other areas of economic and environmental importance. In concert with other agencies and the global research community, ES is providing the scientific foundation needed for the complex policy choices that lie ahead on the road to sustainable development. ES has established three broad goals to fulfill its purpose: (1) expand scientific knowledge of the Earth system using NASA's unique capabilities from the vantage points of space, aircraft and *in situ* platforms; (2) disseminate information about the Earth system; and, (3) enable productive use of ES science and technology in the public and private sectors.

In 1998, the Earth Science program continued to make great progress analyzing data from significant scientific events detected from orbiting spacecraft and scientific campaigns. Multiple spacecraft and instruments have played an important role in predicting the El Niño event and will continue to track a possible La Niña. Images derived from the TOPEX-Poseidon satellite allowed the public to watch the progression of El Niño across the Pacific Ocean. Radarsat brought the first detailed radar map of Antarctica. A cooperative mission with Japan, the Tropical Rainfall Measuring Mission (TRMM) was launched and has proven to be valuable for both scientific research and development of new weather forecasting capabilities. ES has been monitoring fires worldwide including those in Indonesia, Mexico and Russia and the results are available via the Internet. The Sea-viewing Wide Field-of-view Sensor (SeaWiFS), which became fully operational as part of a data purchase from the private sector, provided important data on coastal up-welling in the Northwest, Argentina, and South Africa related to dramatic plankton blooms, a critical food source for fish. These data are used to understand the role of oceans in removing carbon dioxide from the atmosphere and the ocean's productivity.

The Earth Observing System (EOS), the centerpiece of Earth Science, is a program of multiple spacecraft, supporting technology and interdisciplinary science investigations to provide a long-term data set of key parameters needed to understand global climate change. The first EOS satellite launches will begin in 1999 with the launches of Landsat-7, AM–1, and QuikSCAT. EOS PM–1 and Chemistry are on schedule

to launch in 2000 and 2002 respectively. Preceding the EOS are a number of individual satellite and Shuttle-based missions which are helping to reveal basic processes.

Complementing EOS, under the Earth Probes Program, will be a series of small, rapid development Earth System Science Pathfinder (ESSP) missions to study emerging science questions and to use innovative measurement techniques in support of EOS. The first two ESSP missions, Vegetation Canopy Lidar (VCL) and Gravity Recovery and Climate Experiment (GRACE), are scheduled for launch in 2000 and 2001, respectively. The next ESSP missions were selected in December 1998. NASA has chosen for development one primary and two alternate small spacecraft missions. The Pathfinder Instruments for Cloud and Aerosol Spaceborne Observations - Climatologie Etendue des Nuages et des Aerosols (PICASSO-CENA) mission, led by NASA's Langley Research Center, will be the next ESSP mission scheduled for launch in 2003.

Data from Earth Science missions, both current and future, will be captured, processed into useful information, and broadly distributed by the EOS Data information System (EOSDIS). EOSDIS will ensure that data from these diverse missions remain available in active archives for use by current and future scientists. Since these data are expected to find uses well beyond the Earth Science research community, EOSDIS will ultimately be accessible by environmental decision-makers, resource managers, commercial firms, social scientists and the general academic community, educators, state and local government—anyone who wants the information.

The ES science program is essential to the discovery of new concepts and to the design of future missions. ES research is coordinated through the U.S. Global Change Research Program (USGCRP), the Committee on the Environment and Natural Resources (CENR) and its Subcommittee on Global Change Research, and the various boards and committees at the National Academy of Sciences.

Aero-Space Technology.—The mission of this Enterprise is to pioneer the identification, development, verification, transfer, application, and commercialization of high-payoff aerospace technologies. Through its research and technology accomplishments, Aero-Space Technology promotes economic growth and national security through a safe, efficient national aviation system and affordable, reliable space transportation. To meet this challenge, the Enterprise has established three pillars for success. Within these three pillars, a set of ten objectives, each with its own roadmap, has been defined to address current and future National needs. The technologies associated with these objectives are pre-competitive, long-term, high-risk research endeavors with high-payoff in terms of market growth, safety, low acquisition cost, consumer affordability and cleaner environment. The goals of this Enterprise directly support national policy in Aero-Space, documented in "Goals for a National Partnership in Aeronautics Research and Technology" and the 1994 National Space Transportation Policy.

The first Pillar, Global Civil Aviation, addresses the fundamental, systemic issues in the aviation system to ensure continued growth and development appropriate to the needs of the national and global economies. These systemic issues—safety, capacity, environmental compatibility, and affordability—cut across markets including large subsonic civil transports, air cargo, commuter and general aviation, and rotorcraft. The second Pillar, Revolutionary Technology Leaps, will revolutionize air travel and the way in which aircraft are designed, built, and operated, and addresses the challenges in General Aviation, Design Tools, and Experimental Planes. The Third Pillar, Access to Space, will enable greater commercial potential of space and the expansion of space research and exploration by significantly reducing the cost of space transportation systems while improving reliability, operability, responsiveness, and safety.

The accomplishments over the past year provide a foundation for longer term technology development to address national needs. Great strides have been made in Aviation Safety. In FY 1998, non-destuctive inspection prototypes that locate cracks, corrosion and disbonds in aircraft fuselages were demonstrated and the technology transferred to industry. An airborne coherent Light Detection And Ranging (LIDAR) system for advanced in-flight measurements demonstrated its capability to precisely detect the turbulence level one kilometer ahead of the airplane. The Aviation Safety program in FY 2000 will demonstrate technologies for a real time graphical display of weather in the cockpit.

NASA has made similar strides toward other aviation goals. In FY 1998, innovative concepts were demonstrated that showed promise in significantly reducing aviation noise. Advanced low NOx combustor concepts demonstrated a 50% reduction in NOx in flame tube tests, and showed potential for achieving the 70% reduction goal. The Environmental Research Aircraft & Remote Sensor Technology (ERAST) project set a world record for solar powered aircraft by reaching an altitude of 80,200 feet. A solar powered RPV, with the capability of reaching 100,000 feet, will be flight tested in FY 2000.

The Reduced Seat cost element of the AST Program will be completed in FY 1999 with the testing of a semi-span advanced composite wing to verify weight (25 percent reduction) and structural performance goals, and the fabrication of wing cover panels to verify the cost reduction goal (20 percent reduction). The Capacity Program demonstrated its Aircraft Vortex Spacing System (AVOSS) in an initial deployment at Dallas Fort Worth airport. Results showed that significant capacity gains were possible with this system under various weather conditions. Building on previous technology development efforts, the final demonstration of the Terminal Productivity element will occur in FY 2000 and is expected to demonstrate the potential for a 12 to 15% increase in airport throughput. Also in FY 2000, the Advanced Air Transportation element is planned to demonstrate decision support tools that have the potential for a 30% increase in throughput for the extended terminal area.

The Reusable Launch Vehicle (RLV) Program, through the X–33, X–34 and new Future-X Pathfinder Programs, continues to develop, apply and demonstrate new technologies that significantly advance the ability of the launch vehicle industry to initiate commercially viable reusable launch systems. The X–33 and X–34 have completed major hardware fabrication and test milestones and are scheduled to begin flight tests in 1999. The Future-X Program selected the first of its planned series of flight demonstrators. The first Future-X demonstrator complements existing x-vehicles by investigating the orbit-to-Earth and orbital operations regimes of the flight spectrum, and will begin flight tests in 2000.

The Advanced Space Transportation Program (ASTP) focuses on advanced technology across a broad front in order to reduce costs beyond the targets of the immediate RLV program goals. The ASTP includes a base of core technology investments as well as technology investments unique to focused program efforts. In FY 1999, the ion engine aboard Deep Space-1 was activated and continues to operate in a nominal fashion. Industry-led Future Launch Architecture studies are currently underway to support an end-of-the decade decision on lower cost civil space transportation architectures as called for in the National Space Transportation Policy. Funds are provided in the Future Space Launch budget line for the years beyond FY 2000 to pursue the decision.

The Commercial Technology Program's focus in FY 1998 was continued investment of 10–15 percent of the NASA R&D budget in commercial partnerships with industry. Based on experience to date, these commercial partnerships are expected to increase the return on the government's R&D in-

General and special funds—Continued

SCIENCE, AERONAUTICS AND TECHNOLOGY—Continued

vestment, allowing NASA to do more with limited funds, and strengthening the international competitiveness of key industry sectors. In FY 1999 and 2000, the program will continue to emphasize increasing commercial partnerships with industry and continue to refine and expand a technology and partnership database.

Mission Communication Services.—The primary goal of this operational program is to provide highly reliable, cost-effective space operations services in support of NASA's science and aeronautics programs. In addition, support is provided to interagency, international, and commercial space-faring enterprises on a reimbursable basis. The mission communication services program is composed of ground networks, space network services, and mission control systems, as well as Agency radio spectrum management and data standards coordination. Services are provided to a large number of NASA missions, including planetary and interplanetary missions; human space flight missions; near-earth and earth orbiting missions; and sub-orbital and aeronautical flight tests. On October 1, 1998 a Consolidated Space Operations Contract (CSOC) was competitively awarded to Lockheed-Martin Space Operations Company. This contract is designed to maximize space operations resources by reducing systems overlap and duplication.

Academic Programs.—The goal of this program is to promote excellence in America's education system through enhancing and expanding scientific and technological competence. NASA's education programs span the elementary through graduate levels and are directed at both students and faculty. The goal of the Minority University Research Program is to expand opportunities for talented students from underrepresented groups who are pursuing degrees in science and engineering and to strengthen the research capabilities of minority universities and colleges. The range of activities conducted under this program will continue to capture the interest of all students in science and technology, develop talented students at the undergraduate and graduate levels, provide research opportunities for students and faculty members at NASA centers, and strengthen and enhance the research capabilities of the nation's colleges and universities.

Object Classification (in millions of dollars)

Identification code 80–0110–0–1–999		1998 actual	1999 est.	2000 est.
	Direct obligations:			
22.0	Transportation of things	5	5	5
23.1	Rental payments to GSA	1	1	1
23.3	Communications, utilities, and miscellaneous charges	64	61	60
24.0	Printing and reproduction	6	6	6
25.1	Advisory and assistance services	390	369	366
25.2	Other services	1,164	1,102	1,093
25.3	Purchases of goods and services from Government accounts	265	251	249
25.4	Operation and maintenance of facilities	134	127	126
25.5	Research and development contracts	2,421	2,293	2,275
25.7	Operation and maintenance of equipment	111	105	104
26.0	Supplies and materials	52	49	49
31.0	Equipment	165	156	155
32.0	Land and structures	24	23	23
41.0	Grants, subsidies, and contributions	994	941	935
99.0	Subtotal, direct obligations	5,796	5,489	5,447
99.0	Reimbursable obligations	508	599	577
99.9	Total new obligations	6,304	6,088	6,024

MISSION SUPPORT

For necessary expenses, not otherwise provided for, in carrying out mission support for human space flight programs and science, aeronautical, and technology programs, including research operations and support; space communications activities including operations, production and services; maintenance; construction of facilities including repair, rehabilitation, and modification of facilities, minor construction of new facilities and additions to existing facilities, facility planning and design, environmental compliance and restoration, and acquisition or condemnation of real property, as authorized by law; program management; personnel and related costs, including uniforms or allowances therefor, as authorized by 5 U.S.C. 5901–5902; travel expenses; purchase, lease, charter, maintenance, and operation of mission and administrative aircraft; not to exceed $35,000 for official reception and representation expenses; and purchase (not to exceed 33 for replacement only) and hire of passenger motor vehicles, 【$2,511,100,000】 *$2,494,900,000*, to remain available until September 30, 【2000】 *2001. (Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1999.)*

Program and Financing (in millions of dollars)

Identification code 80–0112–0–1–999		1998 actual	1999 est.	2000 est.
	Obligations by program activity:			
	Direct program:			
00.01	Safety, reliability and quality assurance	36	35	44
00.02	Space communication services	204	169	99
00.03	Research and program management	2,059	2,105	2,180
00.04	Construction of facilities	155	168	177
01.00	Total direct program	2,454	2,477	2,500
09.01	Reimbursable program	91	131	121
10.00	Total new obligations	2,545	2,608	2,621
	Budgetary resources available for obligation:			
21.40	Unobligated balance available, start of year	160	85	119
22.00	New budget authority (gross)	2,471	2,642	2,616
23.90	Total budgetary resources available for obligation	2,631	2,727	2,735
23.95	Total new obligations	−2,545	−2,608	−2,621
23.98	Unobligated balance expiring	−1	.....	.....
24.40	Unobligated balance available, end of year	85	119	114
	New budget authority (gross), detail:			
	Current:			
40.00	Appropriation	2,433	2,511	2,495
41.00	Transferred to other accounts	−53	.....	.....
43.00	Appropriation (total)	2,380	2,511	2,495
	Permanent:			
	Spending authority from offsetting collections:			
68.00	Offsetting collections (cash)	131	131	121
68.10	From Federal sources: Change in receivables and unpaid, unfilled orders	−40	.....	.....
68.90	Spending authority from offsetting collections (total)	91	131	121
70.00	Total new budget authority (gross)	2,471	2,642	2,616
	Change in unpaid obligations:			
	Unpaid obligations, start of year:			
72.40	Obligated balance, start of year	526	487	378
72.95	From Federal sources: Receivables and unpaid, unfilled orders	106	66	66
72.99	Total unpaid obligations, start of year	632	553	444
73.10	Total new obligations	2,545	2,608	2,621
73.20	Total outlays (gross)	−2,614	−2,717	−2,541
73.40	Adjustments in expired accounts	−10	.....	.....
	Unpaid obligations, end of year:			
74.40	Obligated balance, end of year	487	378	458
74.95	From Federal sources: Receivables and unpaid, unfilled orders	66	66	66
74.99	Total unpaid obligations, end of year	553	444	524
	Outlays (gross), detail:			
86.90	Outlays from new current authority	1,930	2,006	1,994
86.93	Outlays from current balances	588	580	427
86.97	Outlays from new permanent authority	55	131	121
86.98	Outlays from permanent balances	41	.....	.....
87.00	Total outlays (gross)	2,614	2,717	2,541

	Offsets:			
	Against gross budget authority and outlays:			
	Offsetting collections (cash) from:			
88.40	Non-Federal sources	−23	−29	−24
88.45	Offsetting governmental collections	−108	−102	−97
88.90	Total, offsetting collections (cash)	−131	−131	−121
88.95	From Federal sources: Change in receivables and unpaid, unfilled orders	40		
	Net budget authority and outlays:			
89.00	Budget authority	2,380	2,511	2,495
90.00	Outlays	2,483	2,586	2,420

This appropriation provides funding for mission support and includes: safety, mission assurance, engineering and advanced concepts activities supporting agency programs; space communication services for NASA programs; salaries and related expenses in support of research in NASA field installations; design, repair, rehabilitation and modification of institutional facilities and construction of new institutional facilities; and other operations activities supporting conduct of agency programs.

Performance Objectives

Safety, Mission Assurance, Engineering, and Advanced Concepts.—The goal of this program is to invest in the safety and success of NASA missions by assuring that sound and robust policies, processes, and tools for safety, reliability, quality assurance, and engineering disciplines are in place and applied throughout NASA. The program also examines long-term technology requirements for NASA's strategic objectives.

Space Communication Services.—The primary goal is to provide highly reliable, cost-effective space operations services in support of NASA's science and aeronautics programs. In addition, support is provided to interagency, international, and commercial space-faring enterprises on a reimbursable basis. The space communications services program is composed of Space Network and telecommunications programs. Services are provided to human space flight missions and low earth-orbital spacecraft compatible with the Tracking and Data Relay Satellite System (TDRSS); to expendable launch vehicles and research aircraft; and for telecommunications interconnectivity among NASA, contractor and investigator science facilities around the world. Development of a remote ground terminal at Guam which extends network capability, by providing coverage of the zone of exclusion, was completed in FY 1998. Development of the TDRSS Replenishment Spacecraft is ongoing, with the first satellite scheduled for launch late in FY 1999. Management and responsibility for all Wide Area Network data distribution services for all manned, earth orbiting and deep space missions and NASA administrative communications will be outsourced by CSOC late in FY 1999.

Research and Program Management.—This activity provides for the salaries, travel support, other personnel expenses of the entire NASA civil service workforce, and includes vital support to the physical plant at the Centers and at NASA Headquarters.

Construction of Facilities.—This activity provides for facility construction activities to preserve NASA's core infrastructure; environmental compliance and restoration activities, design of facilities projects, and advanced planning related to future facilities needs. In 1998–2000, activities in support of discrete projects to repair and modernize the basic infrastructure and institutional facilities at NASA centers will continue, as well as activities in support of environmental compliance and restoration requirements.

Object Classification (in millions of dollars)

Identification code 80–0112–0–1–999	1998 actual	1999 est.	2000 est.
Direct obligations:			
Personnel compensation:			
11.1 Full-time permanent	1,194	1,219	1,254
11.3 Other than full-time permanent	30	31	33
11.5 Other personnel compensation	23	24	26
11.8 Special personal services payments	8	8	8
11.9 Total personnel compensation	1,255	1,282	1,321
12.1 Civilian personnel benefits	264	271	274
13.0 Benefits for former personnel	30	13	11
21.0 Travel and transportation of persons	45	45	45
22.0 Transportation of things	5	5	5
23.1 Rental payments to GSA	15	15	15
23.3 Communications, utilities, and miscellaneous charges	59	60	58
24.0 Printing and reproduction	4	4	4
25.1 Advisory and assistance services	18	19	18
25.2 Other services	269	269	266
25.3 Purchases of goods and services from Government accounts	27	28	27
25.4 Operation and maintenance of facilities	49	49	48
25.5 Research and development contracts	140	141	138
25.6 Medical care	2	2	2
25.7 Operation and maintenance of equipment	95	96	93
26.0 Supplies and materials	21	21	21
31.0 Equipment	15	15	15
32.0 Land and structures	135	136	133
41.0 Grants, subsidies, and contributions	6	6	6
99.0 Subtotal, direct obligations	2,454	2,477	2,500
99.0 Reimbursable obligations	91	131	121
99.9 Total new obligations	2,545	2,608	2,621

Personnel Summary

Identification code 80–0112–0–1–999	1998 actual	1999 est.	2000 est.
Direct:			
1001 Total compensable workyears: Full-time equivalent employment	18,839	18,460	17,885
Reimbursable:			
2001 Total compensable workyears: Full-time equivalent employment	85	85	85

Research and Development

Program and Financing (in millions of dollars)

Identification code 80–0108–0–1–999	1998 actual	1999 est.	2000 est.
New budget authority (gross), detail:			
Spending authority from offsetting collections:			
68.00 Offsetting collections (cash)	5		
68.10 From Federal sources: Change in receivables and unpaid, unfilled orders	−5		
68.90 Spending authority from offsetting collections (total)			
Change in unpaid obligations:			
Unpaid obligations, start of year:			
72.40 Obligated balance, start of year	104	51	31
72.95 From Federal sources: Receivables and unpaid, unfilled orders	34	29	29
72.99 Total unpaid obligations, start of year	138	80	60
73.20 Total outlays (gross)	−45	−20	−44
73.40 Adjustments in expired accounts	−13		
Unpaid obligations, end of year:			
74.40 Obligated balance, end of year	51	31	−13
74.95 From Federal sources: Receivables and unpaid, unfilled orders	29	29	29
74.99 Total unpaid obligations, end of year	80	60	16
Outlays (gross), detail:			
86.93 Outlays from current balances	45	20	44

General and special funds—Continued

RESEARCH AND DEVELOPMENT—Continued

Program and Financing (in millions of dollars)—Continued

Identification code 80–0108–0–1–999	1998 actual	1999 est.	2000 est.
Offsets:			
Against gross budget authority and outlays:			
88.45 Offsetting collections (cash) from: Offsetting governmental collections	−5		
88.95 From Federal sources: Change in receivables and unpaid, unfilled orders	5		
Net budget authority and outlays:			
89.00 Budget authority			
90.00 Outlays	40	20	44

Since FY 1995 NASA's Research and Development activities have been performed in Human Space Flight; Science, Aeronautics and Technology; and Mission Support. This account shows spending from balances prior to the account restructuring.

SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS

Program and Financing (in millions of dollars)

Identification code 80–0105–0–1–252	1998 actual	1999 est.	2000 est.
Change in unpaid obligations:			
Unpaid obligations, start of year:			
72.40 Obligated balance, start of year	56	20	12
72.95 From Federal sources: Receivables and unpaid, unfilled orders	2	2	
72.99 Total unpaid obligations, start of year	58	22	12
73.20 Total outlays (gross)	−34	−10	−12
73.40 Adjustments in expired accounts	−2		
Unpaid obligations, end of year:			
74.40 Obligated balance, end of year	20	12	
74.95 From Federal sources: Receivables and unpaid, unfilled orders	2		
74.99 Total unpaid obligations, end of year	22	12	
Outlays (gross), detail:			
86.93 Outlays from current balances	34	10	12
Net budget authority and outlays:			
89.00 Budget authority			
90.00 Outlays	34	10	12

Since FY 1995 NASA's Space Flight, Control and Data Communications activities have been performed in Human Space Flight; Science, Aeronautics and Technology; and Mission Support. This account shows spending from balances prior to the account restructuring.

CONSTRUCTION OF FACILITIES

Program and Financing (in millions of dollars)

Identification code 80–0107–0–1–999	1998 actual	1999 est.	2000 est.
Obligations by program activity:			
00.01 Supporting activity	4	9	
00.02 Space transportation	4	10	
00.03 Mission to Planet Earth	1		
00.04 Aeronautical research and technology	18	10	
10.00 Total new obligations	27	29	
Budgetary resources available for obligation:			
21.40 Unobligated balance available, start of year	56	29	
23.95 Total new obligations	−27	−29	
24.40 Unobligated balance available, end of year	29		
Change in unpaid obligations:			
72.40 Unpaid obligations, start of year: Obligated balance, start of year	68	30	29
73.10 Total new obligations	27	29	
73.20 Total outlays (gross)	−64	−14	−44
73.40 Adjustments in expired accounts	−1	−16	15
74.40 Unpaid obligations, end of year: Obligated balance, end of year	30	29	
Outlays (gross), detail:			
86.93 Outlays from current balances	64	14	44
Net budget authority and outlays:			
89.00 Budget authority			
90.00 Outlays	64	14	44
Memorandum (non-add) entries:			
92.01 Total investments, start of year: U.S. securities: Par value	2		
92.02 Total investments, end of year: U.S. securities: Par value			

Since FY 1995 NASA's Construction of Facilities activities have been performed in Human Space Flight; Science, Aeronautics and Technology; and Mission Support. This account shows spending from balances prior to the account restructuring.

Object Classification (in millions of dollars)

Identification code 80–0107–0–1–999	1998 actual	1999 est.	2000 est.
25.2 Other services	2	1	
25.4 Operation and maintenance of facilities	3	3	
32.0 Land and structures	22	25	
99.9 Total new obligations	27	29	

RESEARCH AND PROGRAM MANAGEMENT

Program and Financing (in millions of dollars)

Identification code 80–0103–0–1–999	1998 actual	1999 est.	2000 est.
Change in unpaid obligations:			
72.40 Unpaid obligations, start of year: Obligated balance, start of year	1	1	
74.40 Unpaid obligations, end of year: Obligated balance, end of year	1		
Net budget authority and outlays:			
89.00 Budget authority			
90.00 Outlays			

Since FY 1995 NASA's Research and Program Management activities have been performed in Mission Support. This account shows spending from balances prior to the account restructuring.

OFFICE OF INSPECTOR GENERAL

For necessary expenses of the Office of Inspector General in carrying out the Inspector General Act of 1978, as amended, 【$20,000,000】 *$20,800,000. (Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1999.)*

Program and Financing (in millions of dollars)

Identification code 80–0109–0–1–252	1998 actual	1999 est.	2000 est.
Obligations by program activity:			
10.00 Total obligations	18	20	21
Budgetary resources available for obligation:			
22.00 New budget authority (gross)	18	20	21
23.95 Total new obligations	−18	−20	−21

	New budget authority (gross), detail:			
40.00	Appropriation	18	20	21
	Change in unpaid obligations:			
72.40	Unpaid obligations, start of year: Obligated balance, start of year	2	2	2
73.10	Total new obligations	18	20	21
73.20	Total outlays (gross)	−18	−20	−21
74.40	Unpaid obligations, end of year: Obligated balance, end of year	2	2	2
	Outlays (gross), detail:			
86.90	Outlays from new current authority	16	18	18
86.93	Outlays from current balances	2	2	2
87.00	Total outlays (gross)	18	20	21
	Net budget authority and outlays:			
89.00	Budget authority	18	20	21
90.00	Outlays	18	20	21

The mission of the Office of Inspector General is to conduct audits and investigations of agency activities. The Inspector General keeps the Administrator informed of problems and deficiencies in agency programs and operations.

Object Classification (in millions of dollars)

Identification code 80–0109–0–1–252		1998 actual	1999 est.	2000 est.
11.1	Personnel compensation: Full-time permanent	13	15	16
12.1	Civilian personnel benefits	3	3	3
21.0	Travel and transportation of persons	1	2	2
25.2	Other services	1	.....	.....
99.9	Total new obligations	18	20	21

Personnel Summary

Identification code 80–0109–0–1–252		1998 actual	1999 est.	2000 est.
1001	Total compensable workyears: Full-time equivalent employment	185	210	210

Trust Funds

Science, Space, and Technology Education Trust Fund

Unavailable Collections (in millions of dollars)

Identification code 80–8978–0–7–503		1998 actual	1999 est.	2000 est.
	Balance, start of year:			
01.99	Balance, start of year	.....	.....	.....
	Receipts:			
02.01	Earnings on investments; Science, Space and Technology Education, Trust Fund	1	1	1
	Appropriation:			
05.01	Science, space, and technology education trust fund	−1	−1	−1
07.99	Total balance, end of year	.....	.....	.....

Program and Financing (in millions of dollars)

Identification code 80–8978–0–7–503		1998 actual	1999 est.	2000 est.
	Obligations by program activity:			
10.00	Total obligations (object class 41.0)	1	.....	.....
	Budgetary resources available for obligation:			
21.40	Unobligated balance available, start of year	18	18	18
22.00	New budget authority (gross)	1	1	1
23.90	Total budgetary resources available for obligation	19	19	19
23.95	Total new obligations	−1	.....	.....
24.40	Unobligated balance available, end of year	18	18	18
	New budget authority (gross), detail:			
60.27	Appropriation (trust fund, indefinite)	1	1	1
	Change in unpaid obligations:			
73.10	Total new obligations	1	.....	.....
73.20	Total outlays (gross)	−1	−1	−1
	Outlays (gross), detail:			
86.97	Outlays from new permanent authority	1	1	1
	Net budget authority and outlays:			
89.00	Budget authority	1	1	1
90.00	Outlays	1	1	1
	Memorandum (non-add) entries:			
92.01	Total investments, start of year: U.S. securities: Par value	16	17	17
92.02	Total investments, end of year: U.S. securities: Par value	17	17	17

Administrative Provisions

Notwithstanding the limitation on the availability of funds appropriated for "Human space flight", "Science, aeronautics and technology", or "Mission support" by this appropriations Act, when any activity has been initiated by the incurrence of obligations for construction of facilities as authorized by law, such amount available for such activity shall remain available until expended. This provision does not apply to the amounts appropriated in "Mission support" pursuant to the authorization for repair, rehabilitation and modification of facilities, minor construction of new facilities and additions to existing facilities, and facility planning and design.

Notwithstanding the limitation on the availability of funds appropriated for "Human space flight", "Science, aeronautics and technology", or "Mission support" by this appropriations Act, the amounts appropriated for construction of facilities shall remain available until September 30, **[**2001**]** *2002*.

Notwithstanding the limitation on the availability of funds appropriated for "Mission support" and "Office of Inspector General", amounts made available by this Act for personnel and related costs and travel expenses of the National Aeronautics and Space Administration shall remain available until September 30, **[**1999**]** *2000* and may be used to enter into contracts for training, investigations, costs associated with personnel relocation, and for other services, to be provided during the next fiscal year.

[NASA shall develop a revised appropriation structure for submission in the fiscal year 2000 budget request consisting of five appropriations accounts (International Space Station; Launch Vehicles and Payload Operations; Science, Aeronautics and Technology; Mission Support; and Office of Inspector General).**]**

NASA shall develop a revised appropriation account structure for submission in the fiscal year 2001 budget request consisting of the "Human Space Flight" account; the "Science, Aeronautics, and Technology" account; and the "Office of the Inspector General" account. The accounts shall each include the planned full costs (direct and indirect costs) of NASA's related activities and allow NASA to shift civil service salaries, benefits and support among accounts, as required, for the safe, timely, and successful accomplishment of NASA missions. (Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1999.)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Federal Funds

General and special funds:

HUMAN SPACE FLIGHT

For necessary expenses, not otherwise provided for, in the conduct and support of human space flight research and development activities, including research, development, operations, and services; maintenance; construction of facilities including [repair, rehabilitation,] *revitalization* and modification of [real and personal property,] *facilities, construction of new facilities and additions to existing facilities, facility planning and design,* and acquisition or condemnation of real property, as authorized by law; space flight, spacecraft control and communications activities including operations, production, and services; and purchase, lease, charter, maintenance and operation of mission and administrative aircraft, [$5,510,900,000] *$5,499,900,000,* to remain available until September 30, [2001: *Provided,* That $40,000,000 of the amount provided in this paragraph shall be available to the space shuttle program only for preparations necessary to carry out a life and micro-gravity science mission, to be flown between STS–107 and December 2001] *2002. For necessary expenses of the International Space Station, to become available on October 1 of the fiscal year specified and remain available for that and the following fiscal year, as follows: for fiscal year 2002, $1,858,500,000; for fiscal year 2003, $1,452,500,000; for fiscal year 2004, $1,327,000,000; and for fiscal year 2005, $1,275,000,000. (Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2000.)*

Program and Financing (in millions of dollars)

Identification code 80–0111–0–1–252		1999 actual	2000 est.	2001 est.
	Obligations by program activity:			
	Direct program:			
00.01	Space station	2,252	2,464	2,125
00.02	Payload and ELV support	.....	.....	86
00.03	Investments and support	.....	.....	123
00.04	Space shuttle	2,956	2,858	3,156
00.05	Payload and utilization operations	199	261	8
09.01	Reimbursable program	183	204	195
10.00	Total new obligations	5,590	5,787	5,693
	Budgetary resources available for obligation:			
21.40	Unobligated balance available, start of year	271	368	274
22.00	New budget authority (gross)	5,663	5,692	5,695
22.10	Resources available from recoveries of prior year obligations	24	.....	.....
23.90	Total budgetary resources available for obligation	5,958	6,060	5,969
23.95	Total new obligations	−5,590	−5,787	−5,693
24.40	Unobligated balance available, end of year	368	274	276
	New budget authority (gross), detail:			
	Discretionary:			
40.00	Appropriation	5,480	5,511	5,500
40.76	Reduction pursuant to P.L. 106–113	.....	−23	.....
43.00	Appropriation (total discretionary)	5,480	5,488	5,500
	Spending authority from offsetting collections:			
68.00	Offsetting collections (cash)	174	204	195
68.10	From Federal sources: Change in receivables and unpaid, unfilled orders	9	.....	.....
68.90	Spending authority from offsetting collections (total discretionary)	183	204	195
70.00	Total new budget authority (gross)	5,663	5,692	5,695
	Change in unpaid obligations:			
	Unpaid obligations, start of year:			
72.40	Obligated balance, start of year	1,662	1,627	1,740
72.95	From Federal sources: Receivables and unpaid, unfilled orders	23	32	32
72.99	Total unpaid obligations, start of year	1,685	1,659	1,772
73.10	Total new obligations	5,590	5,787	5,693
73.20	Total outlays (gross)	−5,591	−5,674	−5,655
73.40	Adjustments in expired accounts (net)	1	.....	.....
73.45	Adjustments in unexpired accounts	−24	.....	.....
	Unpaid obligations, end of year:			
74.40	Obligated balance, end of year	1,627	1,740	1,778
74.95	From Federal sources: Receivables and unpaid, unfilled orders	32	32	32
74.99	Total unpaid obligations, end of year	1,659	1,772	1,810
	Outlays (gross), detail:			
86.90	Outlays from new discretionary authority	3,753	3,864	3,864
86.93	Outlays from discretionary balances	1,838	1,810	1,791
87.00	Total outlays (gross)	5,591	5,674	5,655
	Offsets:			
	Against gross budget authority and outlays:			
	Offsetting collections (cash) from:			
88.40	Non-Federal sources	−29	−44	−40
88.45	Offsetting governmental collections from the public	−145	−160	−155
88.90	Total, offsetting collections (cash)	−174	−204	−195
	Against gross budget authority only:			
88.95	From Federal sources: Change in receivables and unpaid, unfilled orders	−9	.....	.....
	Net budget authority and outlays:			
89.00	Budget authority	5,480	5,488	5,500
90.00	Outlays	5,417	5,470	5,460

Summary of Budget Authority and Outlays

(in millions of dollars)

	1999 actual	*2000 est.*	*2001 est.*
Enacted/requested:			
Budget Authority	5,480	5,488	5,500
Outlays	5,417	5,470	5,460
Supplemental proposal:			
Budget Authority	.....	–20	.....
Outlays	.....	–13	–6
Total:			
Budget Authority	5,480	5,468	5,500
Outlays	5,417	5,457	5,454

This appropriation provides funding for human space flight activities, including development and operations of the Space Station, the Space Station research program, and operation of the Space Shuttle. This includes development of contingency capabilities for the Space Station, high priority investments to improve the safety of the Space Shuttle, and required construction projects in direct support of Space Station and Space Shuttle programs.

Performance Objectives

Space station.—The International Space Station (ISS) is an international laboratory in low Earth orbit on which American, Russian, Canadian, European, and Japanese astronauts will conduct unique scientific and technological investigations in a microgravity environment. The goal of the Station is to support activities requiring the unique attributes of humans in space and establish a permanent human presence in Earth orbit. The proposed budget provides multi-year funding through an advance appropriation for the continued development of the vehicle and its research components and for current operations, assembly and utilization of the station. With the first launches successfully completed, the budget includes funding to keep subsequent assembly missions on schedule for completion in 2004–2005 and continue work to-

General and special funds—Continued

HUMAN SPACE FLIGHT—Continued

wards a long-term solution to the safe return of the full complement of station crewmembers in the event of an emergency.

In FY 1999, successful launches of the first two components of the Station—the FGB control module and the first node—were completed in November and December respectively, and the elements were assembled in orbit and activated. A third flight delivering supplies to support the first crews was successfully performed in May 1999. Flight hardware elements for the next six U.S. assembly launches—the Z1 and S0 trusses, the control moment gyros, the first photo-voltaic array and battery sets, initial thermal radiators, communication equipment, the U.S. Laboratory, the mobile servicing system and the Multi-Purpose Logistics Carrier—were delivered to the launch site, and the first phases of multi-element integrated testing (MEIT) were completed. Crew training, payload processing, hardware element processing, and mission operations were supported. In 2000, fabrication of flight hardware, qualification testing, assembly, integration and mission operations will all continue. Difficulties with completion of U.S. MEIT testing, coupled with delays to the Russian Service Module, caused by recent failures of the Proton launch system, have delayed planned assembly and expedition flights. The Service Module will be launched in mid- to late-2000, and assembly and expedition flights will follow. The Russian launch of a Soyuz vehicle will enable permanent occupation of the station with rotating crews of three. In 2001 plans are to launch seven U.S. missions to station, including the lab module. Phase 2 of the station assembly will be completed with the launch of the airlock, and preparations will continue for the start of Phase 3 and the first shuttle mission dedicated to research utilization in late 2001/early 2002.

As part of the FY 1999 operating plan, Russian Program Assurance (RPA) was re-established within the Space Station budget line. The RPA funding provides contingency activities to address ISS program requirements resulting from delays or shortfalls on the part of Russia in meeting its commitments to the ISS program. The first step in the contingency plan is to protect against a potential further delay in the Russian Service Module (SM) and its capabilities. The ISS program is purchasing, from the U.S. Naval Research Laboratory (NRL), an interim control module (ICM) to provide backup attitude control and reboost functions for the ISS. Additionally, the Shuttle fleet is being configured for reaction control system (RCS) interconnectivity modifications to enable greater Shuttle reboost capability to the ISS. A permanent U.S. propulsion capability is being developed for implementation in the 2002 timeframe. This includes a propulsion module, carriers, and activities to support propulsion logistics. An agreement negotiated with the Russians in 1999 will provide needed hardware and services to the U.S., including services to provide additional crew return capability when the station attains the ability to support a permanent crew of six.

Phase I development of a crew return vehicle (CRV), to provide the U.S. capability to return up to seven crew members, is initiated in 2000. Design and operational technologies tested and demonstrated in Phase I will reduce CRV development risk. The X–38, including the space test flight in 2002, is being transitioned to merge with the ISS CRV funding in 2000 because of the overlap of CRV and X–38 technology developments. Pending a final decision on CRV development, which will be part of broader future launch decisions, Phase 2 development funding will be included in the Aero-Space Technology budget estimates beginning in FY 2002.

Payload and Expendable Launch Vehicle (ELV) support.—Activities funded by the payload processing budget support the required technical expertise and facilities to perform the payload buildup, test and checkout, integration, servicing, transportation and installation in the launch vehicle. In FY 1999, launch and landing payload support activities were provided for four Space Shuttle missions, including the first American segment of the ISS, and payload processing support activities and facilities for six manifested major payloads. In FY 2000, launch and landing payload support activities will be provided for six Space Shuttle missions including the Hubble Space Telescope (HST–03A) launch, the Shuttle Radar Topography Mission (SRTM) launch, and three assembly flights for the ISS. In FY 2001, launch and landing payload support activities will be provided for nine Space Shuttle missions, including seven ISS assembly and utilization flights. During this period, five pallets will be used in Space Shuttle missions, including the fourth HST servicing mission and three of the ISS assembly flights. In FY 2000 and 2001, over 20 major and secondary payloads will be supported, including major hardware for ISS assembly.

The ELV Mission Support budget provides funds for acquiring requisite launch services to meet all NASA requirements and for technical insight of commercially provided launch services. Advanced mission design/analysis and leading edge integration services are provided for the full range of NASA missions under consideration for launch on ELVs. During FY 1999, 10 ELV launches and 1 secondary ELV mission were successfully launched. Support for 13 missions, including Tracking and Data Relay Satellite–H (TDRS–H), Terra and Geostationary Operational Environmental Satellite–L (GOES–L), and four planetary missions are planned for launch in FY 2000, and integration and technical management of 28 payloads are planned for launch in FY 2000 and FY 2001. Support for 11 missions and 1 secondary payload is planned for FY 2001.

Investments and support.—Beginning in FY 2001, the Human Exploration and Development of Space (HEDS) Commercialization and Technology Initiative will include human space exploration and development activities emphasizing highly innovative technologies, advances in science, and enabling synergistic commercial space development efforts.

A new project activity will begin in FY 2001 to ensure NASA's rocket propulsion test capabilities are properly managed and maintained in world class condition. The project will significantly enhance our ability to properly manage NASA's rocket testing activities and infrastructure across all four participating NASA centers.

Engineering and technical base (ETB) activity will continue to support the institutional capability in the operation of space flight laboratories, technical facilities, and testbeds; to conduct independent safety, and reliability assessments; and to stimulate science and technical competence in the United States.

Space shuttle.—The Space Shuttle is a partially reusable space vehicle that provides several unique capabilities to the United States space program. These include retrieving payloads from orbit for reuse, servicing and repairing satellites in space, safely transporting humans to and from space, launching ISS components and providing an assembly platform in space, and operating and returning space laboratories. In FY 1999, the Space Shuttle launched four flights successfully including the first ISS assembly mission, one resupply flight to the ISS, one microgravity research mission which included the return to space of Senator John Glenn, and the successful deployment of the Chandra—Advanced X-Ray Astrophysics Facility (AXAF).

The six flights manifested in FY 2000 include the emergency HST Servicing Mission 3A which will replace failing gyros on the HST and the Shuttle Radar Topography Mission (SRTM), a joint DOD/NASA payload to study the earth. The Space Shuttle will also visit the ISS four more times, for both assembly and maintenance. Finally, the first crew will

begin the permanent occupation and presence aboard the ISS in FY 2000.

Nine flights are planned during FY 2001, including seven ISS assembly and servicing missions. In addition, a dedicated microgravity research flight and another HST Servicing Mission (3B) will be flown.

The 2002 budget estimate for this account is $5.5 billion, including advance appropriations.

Object Classification (in millions of dollars)

Identification code 80–0111–0–1–252	1999 actual	2000 est.	2001 est.
Direct obligations:			
22.0 Transportation of things	4	4	4
23.3 Communications, utilities, and miscellaneous charges	55	57	56
24.0 Printing and reproduction	2	2	2
25.1 Advisory and assistance services	5	5	5
25.2 Other services	132	136	134
25.3 Purchases of goods and services from Government accounts	125	129	127
25.4 Operation and maintenance of facilities	1,389	1,429	1,412
25.5 Research and development contracts	3,220	3,333	3,274
25.7 Operation and maintenance of equipment	43	44	44
26.0 Supplies and materials	148	152	151
31.0 Equipment	95	98	97
32.0 Land and structures	146	150	148
41.0 Grants, subsidies, and contributions	43	44	44
99.0 Subtotal, direct obligations	5,407	5,583	5,498
99.0 Reimbursable obligations	183	204	195
99.9 Total new obligations	5,590	5,787	5,693

Science, Aeronautics and Technology

For necessary expenses, not otherwise provided for, in the conduct and support of science, aeronautics and technology research and development activities, including research, development, operations, and services; maintenance; construction of facilities including [repair, rehabilitation] *revitalization*, and modification of [real and personal property] *facilities, construction of new facilities and additions to existing facilities, facility planning and design*, and acquisition or condemnation of real property, as authorized by law; space flight, spacecraft control and communications activities including operations, production, and services; and purchase, lease, charter, maintenance and operation of mission and administrative aircraft, [$5,606,700,000] *$5,929,400,000*, to remain available until September 30, [2001] *2002. (Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2000.)*

Program and Financing (in millions of dollars)

Identification code 80–0110–0–1–999	1999 actual	2000 est.	2001 est.
Obligations by program activity:			
Direct program:			
00.01 Space science	2,211	2,224	2,389
00.02 Life and microgravity science	246	294	301
00.03 Earth science	1,478	1,427	1,408
00.04 Aero-space technology	1,342	1,093	1,190
00.05 Space operations	.....	.....	503
00.06 Academic programs	146	152	102
00.07 Mission communication services	375	394	20
09.01 Reimbursable program	574	606	548
10.00 Total new obligations	6,372	6,190	6,461
Budgetary resources available for obligation:			
21.40 Unobligated balance available, start of year	401	281	278
22.00 New budget authority (gross)	6,228	6,187	6,477
22.10 Resources available from recoveries of prior year obligations	25	.....	.....
23.90 Total budgetary resources available for obligation	6,654	6,468	6,755
23.95 Total new obligations	−6,372	−6,190	−6,461
23.98 Unobligated balance expiring or withdrawn	−1	.....	.....
24.40 Unobligated balance available, end of year	281	278	294
New budget authority (gross), detail:			
Discretionary:			
40.00 Appropriation	5,654	5,607	5,929
40.76 Reduction pursuant to P.L. 106–113	.....	−26	.....
43.00 Appropriation (total discretionary)	5,654	5,581	5,929
Spending authority from offsetting collections:			
68.00 Offsetting collections (cash)	542	606	548
68.10 From Federal sources: Change in receivables and unpaid, unfilled orders	32	.....	.....
68.90 Spending authority from offsetting collections (total discretionary)	574	606	548
70.00 Total new budget authority (gross)	6,228	6,187	6,477
Change in unpaid obligations:			
Unpaid obligations, start of year:			
72.40 Obligated balance, start of year	2,997	2,977	3,195
72.95 From Federal sources: Receivables and unpaid, unfilled orders	318	350	350
72.99 Total unpaid obligations, start of year	3,315	3,327	3,545
73.10 Total new obligations	6,372	6,190	6,461
73.20 Total outlays (gross)	−6,327	−5,972	−6,183
73.40 Adjustments in expired accounts (net)	−9	.....	.....
73.45 Adjustments in unexpired accounts	−25	.....	.....
Unpaid obligations, end of year:			
74.40 Obligated balance, end of year	2,977	3,195	3,473
74.95 From Federal sources: Receivables and unpaid, unfilled orders	350	350	350
74.99 Total unpaid obligations, end of year	3,327	3,545	3,823
Outlays (gross), detail:			
86.90 Outlays from new discretionary authority	3,209	3,123	3,222
86.93 Outlays from discretionary balances	3,118	2,849	2,962
87.00 Total outlays (gross)	6,327	5,972	6,183
Offsets:			
Against gross budget authority and outlays:			
Offsetting collections (cash) from:			
88.40 Non-Federal sources	−24	−42	−37
88.45 Offsetting governmental collections from the public	−518	−564	−511
88.90 Total, offsetting collections (cash)	−542	−606	−548
Against gross budget authority only:			
88.95 From Federal sources: Change in receivables and unpaid, unfilled orders	−32	.....	.....
Net budget authority and outlays:			
89.00 Budget authority	5,654	5,581	5,929
90.00 Outlays	5,785	5,366	5,635

This appropriation provides for the research and development activities of the National Aeronautics and Space Administration. Funds are included for the construction, maintenance, and operation of programmatic facilities. Space science, earth science, life and microgravity science, and aero-space technology programs are included in the 21st Century Research Fund.

Performance Objectives

Space science.—The Space Science program seeks to answer fundamental questions concerning: the galaxy and the universe; the connection between the Sun, Earth and heliosphere; the origin and evolution of planetary systems; and the origin and distribution of life in the universe. The Space Science program is comprised of a base program of research and development activities, including research and flight mission activities, and major space-based facilities.

In 1999, the Space Science program produced many notable scientific accomplishments. The Hubble Space Telescope fulfilled one of its most important objectives in May 1999, when the Hubble Space Telescope Key Project Team announced the results of their studies, which yielded an estimate of the Hubble constant to within 10% accuracy. The Hubble constant indicates the rate at which the universe is expanding

General and special funds—Continued

SCIENCE, AERONAUTICS AND TECHNOLOGY—Continued

from the primordial "Big Bang" and is one of the most important numbers in cosmology because it is needed to estimate the age and size of the universe. Combining the Hubble constant measurement with estimates of the density of the universe, the team estimated that the universe is approximately 12 billion years old. The Chandra X-ray Observatory (CXO), the third of the four "great observatories," was successfully launched and activated. As soon as science operations began, images showing astonishing detail of X-ray sources were obtained. With its unprecedented capabilities in energy coverage, spatial resolution, spectral resolution and sensitivity, CXO has just begun to investigate some of the most important topics in space science, including the age and size of the universe, dark matter, and X-ray background radiation. Other scientific discoveries related to the structure and evolution of the universe include the detection of "middleweight" black holes that are 100 to 10,000 times as massive as the Sun but occupy less space that the Moon, and the first-ever optical image of a gamma ray burst. Gamma ray bursts are the most powerful explosions in the universe, and for a very short period produce more energy than the rest of the universe combined. Also in 1999, several teams of researchers supported by NASA discovered many new planets orbiting nearby stars, including evidence of the first known planet orbiting a pair of stars. Within our own solar system, the Mars Global Surveyor (MGS) generated the first global three-dimensional view of Mars. These images revealed an impact basin deep enough to swallow Mount Everest, as well as pathways for water flow. Scientists using MGS' magnetometer discovered surprising evidence of past movement of the Martian crust, further evidence that ancient Mars was a more dynamic, Earth-like planet than it is today. A dramatic time-lapse movie by the Hubble Space Telescope showed, for the first time, seasonal changes on Uranus. The Galileo spacecraft produced new images showing volcanic activity on Jupiter's moon Io, similar to that which occurred on Earth eons ago. Analysis of data from the Lunar Prospector spacecraft confirmed that the Moon has a small core, supporting the theory that the bulk of the Moon was ripped away from the Earth when an object the size of Mars collided with the Earth. In the field of solar science, NASA sponsored scientists using the Japanese Yokoh spacecraft discovered that an S-shaped structure often appears on the Sun in advance of a coronal mass ejection (CME), a violent eruption that is as powerful as billions of nuclear explosions. The Solar and Heliospheric Observatory (SOHO) spacecraft discovered the source of high-speed solar wind, a stream of electrified gas that affects the Earth's space environment.

To capitalize on these enormous successes during the past year, the NASA budget request for FY 2001 once again highlights Space Science. The President's request includes an enhanced Solar System Exploration program to establish a sustained presence at multiple locations on and around Mars and other potential research targets. Using outposts of numerous, networked spacecraft, NASA will greatly enhance the science return and overall success of future missions. Eventually, such outposts will bring continuous access to live data and video so that researchers and the public can explore and experience other worlds first-hand. Space Science continues to focus on the Origins program and fundamental questions regarding the creation of the universe and planetary systems and the possibility of life on places other than planet Earth. Planning and technology development continues for the deployment of powerful telescopes to detect Earth-like planets beyond our solar system, for the launch of a mission to directly observe subsurface oceans on Europa, and for future missions to seek evidence of past or present life on Mars. The Administration's request also includes a "Living With a Star" Initiative to develop better solar weather forecasting capabilities and to better protect high-tech infrastructure from dangerous solar phenomena. The Space Science program is responsible for agency-wide core technology development, and funding is provided in this program to enhance and enable future missions through the administration's information technology (IT) initiative and other high-leverage technologies. These technologies will increase the return of the Space Science program and other NASA programs many fold through revolutionary capabilities in the areas of networking, intelligent systems, nanotechnology, communications, lightweight structures, miniaturization, mobility, and propulsion for robotic spacecraft and rovers.

Development activities continue on the Relativity (Gravity Probe-B) mission, which is now scheduled for launch in 2001. The Space Infrared Telescope Facility (SIRTF) initiated development in April 1998, with launch planned for December 2001. Development activities on the Thermosphere, Ionosphere, Mesosphere Energetics and Dynamics (TIMED) mission continued in 1999, with launch planned in 2000. Development activities on the Stratospheric Observatory for Infrared Astronomy (SOFIA) continue. The upgraded Hubble Space Telescope (HST) is providing new insights into our universe. Funding for HST continues to support operations, as well as preparation for servicing mission 3B in 2001 and servicing mission 4 in 2003.

In Explorer missions, development activities continue for the Microwave Anisotropy Probe (MAP) and Imager for Magnetosphere-to-Aurora Global Exploration (IMAGE). MAP will be launched in November 2000, IMAGE in February 2000. Two new MIDEX missions were selected in 1999: Full-sky Astrometric Mapping Explorer (FAME) scheduled for launch in 2004, and Swift, a multi-wavelength observatory for gamma-ray burst astronomy, to be launched in 2003. Three Small (SMEX) missions continued development in FY 1999: the High Energy Spectroscopic Imager (HESSI) is to launch in 2000; the Galaxy Evolution Explorer (GALEX) will launch in 2001; and the Two Wide-Angle Neutral Atom Spectrometers (TWINS) has been selected as a mission of opportunity, to be launched in 2002 and 2004. These missions emphasize reduced mission costs and accelerated launch schedules.

The Mars Global Surveyor entered Mars orbit in September 1997, the Mars Climate Orbiter was launched in December 1998 and the Mars Polar Lander was launched in January 1999. Unfortunately, the Orbiter was lost while attempting to enter Mars orbit in September 1999, and the Lander was lost during entry, descent and landing in December 1999. Funds are requested for the development of future Mars missions to establish a sustained presence at Mars that will increase the science return and overall success of the Mars program. A review to be accomplished in 2000 will provide the plan for future launches.

In the Discovery program, the fourth mission, Stardust, was launched on schedule in February 1999, and is operating normally during its cruise to comet Wild-2, with the encounter scheduled for 2004. Two Discovery missions selected in 1997 are proceeding on schedule: the Comet Nucleus Tour (CONTOUR) will begin development in CY 2000 and will be launched in 2002; the Genesis solar wind sample return mission has begun development and will be launched in 2001. Two new missions were selected for implementation during 1999: The MErcury Surface, Space ENvironment, GEochemistry and Ranging (MESSENGER) mission to orbit Mercury; and the Deep Impact mission to fly by and fire an impactor into a comet. Both MESSENGER and Deep Impact are planned for launch in 2004. The President's request supports a new class of Discovery micromissions that will also be undertaken in 2001 to complement solar system explo-

ration efforts with more frequent and varied research opportunities.

The Flight Validation program is providing flight demonstrations of critical new technologies which will reduce the mass and cost of future science and spacecraft subsystems, while maintaining or improving mission capabilities. The Deep Space-1 mission was launched in October 1998, and has validated its technologies and completed its primary mission, and is now in an extended mission. The Deep Space-2 mission which was launched with the Mars Polar Lander in January 1999, and was lost, along with the Lander, during entry, descent and landing on Mars in December 1999. The Space Technology 4 mission was terminated during 1999 due to the need to fund higher priority programs within the Space Science Enterprise. Also in 1999, NASA selected the Nanosat Constellation Trailblazer as the Space Technology-5 Flight Validation mission. This mission will feature three very small satellites (each about the size of a large birthday cake), that will fly in formation and test eight technologies in the harsh space environment near the boundary of Earth's protective magnetic field. The Flight Validation program has been restructured to enhance openness and competition as well as to increase the number of opportunities for technologies to be flight-validated. Funding for the restructured program has been increased.

Life and microgravity science.—This program uses the microgravity environment of space to conduct basic and applied research to understand the effect of gravity on living systems and to conduct research in the areas of fluid physics, combustion science, fundamental physics, materials science and biotechnology. In FY 1999, the program flew one science mission (STS–95) on a Spacehab carrier with ISS precursor science experiments. STS–95 included commercially sponsored research as well as research on the effects of aging conducted in collaboration with the National Institutes of Health's National Institute on Aging. FY 1999 has also seen the beginning of ISS assembly. In FY 2000, the Russian Service Module will be launched, enabling permanent human presence aboard the ISS. In FY 2001, the U.S. laboratory module for the ISS will be launched, which will enable initial life and microgravity hardware and experiments to be established aboard the ISS. This will begin a new era of research. In FY 2001, the Administration introduces a Bioastronautics Initiative to accelerate research and develop countermeasures that will improve the health and safety of astronauts aboard the International Space Station. Devices and countermeasures developed through this initiative may also have many health benefits on Earth. As assembly of the ISS continues to advance, ISS Crew Health Care System (CHECS) components will be utilized to provide on-orbit medical, environmental, and countermeasure capabilities for all ISS crew members. In early FY 2001, prior to full research capabilities aboard the ISS, the program will fly a dedicated Space Shuttle research mission which will extend previous Space Shuttle research results and help the program as well as the community prepare for increasing research operations on the ISS.

Earth science.—The purpose of NASA's Earth Science Enterprise (ESE) is to understand the total Earth system and the effects of natural and human-induced changes on the global environment. ESE is pioneering the new interdisciplinary field of research called Earth system science, which recognizes that the Earth's land surface, oceans, atmosphere, ice sheets and *biota* are both dynamic and highly interactive. Earth system science is an area of research with the potential for immense benefit to the nation, yielding new knowledge and tools for weather forecasting, agriculture, urban and land use planning, and other areas of economic and environmental importance. In concert with other agencies and the global research community, ESE is providing the scientific foundation needed for the complex policy choices that lie ahead on the road to sustainable development. ESE has established three broad goals to fulfill its purpose: (1) expand scientific knowledge of the Earth system using NASA's unique capabilities from the vantage points of space, aircraft and *in situ* platforms; (2) disseminate information about the Earth system; and, (3) enable productive use of Earth science and technology in the public and private sectors.

FY 1999 was a year of substantial scientific accomplishment in our understanding of the major elements that comprise the Earth system. Over the oceans, ESE had several accomplishments. ESE reduced the uncertainty in global rainfall over the tropics by one half, helping improve predictions for short-term weather and availability of fresh water globally; produced near-daily ocean color maps that help us understand the role of oceans in removing carbon dioxide from the atmosphere; documented the waxing and waning of El Nino, enabling seasonal climate prediction; and resumed global measurement of winds at the ocean surface to improve short-term weather prediction and tracking of major hurricanes and tropical storms globally. Over the ice caps, researchers determined the thinning and thickening rates for the Greenland ice sheet; provided the first detailed radar mosaic for Antarctica; and provided the daily observations of the Polar Regions from space.

Over the land, ESE produced the first satellite-derived assessments of global forest cover, began refreshing the global archive of 30-meter land cover data, and conducted an international field experiment in the Amazonia to help understand the role of vegetation on Earth in removing carbon dioxide from the atmosphere. In the solid Earth, ESE and the United States Geological Survey (USGS) measured surface displacement, which is a precursor to earthquakes. In the atmosphere, ESE continued to measure concentrations of both ozone and ozone-depleting substances and assess the recovery of upper ozone correlation and implemented a 17-year data record of aerosols and cloud properties toward predicting annual to decadal climate variations.

The Earth Observing System (EOS), the centerpiece of Earth Science, is a program of multiple spacecraft, supporting technology and interdisciplinary science investigations to provide a long-term data set of key parameters needed to understand global climate change. The first EOS satellite launches began in 1999 with the launches of Landsat-7, Terra (formerly AM–1), and QuikSCAT. EOS PM–1 and Chemistry are on schedule to launch in 2000 and 2002 respectively. Preceding the EOS are a number of individual satellite and Shuttle-based missions which are helping to reveal basic processes.

Complementing EOS, under the Earth Probes Program, will be a series of small, rapid development Earth System Science Pathfinder (ESSP) missions to study emerging science questions and to use innovative measurement techniques in support of EOS. The first two ESSP missions, Vegetation Canopy Lidar (VCL) and Gravity Recovery and Climate Experiment (GRACE), are scheduled for launch in 2000 and 2001, respectively. The second pair of ESSP missions, the Pathfinder Instruments for Cloud and Aerosol Spaceborne Observations—Climatologie Etendue des Nuages et des Aerosols (PICASSO–CENA) mission, and Cloudsat, will be launched together in 2003.

Data from Earth Science missions, both current and future, will be captured, processed into useful information, and broadly distributed by the EOS Data Information System (EOSDIS). EOSDIS will ensure that data from these diverse missions remain available in active archives for use by current and future scientists. These data are expected to find uses well beyond the Earth Science research community. Therefore, ESE is engaging in a variety of public/private partnerships to extend the utility of Earth science data to environmental decision-makers, resource managers, commercial

General and special funds—Continued

SCIENCE, AERONAUTICS AND TECHNOLOGY—Continued

firms, social scientists and the general academic community, educators, state and local governments and others.

The ESE research and analysis program is essential to the discovery of new concepts and to the design of future missions. ESE research is coordinated through the U.S. Global Change Research Program (USGCRP), the Committee on the Environment and Natural Resources (CENR) and its Subcommittee on Global Change Research, and the various boards and committees at the National Academy of Sciences.

Aero-space technology.—The mission of this Enterprise is to pioneer the identification, development, verification, transfer, application, and commercialization of high-payoff aerospace technologies. Through its research and technology accomplishments, Aero-space technology promotes economic growth and national security through a safe, efficient national aviation system and affordable, reliable space transportation. To meet this challenge, the Enterprise has established three pillar goals. Within these three pillar goals, a set of ten objectives, each with its own roadmap, has been defined to address current and future National needs. The technologies associated with these objectives are pre-competitive, long-term, high-risk research endeavors with high-payoff in terms of market growth, safety, low acquisition cost, consumer affordability and a cleaner environment. The goals of this Enterprise directly support National policy in Aero-Space, documented in the 1999 National R&D Plan for Aviation Safety, Security, Efficiency, and Environmental Compatibility and the 1994 National Space Transportation Policy.

The first pillar, Global Civil Aviation, addresses the fundamental, systemic issues in the aviation system to ensure continued growth and development appropriate to the needs of the national and global economies. These systemic issues—safety, capacity, environmental compatibility, and affordability—cut across markets including large subsonic civil transports, air cargo, commuter and general aviation, and rotorcraft. The second pillar, Revolutionary Technology Leaps, will revolutionize air travel and the way in which aircraft are designed, built, and operated, and addresses the challenges in small aircraft, short-haul transportation; supersonic, transoceanic transportation; design tools, and experimental planes. The third pillar, Access to Space, will enable greater commercial potential of space and the expansion of space research and exploration by significantly reducing the cost of space transportation systems while improving reliability, operability, responsiveness, and safety.

A major restructuring and replanning of the Aero-Space Enterprise's base R&T program was accomplished during 1999 to integrate the Enterprise's existing space transportation and aeronautics base R&T development programs into a single entity. There were several benefits that accrued from this effort. First, the restructuring better aligned the required technology development efforts with our core competencies and brought the expertise resident in the Aeronautics Research Centers to bear on the technological challenges associated with space transportation. Second, the integration of space and aeronautics development needs resulted in a synergistic technology development plan that better utilized our resources, eliminated overlaps, and allowed dual use, between the space transportation and aeronautics users, to be planned up front rather than relying on serendipitous events.

The President's request for NASA increases investments in technology development activities that will address the challenges (safety, environmental impact, capacity, and space transportation costs) that face the aero-space community.

The Administration's request supports the development of Smart Air Transport System (SATS) technologies that could enable a revolution in accessibility and mobility in America. The product of the SATS (Phase I) Program will demonstrate the technological potential for transportation-driven economic development throughout the nation.

The Administration's request also supports a Quiet Airplane Technology program that will build upon the highly successful noise reduction efforts that were begun in the Aero-Space Technology (AST) enterprise and maintain progress toward meeting the enterprise's noise reduction goal. The achievement of these goals will lead to an air transportation system that contains objectionable aircraft noise within airport boundaries.

By the end of the decade, NASA will conduct a competitive launch services procurement to support the launch requirements of human spaceflight operations—the 2nd Generation RLV Focused Program. The objectives will be to dramatically improve safety while significantly reducing the cost of such launch services, and to eliminate the current need for the Government to own and operate the full system. The President's request includes new funding through the Space Launch Initiative to support this competition and fulfills a 1994 National Space Transportation Policy guideline calling for government and private sector decisions by 2000 on development of an operational, next-generation reusable launch system.

As part of NASA's response to the national goal of reducing aircraft accidents by a factor of 5 by 2001, NASA increased its safety base R&T efforts in order to provide a foundation for a focused safety program beginning in FY 2000. In 1999, the base R&T programs matured these required safety related technologies to the point where they were successfully transferred to the focused Aviation Safety Program (AvSP) which begins in FY 2000. These technologies will provide the foundation for focused safety development efforts in the future. They also will result in some near term achievements. For example, in FY 1999, the causes of controlled flight into terrain (responsible for 30% of fatal accidents) were identified and 13 contracts issued via a NASA research announcement (NRA) to develop and demonstrate approaches for fully operational and certifiable synthetic vision and health management systems. Also in FY 1999, the preparations for flight evaluation of a crew-centered synthetic vision display were completed and a study initiated to understand the applicability of synthetic vision to General Aviation (GA) type aircraft was begun. In FY 2000, the AvSP program will produce an icing training program for GA and commuter pilots, complete a flight evaluation of an initial national capability for digital data link and graphical display of weather information, and demonstrate a concept for the integration of air traffic control runway incursion information onto aircraft flight deck displays. In FY 2001, the AvSP will complete a laboratory demonstration of a fuel system modification to reduce flammability, define the architecture for an integrated onboard health management system, and down-select synthetic vision concepts suitable for retrofit in commercial, business, and general aviation aircraft. The base R&T will continue to develop the technologies that will contribute to the FY 2007 goal. For example, in FY 2001, NASA will downselect ground-based remote sensor technologies for a prototype ground-system to sense icing conditions and continue work on a related computer.

NASA also continued its efforts to reduce the environmental impact associated with aviation systems. In FY 1999, in partnership with industry, a demonstration in an engine test rig of a low emission combustor that produced a 50% reduction in oxides of nitrogen (NO_X) emissions was successfully demonstrated. The Ultra Efficient Engine Technology (UEET) program will carry this effort forward and demonstrate a system that achieves significant reductions in NO_X and carbon dioxide (CO_X) emissions in FY 2001. The UEET is a new focused program that begins in FY 2000 and is planned and designed

to develop high-payoff, high-risk technologies to enable the next breakthroughs in propulsion systems to spawn a new generation of high performance, operationally efficient and economical, reliable and environmentally compatible U.S. aircraft.

Similarly with noise, in FY 1999, NASA validated an Aircraft Noise Impact model and demonstrated that improved high-lift systems in combination with advanced operational procedures have the potential to reduce community impact by the equivalent of 2-4 db source noise reduction. In 2000, NASA will validate the technologies required to reduce community noise impact by up to 10 dB relative to 1992 technology.

In 1999, the Aviation System Capacity program conducted field evaluation of an initial demonstration of Aircraft Vortex Spacing System (AVOSS) technologies with transport of vortices and class-wise spacing features that have the potential to reduce approach spacing standards. In FY 2000, NASA will demonstrate all technologies in a realistic Terminal Area environment achieving a 12–15% increase in single runway throughput and proving the ability to space aircraft closer than 3,400 feet on parallel runways while meeting all Federal Aviation Administration (FAA) safety criteria. In FY 2001, NASA will demonstrate transition airspace decision support tools for: (1) Air Traffic Control (ATC)/airline operations center and ATC/cockpit information exchange, and (2) conflict resolution.

Building on its world record setting performances, the Environmental Research Aircraft and Sensor technology (ERAST) project in FY 1999 demonstrated a multistage turbocharged RPA to 60,000 feet for an 8 hour duration. The Centurion solar-powered airplane, a vehicle with a wingspan greater than 200 ft., completed initial low altitude evaluation under battery power. The Centurion solar-powered RPA was modified to a wingspan configuration of greater than 245 ft., named Helios and will continue flight testing in FY 2000. This configuration will be more suitable for extreme endurance as well as short flights to the 100,000 ft. altitude. In FY01, the Flight Research program will demonstrate a solar powered RPA at 100,000 ft and complete development of a heavyweight energy storage system under the ERAST project. Both achievements will demonstrate technologies that will provide atmospheric satellites for commercial use, disaster relief efforts such as communication relays and real time sensing, and increase the Nation's capability to make scientific sampling high in the atmosphere.

Also in FY 2000, NASA initiated a new project entitled Revolutionary Concepts (REVCON) to accelerate the exploration of high-risk, breakthrough technologies in order to enable revolutionary departures from traditional approaches to air vehicle design. At the end of FY 1999, three concepts were accepted for inclusion in the REVCON program. Flights of these vehicles will begin in FY 2001 or 2002. Also in FY 2001, NASA will issue the first NRA under REVCON to select the next set of REVCON concepts.

Low-cost space transportation remains the key enabler for a more aggressive civil space program. NASA's Integrated Space Transportation Planning activities have identified a strategy based upon competition, safety, industry leadership and a comprehensive systems approach to NASA requirements. Funding supports aggressive technical risk reduction and advanced development for multiple reusable launch vehicle concepts. Identification and preliminary development of NASA unique systems and near-term pursuit of alternative access for key space station needs are also both critical elements of the Integrated Space Transportation Plan (ISTP). All of these efforts combined will move NASA closer to a full and open Reusable Launch Vehicle (RLV) competition in the 2005 timeframe to meet NASA's human space flight needs by the end of the decade.

Under ISTP, the 2nd Generation RLV Focused Program continues to develop, apply and demonstrate new technologies that significantly advance the ability of the launch vehicle industry to initiate commercially viable reusable launch systems.

The X–33 and X–34 have completed several major hardware fabrication and test milestones. However, technical difficulties and program replanning have delayed the flight testing of these advanced technology demonstrators. The X–34 is now expected to fly in 2000. The X–33 flight schedule is under review, following the failure of the composite liquid hydrogen tanks during testing. The X–37 complements the X–33 and X–34 vehicles by investigating the orbit-to-Earth and orbital operations regimes of the flight spectrum, and will begin flight tests in 2002.

The Commercial Technology Program's focus in FY 1999 was continued investment of 10–20 percent of the NASA R&D budget in commercial partnerships with industry. Based on experience to date, these commercial partnerships are expected to increase the return on the government's R&D investment, allowing NASA to do more with limited funds, and strengthening the international competitiveness of key industry sectors. In FY 2000 and 2001, the program will continue to emphasize increasing commercial partnerships with industry and continue to refine and expand a technology and partnership database.

Space operations.—The primary goal of space operations is to provide highly reliable, cost-effective space operations services in support of NASA's science and aeronautics programs. In addition, support is provided to interagency, international, and commercial space-faring enterprises on a reimbursable basis. The Space Communications Mission and Data Services program is composed of Operations, Mission and Data Service Upgrades, Tracking and Data Relay Satellite Replenishment, and Technology Projects, as well as spectrum management and data standards coordination. Services are provided to a large number of NASA Missions including planetary, and interplanetary missions; human space flight missions; near-earth and earth orbiting missions; and sub-orbital and aeronautical flight tests. A Consolidated Space Operations (CSOC) was successfully implemented by the Space Operations Management Office at Johnson Space Center and Lockheed Martin Space Operations Company. The CSOC provides end-to-end mission and data services to both NASA and non-NASA customers. A total of nine contracts were consolidated at inception, and four more have been consolidated in FY 2000 to date, with two additional contracts to be consolidated in FY 2001. Management responsibility for all Wide Area Network data distribution services for all human space flight, earth orbiting and deep space missions and NASA administrative communications was outsourced by CSOC in FY 2000. Development of the TDRS Replenishment Spacecraft is ongoing, with the first satellite scheduled for launch in FY 2000.

Academic programs.—The goal of this program is to promote excellence in America's education system through enhancing and expanding scientific and technological competence. NASA's education programs span the elementary through graduate levels and are directed at both students and faculty. The goal of the Minority University Research Program is to expand opportunities for talented students from underrepresented groups who are pursuing degrees in science and engineering and to strengthen the research capabilities of minority universities and colleges. The range of activities conducted under this program will continue to capture the interest of all students in science and technology, develop talented students at the undergraduate and graduate levels, provide research opportunities for students and faculty members at NASA centers, and strengthen and enhance the research capabilities of the Nation's colleges and universities.

General and special funds—Continued

SCIENCE, AERONAUTICS AND TECHNOLOGY—Continued

The 2002 budget estimates for this account is $5.9 billion.

Object Classification (in millions of dollars)

Identification code 80–0110–0–1–999	1999 actual	2000 est.	2001 est.
Direct obligations:			
22.0 Transportation of things	5	5	5
23.3 Communications, utilities, and miscellaneous charges	54	52	55
24.0 Printing and reproduction	5	5	5
25.1 Advisory and assistance services	109	105	111
25.2 Other services	772	743	787
25.3 Purchases of goods and services from Government accounts	223	215	227
25.4 Operation and maintenance of facilities	264	254	269
25.5 Research and development contracts	3,132	3,016	3,194
25.7 Operation and maintenance of equipment	82	79	84
26.0 Supplies and materials	210	202	214
31.0 Equipment	101	97	103
32.0 Land and structures	24	23	24
41.0 Grants, subsidies, and contributions	817	788	834
99.0 Subtotal, direct obligations	5,798	5,584	5,912
99.0 Reimbursable obligations	574	606	549
99.9 Total new obligations	6,372	6,190	6,461

MISSION SUPPORT

For necessary expenses, not otherwise provided for, in carrying out mission support for human space flight programs and science, aeronautical, and technology programs, including research operations and support; [space communications activities including operations, production and services;] maintenance; construction of facilities including [repair, rehabilitation,] *revitalization* and modification of facilities, [minor] construction of new facilities and additions to existing facilities, facility planning and design, environmental compliance and restoration, and acquisition or condemnation of real property, as authorized by law; program management; personnel and related costs, including uniforms or allowances therefor, as authorized by 5 U.S.C. 5901–5902; travel expenses; purchase, lease, charter, maintenance, and operation of mission and administrative aircraft; not to exceed [$35,000] *$40,000* for official reception and representation expenses; and purchase (not to exceed 33 for replacement only) and hire of passenger motor vehicles, [$2,515,100,000] *$2,584,000,000* to remain available until September 30, [2001] *2002. (Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2000.)*

Program and Financing (in millions of dollars)

Identification code 80–0112–0–1–999	1999 actual	2000 est.	2001 est.
Obligations by program activity:			
Direct program:			
00.01 Safety, mission assurance, engineering, and advanced concepts	39	43	47
00.02 Research and program management	2,110	2,202	2,292
00.03 Construction of facilities	173	193	233
00.04 Space communication services	184	91	5
01.00 Total direct program	2,506	2,529	2,577
09.01 Reimbursable program	97	127	132
10.00 Total new obligations	2,603	2,656	2,709
Budgetary resources available for obligation:			
21.40 Unobligated balance available, start of year	85	86	69
22.00 New budget authority (gross)	2,597	2,639	2,716
22.10 Resources available from recoveries of prior year obligations	7	.....	.....
23.90 Total budgetary resources available for obligation	2,689	2,725	2,785
23.95 Total new obligations	−2,603	−2,656	−2,709
24.40 Unobligated balance available, end of year	86	69	76
New budget authority (gross), detail:			
Discretionary:			
40.00 Appropriation	2,511	2,515	2,584
40.75 Reduction pursuant to P.L. 106–51	−11	.....	.....
40.76 Reduction pursuant to P.L. 106–113	.....	−3	.....
43.00 Appropriation (total discretionary)	2,500	2,512	2,584
Spending authority from offsetting collections:			
68.00 Offsetting collections (cash)	122	127	132
68.10 From Federal sources: Change in receivables and unpaid, unfilled orders	−25	.....	.....
68.90 Spending authority from offsetting collections (total discretionary)	97	127	132
70.00 Total new budget authority (gross)	2,597	2,639	2,716
Change in unpaid obligations:			
Unpaid obligations, start of year:			
72.40 Obligated balance, start of year	487	586	594
72.95 From Federal sources: Receivables and unpaid, unfilled orders	66	41	41
72.99 Total unpaid obligations, start of year	553	627	635
73.10 Total new obligations	2,603	2,656	2,709
73.20 Total outlays (gross)	−2,517	−2,648	−2,685
73.40 Adjustments in expired accounts (net)	−5	.....	.....
73.45 Adjustments in unexpired accounts	−7	.....	.....
Unpaid obligations, end of year:			
74.40 Obligated balance, end of year	586	594	618
74.95 From Federal sources: Receivables and unpaid, unfilled orders	41	41	41
74.99 Total unpaid obligations, end of year	627	635	659
Outlays (gross), detail:			
86.90 Outlays from new discretionary authority	2,011	2,134	2,197
86.93 Outlays from discretionary balances	506	514	488
87.00 Total outlays (gross)	2,517	2,648	2,685
Offsets:			
Against gross budget authority and outlays:			
Offsetting collections (cash) from:			
88.40 Non-Federal sources	−21	−14	−24
88.45 Offsetting governmental collections from the public	−101	−113	−108
88.90 Total, offsetting collections (cash)	−122	−127	−132
Against gross budget authority only:			
88.95 From Federal sources: Change in receivables and unpaid, unfilled orders	25	.....	.....
Net budget authority and outlays:			
89.00 Budget authority	2,500	2,512	2,584
90.00 Outlays	2,395	2,521	2,553

Summary of Budget Authority and Outlays

(in millions of dollars)

	1999 actual	*2000 est.*	*2001 est.*
Enacted/requested:			
Budget Authority	2,500	2,512	2,584
Outlays	2,395	2,521	2,553
Supplemental proposal:			
Budget Authority	.....	20	.....
Outlays	.....	16	3
Total:			
Budget Authority	2,500	2,532	2,584
Outlays	2,395	2,537	2,556

This appropriation provides funding for mission support and includes: safety, mission assurance, engineering and advanced concepts activities supporting agency programs; salaries and related expenses in support of research in NASA field installations; design, repair, rehabilitation and modification of institutional facilities and construction of new institutional facilities; and other operations activities supporting conduct of agency programs.

Performance Objectives

Safety, mission assurance, engineering, and advanced concepts.—The goal of this program is to invest in the safety and success of NASA missions by assuring that sound and robust policies, processes, and tools for safety, reliability,

quality assurance, and engineering disciplines are in place and applied throughout NASA. The program also examines long-term technology requirements for NASA's strategic objectives.

Research and program management.—This activity provides for the salaries, travel support, other personnel expenses of the entire NASA civil service workforce, and includes vital support to the physical plant at the Centers and at NASA Headquarters.

Construction of facilities.—This activity provides for facility construction activities to preserve NASA's infrastructure; environmental compliance and restoration activities, design of facilities projects, and advanced planning related to future facilities needs. In 1999–2001, activities in support of construction projects to repair and modernize the basic infrastructure and institutional facilities at NASA centers will continue, as well as activities in support of environmental compliance and restoration requirements.

The 2002 budget estimate for this account is $2.6 billion.

Object Classification (in millions of dollars)

Identification code 80–0112–0–1–999	1999 actual	2000 est.	2001 est.
Direct obligations:			
Personnel compensation:			
11.1 Full-time permanent	1,201	1,264	1,343
11.3 Other than full-time permanent	28	21	25
11.5 Other personnel compensation	28	27	37
11.8 Special personal services payments	11	12	14
11.9 Total personnel compensation	1,268	1,324	1,419
12.1 Civilian personnel benefits	270	276	314
13.0 Benefits for former personnel	11	10	.....
21.0 Travel and transportation of persons	48	52	53
22.0 Transportation of things	5	5	5
23.1 Rental payments to GSA	15	14	13
23.3 Communications, utilities, and miscellaneous charges	33	31	29
24.0 Printing and reproduction	6	6	5
25.1 Advisory and assistance services	6	6	5
25.2 Other services	224	214	195
25.3 Purchases of goods and services from Government accounts	26	25	23
25.4 Operation and maintenance of facilities	139	133	121
25.5 Research and development contracts	129	123	112
25.6 Medical care	6	6	5
25.7 Operation and maintenance of equipment	90	86	78
26.0 Supplies and materials	36	34	31
31.0 Equipment	46	43	40
32.0 Land and structures	144	137	125
41.0 Grants, subsidies, and contributions	4	4	4
99.0 Subtotal, direct obligations	2,506	2,529	2,577
99.0 Reimbursable obligations	97	127	132
99.9 Total new obligations	2,603	2,656	2,709

Personnel Summary

Identification code 80–0112–0–1–999	1999 actual	2000 est.	2001 est.
Direct:			
1001 Total compensable workyears: Full-time equivalent employment	18,178	18,031	18,641
Reimbursable:			
2001 Total compensable workyears: Full-time equivalent employment	100	100	100

Research and Development

Program and Financing (in millions of dollars)

Identification code 80–0108–0–1–999	1999 actual	2000 est.	2001 est.
New budget authority (gross), detail:			
Spending authority from offsetting collections:			
Discretionary:			
68.00 Offsetting collections (cash)	10	19	.....
68.10 From Federal sources: Change in receivables and unpaid, unfilled orders	−10	−19	.....
68.90 Spending authority from offsetting collections (total discretionary)	.....	.....	.....
Change in unpaid obligations:			
Unpaid obligations, start of year:			
72.40 Obligated balance, start of year	51	29	.....
72.95 From Federal sources: Receivables and unpaid, unfilled orders	29	19	.....
72.99 Total unpaid obligations, start of year	80	48	.....
73.20 Total outlays (gross)	−28	−48	.....
73.40 Adjustments in expired accounts (net)	−4	.....	.....
Unpaid obligations, end of year:			
74.40 Obligated balance, end of year	29	.....	.....
74.95 From Federal sources: Receivables and unpaid, unfilled orders	19	.....	.....
74.99 Total unpaid obligations, end of year	48	.....	.....
Outlays (gross), detail:			
86.93 Outlays from discretionary balances	28	48	.....
Offsets:			
Against gross budget authority and outlays:			
88.45 Offsetting collections (cash) from: Offsetting governmental collections from the public	−10	−19	.....
Against gross budget authority only:			
88.95 From Federal sources: Change in receivables and unpaid, unfilled orders	10	19	.....
Net budget authority and outlays:			
89.00 Budget authority	.....	.....	.....
90.00 Outlays	18	29	.....

Since FY 1995 NASA's Research and Development activities have been performed in Human Space Flight; Science, Aeronautics and Technology; and Mission Support. This account shows spending from balances prior to the account restructuring.

Space Flight, Control and Data Communications

Program and Financing (in millions of dollars)

Identification code 80–0105–0–1–252	1999 actual	2000 est.	2001 est.
Change in unpaid obligations:			
72.40 Unpaid obligations, start of year: Obligated balance, start of year	20	14	2
73.20 Total outlays (gross)	−2	−12	−2
73.40 Adjustments in expired accounts (net)	−4	.....	.....
74.40 Unpaid obligations, end of year: Obligated balance, end of year	14	2	.....
Outlays (gross), detail:			
86.93 Outlays from discretionary balances	2	12	2
Net budget authority and outlays:			
89.00 Budget authority	.....	.....	.....
90.00 Outlays	2	12	2

Since FY 1995 NASA's Space Flight, Control and Data Communications activities have been performed in Human Space Flight; Science, Aeronautics and Technology; and Mission Support. This account shows spending from balances prior to the account restructuring.

Construction of Facilities

Program and Financing (in millions of dollars)

Identification code 80–0107–0–1–999	1999 actual	2000 est.	2001 est.
Obligations by program activity:			
00.01 Supporting activity	7	13	.....
00.02 Space transportation	5	.....	.....
00.04 Aeronautical research and technology	4	.....	.....
10.00 Total new obligations	16	13	.....

General and special funds—Continued

CONSTRUCTION OF FACILITIES—Continued

Program and Financing (in millions of dollars)—Continued

Identification code 80–0107–0–1–999	1999 actual	2000 est.	2001 est.
Budgetary resources available for obligation:			
21.40 Unobligated balance available, start of year	29	13	.....
23.95 Total new obligations	−16	−13	.....
24.40 Unobligated balance available, end of year	13	.....	.....
Change in unpaid obligations:			
72.40 Unpaid obligations, start of year: Obligated balance, start of year	30	18	6
73.10 Total new obligations	16	13	.....
73.20 Total outlays (gross)	−27	−25	−6
73.40 Adjustments in expired accounts (net)	−1	.....	.....
74.40 Unpaid obligations, end of year: Obligated balance, end of year	18	6	.....
Outlays (gross), detail:			
86.93 Outlays from discretionary balances	27	25	6
Net budget authority and outlays:			
89.00 Budget authority	.....	.....	.....
90.00 Outlays	26	25	6

Since FY 1995 NASA's Construction of Facilities activities have been performed in Human Space Flight; Science, Aeronautics and Technology; and Mission Support. This account shows spending from balances prior to the account restructuring.

Object Classification (in millions of dollars)

Identification code 80–0107–0–1–999	1999 actual	2000 est.	2001 est.
25.2 Other services	1	1	.....
32.0 Land and structures	15	12	.....
99.9 Total new obligations	16	13	.....

RESEARCH AND PROGRAM MANAGEMENT

Program and Financing (in millions of dollars)

Identification code 80–0103–0–1–999	1999 actual	2000 est.	2001 est.
Change in unpaid obligations:			
72.40 Unpaid obligations, start of year: Obligated balance, start of year	1	.....	.....
73.40 Adjustments in expired accounts (net)	−1	.....	.....
Net budget authority and outlays:			
89.00 Budget authority	.....	.....	.....
90.00 Outlays	.....	.....	.....

Since FY 1995 NASA's Research and Program Management activities have been performed in Mission Support. This account shows spending from balances prior to the account restructuring.

OFFICE OF INSPECTOR GENERAL

For necessary expenses of the Office of Inspector General in carrying out the Inspector General Act of 1978, as amended, [$20,000,000] *$22,000,000. (Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2000.)*

Program and Financing (in millions of dollars)

Identification code 80–0109–0–1–252	1999 actual	2000 est.	2001 est.
Obligations by program activity:			
10.00 Total new obligations	20	20	22
Budgetary resources available for obligation:			
22.00 New budget authority (gross)	20	20	22
23.95 Total new obligations	−20	−20	−22
New budget authority (gross), detail:			
Discretionary:			
40.00 Appropriation	20	20	22
Change in unpaid obligations:			
72.40 Unpaid obligations, start of year: Obligated balance, start of year	2	3	5
73.10 Total new obligations	20	20	22
73.20 Total outlays (gross)	−19	−20	−21
74.40 Unpaid obligations, end of year: Obligated balance, end of year	3	5	5
Outlays (gross), detail:			
86.90 Outlays from new discretionary authority	18	18	19
86.93 Outlays from discretionary balances	1	2	2
87.00 Total outlays (gross)	19	20	21
Net budget authority and outlays:			
89.00 Budget authority	20	20	22
90.00 Outlays	19	20	21

The mission of the Office of Inspector General is to conduct audits and investigations of agency activities. The Inspector General keeps the Administrator informed of problems and deficiencies in agency programs and operations.

The 2002 budget estimate for this account is $22 million.

Object Classification (in millions of dollars)

Identification code 80–0109–0–1–252	1999 actual	2000 est.	2001 est.
11.1 Personnel compensation: Full-time permanent	15	16	17
12.1 Civilian personnel benefits	3	3	3
21.0 Travel and transportation of persons	1	1	2
25.2 Other services	1	.....	.....
99.9 Total new obligations	20	20	22

Personnel Summary

Identification code 80–0109–0–1–252	1999 actual	2000 est.	2001 est.
1001 Total compensable workyears: Full-time equivalent employment	191	210	213

Trust Funds

SCIENCE, SPACE, AND TECHNOLOGY EDUCATION TRUST FUND

Unavailable Collections (in millions of dollars)

Identification code 80–8978–0–7–503	1999 actual	2000 est.	2001 est.
Balance, start of year:			
01.99 Balance, start of year	18	15	15
Receipts:			
02.01 Earnings on investments; Science, Space and Technology Education, Trust Fund	−2	1	1
04.00 Total: Balances and collections	16	16	16
Appropriation:			
05.01 Science, space, and technology education trust fund	−1	−1	−1
07.99 Total balance, end of year	15	15	15

Program and Financing (in millions of dollars)

Identification code 80–8978–0–7–503	1999 actual	2000 est.	2001 est.
Obligations by program activity:			
10.00 Total new obligations (object class 41.0)	1	.....	.....
Budgetary resources available for obligation:			
22.00 New budget authority (gross)	1	1	1
23.95 Total new obligations	−1	.....	.....

	New budget authority (gross), detail:			
	Mandatory:			
60.27	Appropriation (trust fund, indefinite)	1	1	1
	Change in unpaid obligations:			
73.10	Total new obligations	1	.....	.....
73.20	Total outlays (gross)	−1	−1	−1
	Outlays (gross), detail:			
86.97	Outlays from new mandatory authority	1	1	1
	Net budget authority and outlays:			
89.00	Budget authority	1	1	1
90.00	Outlays	1	1	1
	Memorandum (non-add) entries:			
92.01	Total investments, start of year: U.S. securities: Par value	17	13	17
92.02	Total investments, end of year: U.S. securities: Par value	13	17	17

Administrative Provisions

Notwithstanding the limitation on the availability of funds appropriated for "Human space flight", "Science, aeronautics and technology", or "Mission support" by this appropriations Act, when any activity has been initiated by the incurrence of obligations for construction of facilities as authorized by law, such amount available for such activity shall remain available until expended. This provision does not apply to the amounts appropriated in "Mission support" pursuant to the authorization for [repair, rehabilitation and modification of facilities,] minor *revitalization and* construction of [new facilities and additions to existing] facilities, and facility planning and design.

Notwithstanding the limitation on the availability of funds appropriated for "Human space flight", "Science, aeronautics and technology", or "Mission support" by this appropriations Act, the amounts appropriated for construction of facilities shall remain available until September 30, [2002] *2003*.

Notwithstanding the limitation on the availability of funds appropriated for "Mission support" and "Office of Inspector General", amounts made available by this Act for personnel and related costs and travel expenses of the National Aeronautics and Space Administration shall remain available until September 30, [2000] *2001* and may be used to enter into contracts for training, investigations, costs associated with personnel relocation, and for other services, to be provided during the next fiscal year. *Funds for announced prizes otherwise authorized shall remain available, without fiscal year limitation, until the prize is claimed or the offer is withdrawn.*

[Unless otherwise provided for in this Act or in the joint explanatory statement of the committee of conference accompanying this Act, no part of the funds appropriated for "Human space flight" may be used for the development of the International Space Station in excess of the amounts set forth in the budget estimates submitted as part of the budget request for fiscal year 2000.] *(Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2000.)*

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Federal Funds

General and special funds:

HUMAN SPACE FLIGHT

(INCLUDING TRANSFER OF FUNDS)

For necessary expenses, not otherwise provided for, in the conduct and support of human space flight research and development activities, including research, development, operations, *support* and services; maintenance; construction of facilities including *repair, rehabilitation,* revitalization and modification of facilities, construction of new facilities and additions to existing facilities, facility planning and design, *environmental compliance and restoration,* and acquisition or condemnation of real property, as authorized by law; space flight, spacecraft control and communications activities including operations, production, and services; *program management; personnel and related costs, including uniforms or allowances therefor, as authorized by U.S.C. 5901–5902; travel expenses; purchase and hire of passenger motor vehicles; not to exceed $20,000 for official reception and representation expenses;* and purchase, lease, charter, maintenance and operation of mission and administrative aircraft, [$5,462,900,000] *$7,296,000,000*, to remain available until September 30, [2002] *2003, of which amounts as determined by the Administrator for salaries and benefits; training, travel and awards; facility and related costs; information technology services; science, engineering, fabricating and testing services; and other administrative services may be transferred to the Science, Aeronautics and Technology account in accordance with section 312(b) of the National Aeronautics and Space Act of 1958, as amended by Public Law 106–377: Provided, That the authorized funding level for the International Space Station through fiscal year 2006 shall not exceed $8,197,300,000 except in amounts equal to budget reductions in other Human Space Flight programs. (Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2001, as enacted by section 1(a)(1) of P.L. 106–377.)*

Program and Financing (in millions of dollars)

Identification code 80–0111–0–1–252		2000 actual	2001 est.	2002 est.
	Obligations by program activity:			
	Direct program:			
00.01	Space station	2,530	2,057	2,043
00.02	Payload and ELV support	.....	99	96
00.03	Investments and support	.....	123	1,271
00.04	Space shuttle	3,001	3,079	3,167
00.05	Payload and utilization operations	160	14	.....
00.06	Space operations	.....	.....	458
00.07	Safety, mission assurance & engineering	.....	.....	46
09.01	Reimbursable program	164	163	201
10.00	Total new obligations	5,855	5,535	7,282
	Budgetary resources available for obligation:			
21.40	Unobligated balance carried forward, start of year	368	167	246
22.00	New budget authority (gross)	5,652	5,614	7,497
22.10	Resources available from recoveries of prior year obligations	2	.....	.....
23.90	Total budgetary resources available for obligation	6,022	5,781	7,743
23.95	Total new obligations	−5,855	−5,535	−7,282
24.40	Unobligated balance carried forward, end of year	167	246	461
	New budget authority (gross), detail:			
	Discretionary:			
40.00	Appropriation	5,511	5,463	7,296
40.76	Reduction pursuant to P.L. 106–113	−23	.....	.....
40.77	Reduction pursuant to P.L. 106–554 (0.22 percent)	.....	−12	.....
43.00	Appropriation (total discretionary)	5,488	5,451	7,296
	Spending authority from offsetting collections:			
68.00	Offsetting collections (cash)	169	163	201
68.10	Change in uncollected customer payments from Federal sources	−5	.....	.....
68.90	Spending authority from offsetting collections (total discretionary)	164	163	201
70.00	Total new budget authority (gross)	5,652	5,614	7,497
	Change in unpaid obligations:			
	Unpaid obligations, start of year:			
72.40	Unpaid obligations, start of year	1,652	1,833	1,784
72.95	Uncollected customer payments from Federal sources, start of year	−25	−20	−20
72.99	Obligated balance, start of year	1,627	1,813	1,764
73.10	Total new obligations	5,855	5,535	7,282
73.20	Total outlays (gross)	−5,666	−5,584	−7,030
73.40	Adjustments in expired accounts (net)	−6	.....	.....
73.45	Recoveries of prior year obligations	−2	.....	.....
74.00	Change in uncollected customer payments from Federal sources	5	.....	.....
	Unpaid obligations, end of year:			
74.40	Unpaid obligations, end of year	1,833	1,784	2,036
74.95	Uncollected customer payments from Federal sources, end of year	−20	−20	−20
74.99	Obligated balance, end of year	1,813	1,764	2,016
	Outlays (gross), detail:			
86.90	Outlays from new discretionary authority	3,783	3,799	5,177
86.93	Outlays from discretionary balances	1,883	1,785	1,853
87.00	Total outlays (gross)	5,666	5,584	7,030
	Offsets:			
	Against gross budget authority and outlays:			
	Offsetting collections (cash) from:			
88.40	Non-Federal sources	−31	−30	−35
88.45	Offsetting governmental collections from the public	−138	−133	−166
88.90	Total, offsetting collections (cash)	−169	−163	−201
	Against gross budget authority only:			
88.95	Change in uncollected customer payments from Federal sources	5	.....	.....
	Net budget authority and outlays:			
89.00	Budget authority	5,488	5,451	7,296
90.00	Outlays	5,498	5,421	6,829

Note.—Includes $1,712 million in budget authority in 2002 for activities previously financed from:

	2000	*2001*
Mission Support (in millions of dollars)	1,566	1,715

This appropriation provides funding for Human Space Flight (HSF) activities, and for Safety, mission assurance and engineering activities supporting the Agency. The HSF activities include development and operations of the Space Station, the Space Station research program, and operation of the Space Shuttle. This includes development of contingency capabilities for the Space Station, high priority investments to improve the safety of the Space Shuttle, and required construction projects in direct support of Space Station and Space Shuttle programs. This appropriation also provides for salaries and related expenses; design, repair, rehabilitation, and modification of facilities and construction of new facilities; maintenance, and operation of facilities; and other operations activities supporting human space flight programs; and space operations, safety, mission assurance and engineering activities that support the Agency.

In FY 2000 and FY 2001, the Human Space Flight (HSF) account provided only for the *direct* funding of human space flight activities; space operations services had been funded within the Science, Aeronautics and Technology (SAT) account; and Safety, mission assurance and engineering had been funded within the Mission Support account. Beginning

General and special funds—Continued

HUMAN SPACE FLIGHT—Continued

(INCLUDING TRANSFER OF FUNDS)—Continued

in FY 2002, other than direct costs (which includes Research and Program Management and non-programmatic Construction of Facilities) will be allocated to either the HSF or the SAT account based on the number of full time equivalent people, and there will no longer be a Mission Support account.

Performance Objectives

Space station.—The International Space Station (ISS) is an international laboratory in low Earth orbit on which American, Russian, Canadian, European, and Japanese astronauts will conduct unique scientific and technological investigations in a microgravity environment. The goal of the Station is to support activities requiring the unique attributes of humans in space and establish a permanent human presence in Earth orbit. The proposed budget provides funding for the continued development of the vehicle and its research components and for current operations, assembly and utilization of the station. With several assembly missions successfully completed, the budget includes funding to keep subsequent assembly missions on schedule through U.S. Core Station Complete, currently planned for late 2003-early 2004, and for early research commensurate with the build-up of on-orbit utilization capabilities and resources.

Between January 2000 and January 2001, the Russian Service Module, the Z1 and SO trusses, the control moment gyros, the first photo-voltaic array and battery sets, initial thermal radiators, communication equipment, and the U.S. Laboratory were assembled on-orbit. A permanent human presence in space was achieved with the launch of Expedition 1. The first phases of multi-element integrated testing (MEIT) were completed. Crew training, payload processing, hardware element processing, and mission operations were supported. During the remainder of 2001, Expedition 2 will be deployed, and Phase 2 of the station assembly will be completed with the launch of the airlock. Preparations will continue for the start of Phase 3 and the first shuttle mission dedicated to research utilization is expected to be launched in mid-2002.

Russian Program Assurance (RPA) is contained within the Space Station budget and provides funding for contingency activities to address ISS program requirements resulting from delays or shortfalls on the part of Russia in meeting its commitments to the ISS program. Key elements of the RPA program have been the Interim Control Module (ICM), developed by the U.S. Naval Research Laboratory (NRL), and the U.S. Propulsion Module. With the successful launch of the Russian Service Module, and escalating costs for Space Station, including RPA components, NASA reassessed its Space Station priorities and the need for planned RPA hardware. In FY 2000, the ICM was placed in "call-up" mode and stored at NRL. Work on the original Propulsion Module design was terminated, and in FY 2001 funds for the Propulsion Module were redirected to cover cost increases in the baseline program. This left logistics contingency funding and funds for potential procurement of safety-related Russian goods and services in the RPA budget. Based on recent operational experience, continuing flight software and hardware integration issues, obsolescence issues, and realization that earlier assembly phase cost estimates were low, NASA concluded that the program baseline could not be executed on schedule within approved funding levels. A reassessment of the ISS Program budget baseline was started in FY 2000 and continued into FY 2001. The initial results, based on conservative estimating assumptions, showed a budget shortfall of up to $4 billion over 5 fiscal years. To remain within the Agency's budget marks, NASA redirected funds from remaining high-risk, high-cost hardware development, including the Habitation Module and Crew Return Vehicle (CRV), as well as funds from the RPA budget mentioned above, to ensure that ISS would stay within budget, while assembly continues though U.S. Core Station Complete (deployment of Node 2 on flight 10A). This will allow for the integration of flight hardware being provided by the International Partners. In addition, the ISS Research Program is being realigned to match the on-orbit capability build-up as the program moves toward U.S. Core Complete. NASA will continue to pursue atmospheric testing of the X-38 and is assessing the affordability of completing the space flight test relative to other program priorities. Options for provision of a crew return capability and Habitat capability to support the desired increase in crew size from 3 to 6 will be discussed with the international partners. However, U.S. contributions to such capabilities will be dependent on the availability of funds within the President's five-year budget plan for Human Space Flight, technical risks, and the Administration's confidence in Agency cost estimates.

Over the next several years, the Agency will press ahead with ISS assembly and the integration of the partners' research modules. Research operations on board the ISS have been expanding since they began in FY 2000 and will greatly exceed any previous capabilities for research in space including Skylab, Shuttle, or Mir.

Payload and Expendable Launch Vehicle (ELV) support.—During 2001, six pallets will be used in Space Shuttle missions. In FY 2001 and FY 2002, over 20 major and secondary payloads will be supported, including major hardware for ISS assembly. The ELV Mission Support budget provides funds for acquiring requisite launch services to meet all NASA requirements and for technical insight of commercially provided launch services. Advanced mission design/analysis and leading edge integration services are provided for the full range of NASA missions under consideration for launch on ELVs. During FY 2000, six ELV missions were successfully launched. Integration and technical management of 13 missions are planned for launch in FY 2001. In FY 2002 support for eight missions is planned.

Investments and support.—The Human Exploration and Development of Space (HEDS) Technology and Commercialization Initiative (HTCI) began in FY 2001. HTCI will continue in FY 2002 to focus on human space exploration and development activities emphasizing highly innovative technologies, advances in science, and enabling synergistic commercial space development efforts.

Project activity will continue in FY 2002 to ensure NASA's rocket propulsion test capabilities are properly managed and maintained in world class condition. The project will significantly enhance our ability to properly manage NASA's rocket testing activities and infrastructure across all four participating NASA centers.

Engineering and technical base (ETB) activity will continue to support the institutional capability in the operation of space flight laboratories, technical facilities, and testbeds; to conduct independent safety, and reliability assessments; and to stimulate science and technical competence in the United States.

Funding for other direct costs associated with Human Space Flight, which were previously funded in the Mission Support account, are now funded as part of investments and support. This includes research and program management costs and non-programmatic construction of facilities costs.

Space shuttle.—The Space Shuttle is a partially reusable space vehicle that provides several unique capabilities to the United States space program. These include retrieving payloads from orbit for reuse, servicing and repairing satellites in space, safely transporting humans to and from space, launching ISS components and providing an assembly platform in space, and operating and returning space laboratories. In FY 2000, the Space Shuttle launched four flights success-

fully including the emergency HST Servicing Mission 3A which replaced failing gyros on the HST and the Shuttle Radar Topography Mission (SRTM), a joint DOD/NASA payload to study the earth. The Space Shuttle also visited the ISS two more times, for both assembly and maintenance.

Seven flights are planned during FY 2001, all of which are ISS assembly and servicing missions. The first crew began permanent occupation and presence aboard the ISS in FY 2001. In FY 2002, seven flights are planned including a dedicated microgravity research flight and another HST Servicing Mission (HST-3B) and five ISS assembly and servicing missions.

Space operations.—The primary goal of space operations is to provide highly reliable and cost-effective space operations services in support of NASA's science and aeronautics programs. In addition, support is provided to interagency, international, and commercial space-faring enterprising on a reimbursable basis. The Space Communications program is composed of Operations, Mission and Data Service Upgrades, Tracking and Data Relay Satellite Replenishment, and Technology Projects, as well as spectrum management and data standards coordination. Services are provided to a large number of NASA missions including planetary and interplanetary missions; human space flight missions, near-earth and earth orbiting missions; and sub-orbital and aeronautical flight tests. A Consolidated Space Operations Contract (CSOC) was successfully implemented by the Space Operations Management Office at Johnson Space Center and the Lockheed Martin Space Operations Company. The CSOC provides end-to-end mission and data services to both NASA and non-NASA customers. A total of nine contracts have been consolidated to date, and seven further contracts are to be consolidated in FY 2001 and FY 2002. Management responsibility for all Wide Area Network data distribution services for all human space flight, earth orbiting and deep space missions and NASA administrative communications was outsourced by CSOC in FY 2000. Development of the TDRS Replenishment Spacecraft is ongoing, with the first satellite launched in FY 2000.

Safety, mission assurance and engineering.—The goal of this program is to invest in the safety and success of NASA missions by assuring that sound and robust policies, processes, and tools for safety, reliability, quality assurance, and engineering disciplines are in place and applied throughout NASA. The program also examines long-term technology requirements for NASA's strategic objectives.

The FY 2003 budget estimate for this account is $6.9 billion.

Object Classification (in millions of dollars)

Identification code 80–0111–0–1–252		2000 actual	2001 est.	2002 est.
	Direct obligations:			
	Personnel compensation:			
11.1	Full-time permanent	.....	.....	613
11.3	Other than full-time permanent	.....	.....	8
11.5	Other personnel compensation	.....	.....	19
11.8	Special personal services payments	.....	.....	6
11.9	Total personnel compensation	.....	.....	646
12.1	Civilian personnel benefits	.....	.....	138
13.0	Benefits for former personnel	.....	.....	467
21.0	Travel and transportation of persons	.....	.....	24
22.0	Transportation of things	3	4	4
23.1	Rental payments to GSA	.....	.....	5
23.2	Rental payments to others	2	2	2
23.3	Communications, utilities, and miscellaneous charges	31	55	59
24.0	Printing and reproduction	2	2	2
25.1	Advisory and assistance services	74	5	5
25.2	Other services	190	131	142
25.3	Purchases of goods and services from Government accounts	109	124	134
25.4	Operation and maintenance of facilities	235	1,378	1,489
25.5	Research and development contracts	4,585	3,199	3,454
25.7	Operation and maintenance of equipment	41	43	46
26.0	Supplies and materials	199	147	159
31.0	Equipment	92	94	102
32.0	Land and structures	77	145	157
41.0	Grants, subsidies, and contributions	51	43	46
99.0	Subtotal, direct obligations	5,691	5,372	7,081
99.0	Reimbursable obligations	164	163	201
99.9	Total new obligations	5,855	5,535	7,282

Personnel Summary

Identification code 80–0111–0–1–252		2000 actual	2001 est.	2002 est.
	Direct:			
1001	Total compensable workyears: Full-time equivalent employment	.....	.....	7,922
	Reimbursable:			
2001	Total compensable workyears: Full-time equivalent employment	.....	.....	48

Science, Aeronautics and Technology

(INCLUDING TRANSFER OF FUNDS)

For necessary expenses, not otherwise provided for, in the conduct and support of science, aeronautics and technology research and development activities, including research, development, operations, *support* and services; maintenance; construction of facilities including *repair, rehabilitation,* revitalization, and modification of facilities, construction of new facilities and additions to existing facilities, facility planning and design *environmental compliance and restoration,* and acquisition or condemnation of real property, as authorized by law; space flight, spacecraft control and communications activities including operations, production, and services; *program management; personnel and related costs, including uniforms or allowances therefor, as authorized by 5 U.S.C. 5901–5902; travel expenses; purchase and hire of passenger motor vehicles; not to exceed $20,000 for official reception and representation expenses;* and purchase, lease, charter, maintenance and operation of mission and administrative aircraft, **[**$6,190,700,000**]** *$7,191,700,000*, to remain available until September 30, **[**2002**]** *2003, of which amounts as determined by the Administrator for salaries and benefits; training, travel and awards; facility and related costs; information technology services; science, engineering, fabricating and testing services; and other administrative services may be transferred to the Human Space Flight account in accordance with section 312(b) of the National Aeronautics and Space Act of 1958, as amended by Public Law 106–377. (Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2001, as enacted by section 1(a)(1) of P.L. 106–377.)*

Program and Financing (in millions of dollars)

Identification code 80–0110–0–1–999		2000 actual	2001 est.	2002 est.
	Obligations by program activity:			
	Direct program:			
00.01	Space science	2,198	2,361	2,778
00.02	Biological and physical research	280	333	376
00.03	Earth science	1,439	1,474	1,502
00.04	Aerospace technology	1,125	1,369	2,353
00.05	Space operations	.....	500	26
00.06	Academic programs	137	146	143
00.07	Mission communication services	410	5	.....
09.01	Reimbursable program	432	600	680
10.00	Total new obligations	6,021	6,788	7,858
	Budgetary resources available for obligation:			
21.40	Unobligated balance carried forward, start of year	281	306	295
22.00	New budget authority (gross)	6,014	6,777	7,872
22.10	Resources available from recoveries of prior year obligations	31	.....	.....
23.90	Total budgetary resources available for obligation	6,326	7,083	8,167
23.95	Total new obligations	−6,021	−6,788	−7,858
23.98	Unobligated balance expiring or withdrawn	−1	.....	.....
24.40	Unobligated balance carried forward, end of year	306	295	309

General and special funds—Continued

SCIENCE, AERONAUTICS AND TECHNOLOGY—Continued

(INCLUDING TRANSFER OF FUNDS)—Continued

Program and Financing (in millions of dollars)—Continued

Identification code 80–0110–0–1–999	2000 actual	2001 est.	2002 est.
New budget authority (gross), detail:			
Discretionary:			
40.00 Appropriation	5,608	6,191	7,192
40.76 Reduction pursuant to P.L. 106–113	−26	.....	.....
40.77 Reduction pursuant to P.L. 106–554 (0.22 percent)	.....	−14	.....
43.00 Appropriation (total discretionary)	5,582	6,177	7,192
Spending authority from offsetting collections:			
68.00 Offsetting collections (cash)	540	600	680
68.10 Change in uncollected customer payments from Federal sources	−108	.....	.....
68.90 Spending authority from offsetting collections (total discretionary)	432	600	680
70.00 Total new budget authority (gross)	6,014	6,777	7,872
Change in unpaid obligations:			
Unpaid obligations, start of year:			
72.40 Unpaid obligations, start of year	3,194	3,155	3,598
72.95 Uncollected customer payments from Federal sources, start of year	−217	−109	−109
72.99 Obligated balance, start of year	2,977	3,046	3,489
73.10 Total new obligations	6,021	6,788	7,858
73.20 Total outlays (gross)	−6,017	−6,345	−7,528
73.40 Adjustments in expired accounts (net)	−12	.....	.....
73.45 Recoveries of prior year obligations	−31	.....	.....
74.00 Change in uncollected customer payments from Federal sources	108	.....	.....
Unpaid obligations, end of year:			
74.40 Unpaid obligations, end of year	3,155	3,598	3,928
74.95 Uncollected customer payments from Federal sources, end of year	−109	−109	−109
74.99 Obligated balance, end of year	3,046	3,489	3,819
Outlays (gross), detail:			
86.90 Outlays from new discretionary authority	3,028	3,386	4,398
86.93 Outlays from discretionary balances	2,989	2,960	3,131
87.00 Total outlays (gross)	6,017	6,345	7,528
Offsets:			
Against gross budget authority and outlays:			
Offsetting collections (cash) from:			
88.40 Non-Federal sources	−87	−60	−61
88.45 Offsetting governmental collections from the public	−453	−540	−619
88.90 Total, offsetting collections (cash)	−540	−600	−680
Against gross budget authority only:			
88.95 Change in uncollected customer payments from Federal sources	108	.....	.....
Net budget authority and outlays:			
89.00 Budget authority	5,582	6,177	7,192
90.00 Outlays	5,478	5,745	6,848

Note.—Includes $1,029 million in budget authority in 2002 for activities previously financed from:

	2000	*2001*
Mission support (in millions of dollars)	856	887

This appropriation provides for the science, aeronautics and technology (SAT) supporting the Agency. The SAT activities include space science, biological and physical research, earth science, aerospace technology, and academic programs. This appropriation also provides for salaries and related expenses; design, repair, rehabilitation, and modification of facilities and construction of new facilities; maintenance and operation of facilities; and other operations activities supporting science, aeronautics, and technology programs.

In FY 2000 and FY 2001, the SAT account provided only for the *direct* funding of science, aeronautics and technology activities, and included funding for space operations services which are now funded within the human space flight account. Beginning in FY 2002, other direct costs (which include Research and Program Management and non-programmatic Construction of Facilities) will be allocated to either the HSF or the SAT account based on the number of full time equivalent personnel, and there will no longer be a Mission Support account.

Performance Objectives

Space science.—The Space Science program seeks to answer fundamental questions concerning: the galaxy and the universe; the connection between the Sun, Earth and heliosphere; the origin and evolution of planetary systems; and the origin and distribution of life in the universe. The Space Science program is comprised of a base program of research and development activities, including research and flight mission activities, and major space-based facilities.

In 2000, the Space Science program produced many notable scientific accomplishments. Scientists using data from NASA's Mars Global Surveyor spacecraft camera found features that suggest there may be current sources of liquid water at or near the surface of the red planet. The water supply may be about 100 to 400 meters (300 to 1,300 feet) below the surface, and limited to specific regions across the planet. Additional MGS images revealed layers of sedimentary rock that paint a portrait of an ancient Mars that long ago may have featured numerous lakes and shallow seas. These regions of sedimentary layers on Mars are spread out and scattered around the planet.

Solar and Heliospheric Observatory (SOHO) scientists have, for the first time, imaged solar storm regions on the side of the Sun facing away from the Earth. A week's advance warning of potential bad weather in space is now possible thanks to these SOHO measurements. Detailed images from the Transition Region and Coronal Explorer (TRACE) mission of giant fountains of fast-moving, multimillion-degree gas in the outermost atmosphere of the Sun have revealed an important clue to a long-standing mystery—the location of the heating mechanism that makes the corona 300 times hotter than the Sun's visible surface. Scientists are interested in the corona, which appears as a halo of light seen by the unaided eye during a total solar eclipse, because eruptive events in this region can disrupt high-technology systems on Earth. Astronomers also hope to use the solar corona studies to better understand other stars.

The balloon-borne BOOMERANG sub-millimeter telescope mapped the faint light left over from the Big Bang, revealing the earliest structure in the Universe that later became the vast, soap bubble-shaped clusters of galaxies that astronomers observe today. BOOMERANG confirmed that the Universe is flat (Euclidean) and that the expansion of the universe is accelerating.

The Shoemaker Near Earth Asteroid Rendezvous (NEAR) mission became the first spacecraft to orbit an asteroid on February 14, 2000. The mission has returned stunning images and other data of the asteroid Eros, resulting in numerous discoveries throughout the year. Most recently, NEAR made history again by becoming the first spacecraft ever to touch down on the surface of a small solar system body.

Scientists used the Chandra X-ray Observatory to examine a mid-mass black hole in the galaxy M82. This black hole may represent the missing link between smaller stellar black holes and the supermassive black holes found at the centers of galaxies. A Hubble Space Telescope census finds that the mass of a supermassive black hole is directly related to the size of a the bulge of stars at the center of its host galaxy. This suggests that the evolution of galaxies and their host black holes is intimately linked.

The Cassini spacecraft, on its way to meet Saturn in 2004, flew by Jupiter in December and performed joint science operations with Galileo.

The Imager for Magnetopause-to-Aurora Global Exploration (IMAGE) was successfully launched in March 2000, and has provided the first large-scale pictures of the Earth's magnetic field.

The NASA budget request for FY 2002 funds a robust program of Mars exploration for the next decade. Following the loss of the Mars Climate Orbiter and the Mars Polar Lander in 1999, an in-depth review of our Mars exploration program found significant flaws in program formulation and execution, and made recommendations for the future exploration of Mars. Consistent with those recommendations, we are pressing forward with the development of a set of future Mars missions to establish a sustained presence at Mars. By means of orbiters, landers, rovers and sample return missions, NASA's revamped campaign to explore Mars is poised to unravel the secrets of the red planet's past environments, the history of its rocks, the many roles of water and, possibly, evidence of past or present life. The Mars Global Surveyor entered Mars orbit in September 1997, and is still performing flawlessly. The 2001 Mars Odyssey will be launched in April 2001, and we have started development of the twin Mars Environmental Rovers for launch in 2003. Additional Mars Exploration Program funding provided in the President's FY 2002 Budget will enable: a robust 2005 Mars Reconnaissance Orbiter; a competitively selected 2007 Mars Scout mission; an accelerated 2009 Mars Mobile Laboratory mission; U.S. participation in foreign missions to Mars; and technologies for the next decade of robotic Mars missions.

Development activities continue on the Relativity (Gravity Probe-B) mission, which is now scheduled for launch in 2002, and the Space Infrared Telescope Facility (SIRTF), with launch planned for July 2002. Launch of the Thermosphere, Ionosphere, Mesosphere Energetics and Dynamics (TIMED) mission is expected to occur this summer (2001). Development activities on the Stratospheric Observatory for Infrared Astronomy (SOFIA) continue. Funding for the Hubble Space Telescope (HST) continues to support operations and preparations for the last planned Hubble servicing missions, servicing mission 3B in early FY 2002 and servicing mission 4 in FY 2004, when new science instruments will be installed.

In the Explorer program, development activities continue for the Microwave Anisotropy Probe (MAP), which will be launched in summer 2001; the Full-sky Astrometric Mapping Explorer (FAME), scheduled for launch in 2004, and Swift, a multi-wavelength observatory for gamma-ray burst astronomy, to be launched in 2003. Three Small (SMEX) missions continued development in FY 1999: the High Energy Spectroscopic Imager (HESSI) is to launch in spring 2001; the Galaxy Evolution Explorer (GALEX) will launch in early FY 2002; and the Two Wide-Angle Neutral Atom Spectrometers (TWINS) will be launched in 2002 and 2004.

In the Discovery program, the fourth mission, Stardust, was launched on schedule in February 1999, and is operating normally during its cruise to comet Wild-2, with the encounter scheduled for 2004. Two Discovery missions selected in 1997 are proceeding: the Comet Nucleus Tour (CONTOUR) began development in CY 2000 and will be launched in 2002; the Genesis solar wind sample return mission has nearly finished development and will be launched in summer 2001. Two new missions were selected for implementation during 1999: The MErcury Surface, Space ENvironment, GEochemistry and Ranging (MESSENGER) mission to orbit Mercury; and the Deep Impact mission to fly by and fire an impactor into a comet. Both MESSENGER and Deep Impact are planned for launch in 2004.

The New Millennium program is providing flight demonstrations of critical new technologies which will reduce the mass and cost of future science and spacecraft subsystems, while maintaining or improving mission capabilities. In 1999, NASA selected the Nanosat Constellation Trailblazer as the Space Technology-5 New Millennium mission. This mission will feature three very small satellites (each about the size of a large birthday cake), that will fly in formation and test eight technologies in the harsh space environment near the boundary of Earth's protective magnetic field. The Flight Validation program has been restructured to enhance openness and competition as well as to increase the number of opportunities for technologies to be flight-validated. An Announcement of Opportunity for Space Technology-6 technologies was recently released, and in January 2001, eight teams from industry, universities and NASA centers were selected to develop new technology concepts, such as advanced solar power and optical communications, for future NASA missions. The teams will study flight test options during a six-month phase for defining the technology concepts. NASA then plans to select up to five of the concepts for Space Technology–6 (ST–6), the next New Millennium Program project, which will flight-test the new technology concepts in 2003 and 2004.

The President's FY 2002 Budget also provides funding for a new Planetary Propulsion program. This program will competitively develop advanced propulsion systems that will reduce the flight time for future robotic missions to the planets and other science targets in the solar system.

Biological and Physical Research.—In FY 2001, the Office of Biological and Physical Research (OBPR) was created as an independent research organization and a fifth strategic enterprise, by the restructuring of the Office of Life and Microgravity Sciences and Applications (OLMSA). The Enterprise uses the unique environment of space to understand the effect of gravity on biological systems and to conduct research in the areas of fluid physics, combustion science, fundamental physics, materials science and biotechnology.

In FY 2000, Space Shuttle Mission STS-101 flew two commercial research payloads which grew large biological crystals in space and investigated the effects of microgravity on the efficiency of genetically transforming plant seeds. Also during FY 2000, the Protein Crystal Growth-Enhanced Gaseous Nitrogen Dewar (PCG-EGN), was used aboard ISS to crystallize proteins for later analysis.

In FY 2001, the first rack of the Human Research Facility (HRF) will be deployed to the International Space Station, and OBPR will begin initial operations of this facility. Construction continues on the Booster Applications Facility at Brookhaven National Laboratory. In FY 2001, research in bioastronautics increased to accelerate development of countermeasures that will improve the health and safety of astronauts aboard the International Space Station (ISS). Devices and countermeasures developed through this initiative may also have many health benefits on Earth. The first four commercial research payloads, investigating antibiotic production, protein crystal growth, agricultural research, and materials research, will be flown on the International Space Station in FY 2001.

During FY 2002, OBPR will continue to demonstrate key technology capabilities for human support, such as advanced techniques for water processing, solid waste processing, air revitalization, biomass production, food processing, and thermal control. In addition, the office will continue work in fundamental biology and bioastronautics to increase knowledge and address critical questions in crew health and safety by conducting investigations on the Space Shuttle and ISS. These will include investigations of the effect of microgravity on skeletal myofibers, avian development in space, the effects of microgravity on bone as a function of age, changes in gene expression in bacteria in space, and the effects of gravity on plant photosynthesis and respiration. New research projects will be selected in the areas of biotechnology, fluid

General and special funds—Continued

SCIENCE, AERONAUTICS AND TECHNOLOGY—Continued

(INCLUDING TRANSFER OF FUNDS)—Continued

physics, and materials science, and commercial payloads will be flown on both the Shuttle and aboard ISS.

Earth Science.—The mission of NASA's Earth Science Enterprise (ESE) is to develop a scientific understanding of the Earth system and its response to natural and human-induced changes to enable improved prediction of climate, weather and natural hazards for present and future generations. ESE seeks to answer a question of fundamental importance to science and society: *How is the Earth system changing, and what are the consequences for life on Earth?* To do so ESE is developing the interdisciplinary research field of Earth System Science, which recognizes that the Earth's land surface, oceans, atmosphere, ice sheets, and life itself all interact in a highly dynamic system. Earth system science is an area of research with immense benefit to the Nation, leading to new knowledge and tools that may improve weather forecasting, agriculture, urban and regional planning, environmental quality, and natural disaster management. ESE has established three goals to pursue in order to fulfill its mission: (1) Science—observe, understand, and model the Earth system to learn how it is changing, and the consequences for life on Earth; (2) Applications—expand and accelerate the realization of economic and societal benefits from Earth science, information, and technology; (3) Technology—develop and adopt advanced technologies to enable mission success and serve national priorities.

In ESE Science, 2000 was another year of substantial accomplishment toward understanding the Earth system. In an 11-day Space Shuttle mission, a new inteferometric synthetic aperture radar technique collected data sufficient to produce the first detailed topographic map of the entire land surface of the Earth between 60°N and 56°S. Landsat 7 completed a global survey of land cover, and the Terra satellite observed the global land and ocean biosphere as it underwent seasonal changes, and showed that snow cover over North America was substantially below normal following the warmest winter on record. The QuikSCAT satellite observed a Connecticut-size iceberg break off of the Antarctic polar ice sheet, and the US and Canada mapped Antarctica for the second time with space-based radar in order to compare with the first and determine rates of change. Using data from the US/Japan Tropical Rainfall Measuring Mission, researchers determined that air pollution affects rainfall rates downwind of its sources. Also in 2000, ESE formulated a new Research Strategy for 2000–2010 to guide research over the next decade, identifying 23 societally important research questions in the Earth system paradigm of variability, forcing, response, consequence and prediction. This Research Strategy will guide ESE's science activities and investments over the next decade.

In ESE Applications, ESE has entered into a variety of partnerships that will demonstrate the goods and services made possible by ESE's research. ESE provides QuikSCAT data in real time to NOAA to improve marine weather forecasting, and has used these data to show that severe storms forming over the oceans can be predicted two days in advance. ESE is working with FEMA to use remote sensing tools to update their flood plain maps throughout the US. In a partnership called AG 2020 with USDA and four growers associations representing 100,000 farmers, ESE is demonstrating how to increase crop productivity, reduce risks to crop health, and manage environmental impacts. With the National Institutes of Health, we are exploring the use of satellite data to predict spread of infectious diseases such as malaria that are highly influenced by weather and climate. Throughout the summer, three ESE satellites tracked devastating wildfires in the western US, providing data to the US Forest Service and regional authorities. ESE held three regional workshops across the US to plan the next generation of applications demonstration projects with State and local governments in infrastructure planning and related topics.

In ESE Technology, the Enterprise launched its first New Millennium Program satellite to demonstrate a variety of new technologies for Earth Science. These include a new instrument to produce a Landsat-type sensor one-fourth the size of the current Landsat 7 instrument, and the first hyperspectral imager in space, which views the land surface in hundreds of spectral channels rather than the conventional 5 to 7. Sponsored technology research with universities, industry and other government laboratories moved 20 different remote sensing instrument concepts one step closer to reality on an established scale of technology maturity. These will substantially reduce the cost and enhance the capability of new satellites over the next decade or more.

ESE is in the midst of deployment of the Earth Observing System (EOS), a set of spacecraft and associated interdisciplinary science investigations to initiate a long-term data set of key parameters required for the study of global climate change. The first four EOS satellites are already in orbit, including the flagship Terra mission launched in 1999. The remaining EOS satellites will be launched through 2003, including Aqua (2001) to study the water cycle and atmospheric circulation, and Aura (2003) to probe the chemistry of the upper and lower atmosphere. Complementing EOS is a series of small, focused Earth System Science Pathfinder missions to explore Earth system processes never before examined globally from space. Data from the EOS satellites already in orbit are being acquired, processed, and distributed by the EOS Data and Information System (EOSDIS), which is currently handling more than 1 terabyte of data per day. EOSDIS handled 1.5 million user queries for over 8 million products in 2000. EOSDIS continues to evolve as new satellites are launched, and as new partners are added to produce data products with innovative applications.

As it deploys EOS, ESE is also planning for the future. For example, a Landsat Data Continuity Mission is being formulated in partnership with USGS, and will be implemented as a commercial data purchase, if possible. ESE is also planning for the transition of several of its key research observations to the Nation's weather satellite system. The DoD, NOAA and NASA have established an Integrated Program Office (IPO) to create a converged civilian and military weather satellite system called the National Polar-orbiting Operational Environmental Satellite System (NPOESS) to replace the present generation of separate systems. NASA and the IPO are jointly funding the NPOESS Preparatory Project (NPP) that will simultaneously continue key measurements begun by EOS and demonstrate instruments for NPOESS. The NPP will save money for both organizations by combining essential atmospheric and Earth surface observations on a single platform, and by seeking to meet both climate science and operational weather requirements with the same advanced instruments.

ESE data products and research are a major contribution to the US Global Change Research Program, an interagency collaboration overseen by the Committee on Natural Resources of the National Science and Technology Council. Because Earth science is inherently global in scope, ESE is engaged in a variety of international partnerships with individual nation's space agencies, and with international consortia such as the World Meteorological Organization. ESE seeks and receives scientific advice on a broad range of topics from the various boards and committees of the National Research Council. These partnerships, together with those above, ensure that NASA's Earth Science Enterprise conducts research at the frontiers of Earth science on questions of practical importance to the Nation.

Aerospace Technology.—The mission of this Enterprise is to pioneer the identification, development, verification, transfer, application, and commercialization of high-payoff aerospace technologies. Through its research and technology accomplishments, Aerospace Technology promotes economic growth and national security by supporting a safe, efficient national aviation system and affordable, reliable space transportation. In addition, the Aerospace Technology Program supports the development of crosscutting technology to serve the needs of all NASA Enterprises. To meet this challenge, the Enterprise has established three main technology goals and one goal for commercialization. Within the three technology goals a set of objectives has been defined to address current and future National needs. The technologies associated with these objectives are pre-competitive, long-term, high-risk research endeavors with high payoff in terms of market growth, safety, low acquisition cost, consumer affordability and a cleaner environment. The first goal, *Revolutionize Aviation*, addresses the fundamental, systemic issues in the aviation system to ensure continued growth and development appropriate to the needs of the national and global economies. These systemic issues—safety, capacity, environmental compatibility, and mobility—cut across markets including large subsonic civil transports, air cargo, commuter and general aviation. NASA coordinates its investments and technology objectives in this area with the Federal Aviation Administration and the Department of Defense through the *National Research and Development Plan for Aviation Security, Efficiency, and Environmental Compatibility*. The second goal, *Advance Space Transportation*, will create a safe, affordable highway through the air and into space by improving safety, reliability, and operability, while significantly reducing the cost of space transportation systems. With the creation of the Integrated Space Transportation Plan (ISTP), NASA defined a single, integrated investment strategy for all its diverse space transportation efforts. The third goal, *Pioneer Technology Innovation*, is unique in that it focuses on broad, crosscutting innovations critical to a number of NASA missions and to the aerospace industry in general. Pursuing technology fields that are in their infancy today, developing the knowledge bases necessary to design radically new aerospace systems, and developing tools for efficient, high-confidence design and development, will enable a revolution in aerospace. The fourth goal, *Commercialize Technology*, is to extend the commercial application of NASA technology for economic benefit and improved quality of life. By partnering with both aerospace and non-aerospace industry as well as academia, the full range of NASA's assets—technological expertise, new technologies, and research facilities—are made available to help the Nation.

As planned in the FY 2001 budget request, the Administration's 2002 request includes an increase in funding for the 2nd Generation Reusable Launch Vehicle (RLV) Program, although this request is lower than last year's projections primarily due to reallocation of Crew Return Vehicle placeholder funding to the International Space Station. Low-cost space transportation remains the key enabler for a more aggressive civil space program. NASA's Integrated Space Transportation Planning activities have identified a strategy based upon competition, safety, industry leadership and affordable requirements. Funding supports aggressive technical risk reduction and advanced development for multiple reusable launch vehicle concepts. Identification and preliminary development of NASA-unique systems and near-term pursuit of technologies required for alternative access for key Space Station needs are also both critical elements of the Integrated Space Transportation Plan (ISTP). All of these efforts combined will move NASA closer to a full and open RLV competition in the middle of this decade to meet NASA's human space flight needs by the end of the decade. In FY 2001, NASA will make the first risk reduction activity awards to industry under the 2nd Generation RLV Program. These risk reduction activities will continue through FY 2002 and feed future steps toward the launch services competition at mid-decade. The President's FY 2002 Budget prescribes several key management reforms in areas like vehicle requirements and program integration that will help ensure the success of this important undertaking.

The Administration's request includes a significant investment in computing and information technology developments and also increases the investment in biotechnology and nanotechnology—the revolutionary technologies of the 21st Century. To ensure the highest quality research and strong ties to NASA's mission, these investments will be guided by technology development agreements signed by customers in other NASA Enterprises and subject to external, independent reviews. A significant portion of these investments will be externally competed. The Administration's request supports the implementation of six University-based Research, Education, and Training Institutes (RETIs). This will strengthen NASA's ties to the academic community through long-term sustained investment in areas of science and technology critical to NASA's future. To ensure the highest quality research and training and infusion of new ideas, these RETIs will be subject to independent, external reviews and recompetition at regular intervals, including mandatory sunsets after ten years. The Administration's request also supports a 21st Century aerospace vehicle technology program. This research will develop and verify critical technologies that provide leapfrog capabilities for aerospace vehicles that will be able to change their shape in flight like birds to optimize performance or perform complex maneuvers in complete safety, and be capable of self repair when damaged.

The President's request for NASA maintains investments in technology development activities that will address the challenges (safety, environmental impact, capacity, and noise reduction) that face the Nation's air system. As part of NASA's response to the national goal of reducing aircraft accidents by a factor of 5 by the end of FY 2007, NASA began a focused Aviation Safety Program (AvSP) in FY 2000 that builds on the extensive safety related activities of the Base Research and Technology (R&T) Programs. The base technologies provided the foundation for focused safety development efforts in the future, as well as some near-term achievements. For example, in FY 2000, AvSP produced an icing training program for general aviation and commuter pilots, completed a flight evaluation of an initial national capability for digital data link and graphical display of weather information, and demonstrated a concept for the integration of air traffic control runway incursion information onto aircraft flight deck displays. In FY 2001, the AvSP will complete a laboratory demonstration of a fuel system modification to reduce flammability, define the architecture for an integrated onboard health management system, and down-select synthetic vision concepts suitable for retrofit in commercial, business, and general aviation aircraft. The Base R&T Programs will continue to develop the technologies that will contribute to the FY 2007 goal. For example, in FY 2002, NASA will complete an interim progress assessment utilizing the technology products of the Aviation Safety program as well as related Aerospace Base R&T efforts to demonstrate potential to meet the National Goal.

NASA also continued its efforts to reduce the environmental impact associated with aviation systems. The Ultra Efficient Engine Technology (UEET) program is a focused program that began in FY 2000. UEET is planned and designed to develop high-payoff, high-risk technologies to enable the next breakthroughs in propulsion systems and to spawn a new generation of high-performance, operationally efficient and economical, reliable and environmentally compatible U.S. air-

General and special funds—Continued

SCIENCE, AERONAUTICS AND TECHNOLOGY—Continued

(INCLUDING TRANSFER OF FUNDS)—Continued

craft. In FY 2002, UEET will, in sector combustor tests, demonstrate initial 70% low NOx reduction, relative to 1996 International Civil Aviation Organization (ICAO) standards for Landing/Takeoff conditions in subsonic engines. Similarly, progress is being achieved in noise abatement efforts. In 2000, NASA validated the technologies required to reduce community noise impact by up to 10 dB relative to 1992 technology. In FY 2001 and FY 2002, NASA will: select engine system and airframe system technologies necessary to achieve a 3-dB aircraft system noise reduction beyond the 1997 baseline, establish the influence of wind and temperature gradients on community noise impact, and release the beta version of an improved advanced noise prediction code. Also in FY 2002, source diagnostics tests will be completed, giving engine component designers insight into the fundamental physics of the mechanisms that generate broadband fan noise. The data generated by these tests will be used to improve the computational algorithms used in computer codes to predict engine noise. The design of an advanced concept for reduced jet noise will be initiated for testing at laboratory scale later in the Quiet Aircraft Technology program.

In FY 2000, NASA's Aviation System Capacity program demonstrated technologies in a realistic Terminal Area environment, achieving a 12–15% increase in single-runway throughput and proving the ability to space aircraft closer than 3,400 feet on parallel runways while meeting all Federal Aviation Administration (FAA) safety criteria. In FY 2001, NASA will demonstrate transition airspace decision support tools for: (1) Air Traffic Control (ATC)/airline operations center and ATC/cockpit information exchange, and (2) conflict resolution. In FY 2002 NASA will demonstrate an interoperable suite of at least two decision support tools for arrival, surface and departure operations and begin an activity entitled AvSTAR which will undertake a Virtual Airspace Modeling project to produce a high-fidelity computer model of the Nation's aviation system. This model will help the FAA and NASA develop new operational concepts and better understand the benefits of new technologies for reducing aviation system congestion and delays while improving aviation safety.

Building on its world-record-setting performances, the Environmental Research Aircraft and Sensor Technology (ERAST) project modified the Centurion solar-powered remotely piloted aircraft (RPA) to a wingspan configuration of greater than 245 feet, renamed the aircraft Helios, and continued flight testing in FY 2000. This configuration will be more suitable for extreme endurance as well as short flights to the 100,000 ft. altitude. In FY 2001, the Flight Research program will demonstrate a solar-powered RPA at 100,000 ft and complete development of a heavyweight energy storage system under the ERAST project. Both achievements will demonstrate technologies that will provide atmospheric satellites for commercial use, disaster relief efforts such as communication relays and real time sensing, and will increase the Nation's capability to make scientific sampling high in the atmosphere. In FY 2002 flight validation of an experimental, consumable fuel, RPA design will enable an enhanced prototype vehicle that meets the prescribed set of Earth Science RPA platform requirements.

The Commercial Technology Program's focus in FY 2000 was continued investment of 10–20 percent of the NASA R&D budget in commercial partnerships with industry and a more efficiently administered program. Based on experience to date, these commercial partnerships are expected to increase the return on the Government's R&D investment, allowing NASA to do more with limited funds, and strengthening the international competitiveness of key industry sectors. In FY 2001 and 2002, the program will continue to emphasize innovative commercial partnerships with industry and continue to refine and enhance a technology and partnership database. In addition, the Small Business Innovative Research programs will pursue increased use and expanded commercial application of the developed technology.

Academic programs.—The goal of Academic Programs is educational excellence: NASA involves the educational community in our endeavors to inspire America's students, create learning opportunities, and enlighten inquisitive minds. NASA's Education Program brings students and educators at all levels into its missions and its research as participants and partners, providing opportunities for a diverse group of educators and students to experience first hand involvement with NASA personnel, facilities, and research and development activities. Academic Programs includes the Minority University Research Program, with a goal to expand NASA's research base by strengthening the research capabilities of minority universities and colleges; to contribute to the scientific and technological workforce; and to promote educational excellence. The range of activities conducted under this program will continue to capture the interest of all students in science and technology, develop talented students at the undergraduate and graduate levels, provide research opportunities for students and faculty members at NASA centers, and strengthen and enhance the research capabilities of the Nation's colleges and universities.

The 2003 budget estimate for this account is $8.1 billion.

Object Classification (in millions of dollars)

Identification code 80–0110–0–1–999		2000 actual	2001 est.	2002 est.
	Direct obligations:			
	Personnel compensation:			
11.1	Full-time permanent			814
11.3	Other than full-time permanent			10
11.5	Other personnel compensation			25
11.8	Special personal services payments			7
11.9	Total personnel compensation			856
12.1	Civilian personnel benefits			185
13.0	Benefits for former personnel			619
21.0	Travel and transportation of persons			31
22.0	Transportation of things	4	5	5
23.1	Rental payments to GSA			8
23.3	Communications, utilities, and miscellaneous charges	54	58	51
24.0	Printing and reproduction	6	5	5
25.1	Advisory and assistance services	118	116	93
25.2	Other services	627	824	731
25.3	Purchases of goods and services from Government accounts	250	238	211
25.4	Operation and maintenance of facilities	395	282	250
25.5	Research and development contracts	2,910	3,343	2,962
25.6	Medical care			2
25.7	Operation and maintenance of equipment	47	88	78
26.0	Supplies and materials	146	224	199
31.0	Equipment	122	108	96
32.0	Land and structures	65	26	23
41.0	Grants, subsidies, and contributions	845	871	773
99.0	Subtotal, direct obligations	5,589	6,188	7,178
99.0	Reimbursable obligations	432	600	680
99.9	Total new obligations	6,021	6,788	7,858

Personnel Summary

Identification code 80–0110–0–1–999		2000 actual	2001 est.	2002 est.
	Direct:			
1001	Total compensable workyears: Full-time equivalent employment			10,772
	Reimbursable:			
2001	Total compensable workyears: Full-time equivalent employment			50

[MISSION SUPPORT]

[For necessary expenses, not otherwise provided for, in carrying out mission support for human space flight programs and science, aeronautical, and technology programs, including research operations and support; maintenance; construction of facilities including revitalization and modification of facilities, construction of new facilities and additions to existing facilities, facility planning and design, environmental compliance and restoration, and acquisition or condemnation of real property, as authorized by law; program management; personnel and related costs, including uniforms or allowances therefor, as authorized by 5 U.S.C. 5901–5902; travel expenses; purchase, lease, charter, maintenance, and operation of mission and administrative aircraft; not to exceed $40,000 for official reception and representation expenses; and purchase (not to exceed 33 for replacement only) and hire of passenger motor vehicles, $2,608,700,000 to remain available until September 30, 2002.] *(Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2001, as enacted by section 1(a)(1) of P.L. 106–377.)*

Program and Financing (in millions of dollars)

Identification code 80–0112–0–1–999	2000 actual	2001 est.	2002 est.
Obligations by program activity:			
Direct program:			
00.01 Safety, mission assurance, engineering, and advanced concepts	43	47	5
00.02 Research and program management	2,200	2,292	43
00.03 Construction of facilities	170	233	56
00.04 Space communication services	88	5	.....
01.00 Total direct program	2,501	2,577	104
09.01 Reimbursable program	114	76	.....
10.00 Total new obligations	2,615	2,653	104
Budgetary resources available for obligation:			
21.40 Unobligated balance carried forward, start of year	86	136	162
22.00 New budget authority (gross)	2,625	2,679	.....
22.10 Resources available from recoveries of prior year obligations	40	.....	.....
23.90 Total budgetary resources available for obligation	2,751	2,815	162
23.95 Total new obligations	−2,615	−2,653	−104
24.40 Unobligated balance carried forward, end of year	136	162	58
New budget authority (gross), detail:			
Discretionary:			
40.00 Appropriation	2,514	2,609	.....
40.35 Appropriation rescinded	−3	.....	.....
40.77 Reduction pursuant to P.L. 106–554 (0.22 percent)	.....	−6	.....
43.00 Appropriation (total discretionary)	2,511	2,603	.....
Spending authority from offsetting collections:			
68.00 Offsetting collections (cash)	137	76	.....
68.10 Change in uncollected customer payments from Federal sources	−23	.....	.....
68.90 Spending authority from offsetting collections (total discretionary)	114	76	.....
70.00 Total new budget authority (gross)	2,625	2,679	.....
Change in unpaid obligations:			
Unpaid obligations, start of year:			
72.40 Unpaid obligations, start of year	645	659	664
72.95 Uncollected customer payments from Federal sources, start of year	−59	−36	−36
72.99 Obligated balance, start of year	586	623	628
73.10 Total new obligations	2,615	2,653	104
73.20 Total outlays (gross)	−2,553	−2,648	−538
73.40 Adjustments in expired accounts (net)	−9	.....	.....
73.45 Recoveries of prior year obligations	−40	.....	.....
74.00 Change in uncollected customer payments from Federal sources	23	.....	.....
Unpaid obligations, end of year:			
74.40 Unpaid obligations, end of year	659	664	230
74.95 Uncollected customer payments from Federal sources, end of year	−36	−36	−36
74.99 Obligated balance, end of year	623	628	194
Outlays (gross), detail:			
86.90 Outlays from new discretionary authority	1,988	2,156	.....
86.93 Outlays from discretionary balances	565	492	538
87.00 Total outlays (gross)	2,553	2,648	538
Offsets:			
Against gross budget authority and outlays:			
Offsetting collections (cash) from:			
88.40 Non-Federal sources	−18	−15	.....
88.45 Offsetting governmental collections from the public	−119	−61	.....
88.90 Total, offsetting collections (cash)	−137	−76	.....
Against gross budget authority only:			
88.95 Change in uncollected customer payments from Federal sources	23	.....	.....
Net budget authority and outlays:			
89.00 Budget authority	2,511	2,603	.....
90.00 Outlays	2,416	2,572	538

Note.—Excludes $2,741 million in budget authority in 2002 for activities transferred to Human Space Flight and Science, Aeronautics and Technology. Estimated comparable amounts for 2000 ($2,422 million) and 2001 ($2,602 million) are included above.

In FY 2000 and FY 2001, this appropriation provides funding for mission support and includes: safety, mission assurance, engineering and advanced concepts activities supporting agency programs; salaries and related expenses in support of research in NASA field installations; design, repair, rehabilitation and modification of institutional facilities and construction of new institutional facilities; and other operations activities supporting conduct of agency programs.

Beginning in FY 2002, NASA is implementing a two-appropriation budget (excluding the Inspector General account). The two-appropriation budget (Human Space Flight (HSF) and Science, Aeronautics and Technology (SAT)) is NASA's first step at transitioning to a full cost budget. While full cost will ultimately integrate institutional and programmatic funds into a single budget, that integration is done in a stepwise manner, by providing for a mission support budget line under each Enterprise and eliminating the present mission support appropriation. This initial step will begin to recognize, budget, and track direct full time eqivalent (FTE) personnel associated at the Enterprise level and then use this FTE data to distribute other-than-direct (OTD) institutional costs (Research and Program Management and non-programmatic Construction of Facilities) using the relative percentages of direct FTE's by Enterprise.

This means the distribution of the OTD resources takes advantage of a basic assumption, to be used prior to the existence of cost and service pools, that FTE's are a reasonable relative indicator at the Enterprise level of required facility and institutional capabilities. Taking this step will help program/project personnel and decision makers begin to understand the potential magnitude of institutional funds that are associated with each Enterprise in preparation for the day when full cost budgeting will distribute these funds most appropriately to the project level via the appropriate cost/service pools.

The Mission Support budget shown below is shown for display purposes only. Beginning in FY 2002, there will no longer be a Mission Support account. Institutional costs will be budgeted within HSF and SAT (as discussed above) and Safety, mission assurance and engineering will be budgeted within the HSF account.

NASA plans to control personnel levels through full time permanent (FTP) civil servant positions while continuing to track full time equivalent positions, as done in the past. This will allow NASA more flexibility in the use of non-permanent positions for short-term technical needs as well as co-op and intern programs.

General and special funds—Continued

[MISSION SUPPORT]—Continued

Performance Objectives

Research and program management.—In FY 2000 and FY 2001, this activity provides for the salaries, travel support, other personnel expenses of the entire NASA civil service workforce, and includes vital support to the physical plant at the Centers and at NASA Headquarters.

Construction of facilities.—In FY 2000 and FY 2001, this activity provides for facility construction activities to preserve NASA's infrastructure and enable NASA's missions; environmental compliance and restoration activities, design of facilities projects, and advanced planning and critical functional leadership activities related to future facilities needs. Activities in support of construction projects to repair, revitalize and modernize the basic infrastructure and institutional facilities at NASA centers will continue with the major focus on eliminating safety-related concerns. Increasing attention is being given to activities in support of environmental compliance and restoration requirements.

Object Classification (in millions of dollars)

Identification code 80–0112–0–1–999	2000 actual	2001 est.	2002 est.
Direct obligations:			
Personnel compensation:			
11.1 Full-time permanent	1,268	1,370	.....
11.3 Other than full-time permanent	21	25	.....
11.5 Other personnel compensation	26	32	.....
11.8 Special personal services payments	10	9	.....
11.9 Total personnel compensation	1,325	1,436	.....
12.1 Civilian personnel benefits	289	313	.....
13.0 Benefits for former personnel	7	.....	.....
21.0 Travel and transportation of persons	50	53	.....
22.0 Transportation of things	6	4	.....
23.1 Rental payments to GSA	17	13	.....
23.3 Communications, utilities, and miscellaneous charges	19	28	4
24.0 Printing and reproduction	7	5	1
25.1 Advisory and assistance services	10	5	1
25.2 Other services	242	191	26
25.3 Purchases of goods and services from Government accounts	27	22	3
25.4 Operation and maintenance of facilities	105	119	16
25.5 Research and development contracts	70	110	15
25.6 Medical care	7	5	1
25.7 Operation and maintenance of equipment	100	77	10
26.0 Supplies and materials	47	31	4
31.0 Equipment	25	39	5
32.0 Land and structures	143	123	17
41.0 Grants, subsidies, and contributions	6	3	1
99.0 Subtotal, direct obligations	2,502	2,577	104
99.0 Reimbursable obligations	113	76	.....
99.9 Total new obligations	2,615	2,653	104

Personnel Summary

Identification code 80–0112–0–1–999	2000 actual	2001 est.	2002 est.
Direct:			
1001 Total compensable workyears: Full-time equivalent employment	18,094	18,643	.....
Reimbursable:			
2001 Total compensable workyears: Full-time equivalent employment	89	98	.....

RESEARCH AND DEVELOPMENT

Program and Financing (in millions of dollars)

Identification code 80–0108–0–1–999	2000 actual	2001 est.	2002 est.
Change in unpaid obligations:			
Unpaid obligations, start of year:			
72.40 Unpaid obligations, start of year	29	.....	.....
72.99 Obligated balance, start of year	29	.....	.....
73.20 Total outlays (gross)	−18	.....	.....
73.40 Adjustments in expired accounts (net)	−11	.....	.....
Unpaid obligations, end of year:			
74.40 Unpaid obligations, end of year	.....	.....	.....
74.99 Obligated balance, end of year	.....	.....	.....
Outlays (gross), detail:			
86.93 Outlays from discretionary balances	18	.....	.....
Net budget authority and outlays:			
89.00 Budget authority	.....	.....	.....
90.00 Outlays	18	.....	.....

Since FY 1995 NASA's research and development activities have been performed in Human space flight; Science, aeronautics and technology; and Mission support. This account shows spending from balances prior to the account restructuring.

SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS

Program and Financing (in millions of dollars)

Identification code 80–0105–0–1–252	2000 actual	2001 est.	2002 est.
Change in unpaid obligations:			
Unpaid obligations, start of year:			
72.40 Unpaid obligations, start of year	14	1	.....
72.99 Obligated balance, start of year	14	1	.....
73.20 Total outlays (gross)	−1	−1	.....
73.40 Adjustments in expired accounts (net)	−13	.....	.....
Unpaid obligations, end of year:			
74.40 Unpaid obligations, end of year	1	.....	.....
74.99 Obligated balance, end of year	1	.....	.....
Outlays (gross), detail:			
86.93 Outlays from discretionary balances	1	1	.....
Net budget authority and outlays:			
89.00 Budget authority	.....	.....	.....
90.00 Outlays	1	1	.....

Since FY 1995 NASA's Space flight, control and data communications activities have been performed in Human space flight; Science, aeronautics and technology; and Mission support. This account shows spending from balances prior to the account restructuring.

CONSTRUCTION OF FACILITIES

Program and Financing (in millions of dollars)

Identification code 80–0107–0–1–999	2000 actual	2001 est.	2002 est.
Obligations by program activity:			
10.00 Total new obligations	7	.....	.....
Budgetary resources available for obligation:			
21.40 Unobligated balance carried forward, start of year	13	7	7
23.95 Total new obligations	−7	.....	.....
24.40 Unobligated balance carried forward, end of year	7	7	7
Change in unpaid obligations:			
Unpaid obligations, start of year:			
72.40 Unpaid obligations, start of year	18	12	.....

72.99	Obligated balance, start of year	18	12	
73.10	Total new obligations	7		
73.20	Total outlays (gross)	−12	−12	−7
	Unpaid obligations, end of year:			
74.40	Unpaid obligations, end of year	12		−7
74.99	Obligated balance, end of year	12		−7
	Outlays (gross), detail:			
86.93	Outlays from discretionary balances	12	12	7
	Net budget authority and outlays:			
89.00	Budget authority			
90.00	Outlays	12	12	7

Since FY 1995 NASA's Construction of facilities activities have been performed in Human space flight; Science, aeronautics and technology; and Mission support. This account shows spending from balances prior to the account restructuring.

Object Classification (in millions of dollars)

Identification code 80–0107–0–1–999	2000 actual	2001 est.	2002 est.
25.2 Other services	1		
25.3 Purchases of goods and services from Government accounts	2		
32.0 Land and structures	4		
99.9 Total new obligations	7		

Office of Inspector General

For necessary expenses of the Office of Inspector General in carrying out the Inspector General Act of 1978, as amended, [$23,000,000] *$23,700,000. (Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2001, as enacted by section 1(a)(1) of P.L. 106–377.)*

Program and Financing (in millions of dollars)

Identification code 80–0109–0–1–252	2000 actual	2001 est.	2002 est.
Obligations by program activity:			
10.00 Total new obligations	20	23	24
Budgetary resources available for obligation:			
22.00 New budget authority (gross)	20	23	24
23.95 Total new obligations	−20	−23	−24
New budget authority (gross), detail:			
Discretionary:			
40.00 Appropriation	20	23	24
Change in unpaid obligations:			
Unpaid obligations, start of year:			
72.40 Unpaid obligations, start of year	3	2	3
72.99 Obligated balance, start of year	3	2	3
73.10 Total new obligations	20	23	24
73.20 Total outlays (gross)	−20	−22	−24
Unpaid obligations, end of year:			
74.40 Unpaid obligations, end of year	2	3	2
74.99 Obligated balance, end of year	2	3	2
Outlays (gross), detail:			
86.90 Outlays from new discretionary authority	18	20	21
86.93 Outlays from discretionary balances	2	1	3
87.00 Total outlays (gross)	20	22	24
Net budget authority and outlays:			
89.00 Budget authority	20	23	24
90.00 Outlays	20	22	24

The mission of the Office of Inspector General is to conduct audits and investigations of agency activities. The Inspector General keeps the Administrator informed of problems and deficiencies in agency programs and operations.

The 2003 budget estimate for this account is $25 million.

Object Classification (in millions of dollars)

Identification code 80–0109–0–1–252	2000 actual	2001 est.	2002 est.
11.1 Personnel compensation: Full-time permanent	16	18	18
12.1 Civilian personnel benefits	3	4	4
21.0 Travel and transportation of persons	1	1	2
99.9 Total new obligations	20	23	24

Personnel Summary

Identification code 80–0109–0–1–252	2000 actual	2001 est.	2002 est.
1001 Total compensable workyears: Full-time equivalent employment	192	213	213

Trust Funds

Science, Space, and Technology Education Trust Fund

Unavailable Collections (in millions of dollars)

Identification code 80–8978–0–7–503	2000 actual	2001 est.	2002 est.
01.99 Balance, start of year	15	15	15
Receipts:			
02.40 Earnings on investments; Science, Space and Technology Education, Trust Fu	1	1	1
04.00 Total: Balances and collections	16	16	16
Appropriations:			
05.00 Science, space, and technology education trust fund	−1	−1	−1
07.99 Balance, end of year	15	15	15

Program and Financing (in millions of dollars)

Identification code 80–8978–0–7–503	2000 actual	2001 est.	2002 est.
Obligations by program activity:			
10.00 Total new obligations (object class 41.0)	1	1	1
Budgetary resources available for obligation:			
22.00 New budget authority (gross)	1	1	1
23.95 Total new obligations	−1	−1	−1
New budget authority (gross), detail:			
Mandatory:			
60.27 Appropriation (trust fund, indefinite)	1	1	1
Change in unpaid obligations:			
73.10 Total new obligations	1	1	1
73.20 Total outlays (gross)	−1	−1	−1
Outlays (gross), detail:			
86.97 Outlays from new mandatory authority	1	1	1
Net budget authority and outlays:			
89.00 Budget authority	1	1	1
90.00 Outlays	1	1	1
Memorandum (non-add) entries:			
92.01 Total investments, start of year: Federal securities: Par value	13	13	13
92.02 Total investments, end of year: Federal securities: Par value	13	13	13

National Space Grant Program

Unavailable Collections (in millions of dollars)

Identification code 80–8977–0–7–252	2000 actual	2001 est.	2002 est.
01.99 Balance, start of year			
Receipts:			
02.00 Gifts and donations		3	
Appropriations:			
05.00 National space grant program gift fund		−3	

General and special funds—Continued

NATIONAL SPACE GRANT PROGRAM—Continued

Unavailable Collections (in millions of dollars)—Continued

Identification code 80–8977–0–7–252	2000 actual	2001 est.	2002 est.
07.99 Balance, end of year			

Program and Financing (in millions of dollars)

Identification code 80–8977–0–7–252	2000 actual	2001 est.	2002 est.
Obligations by program activity:			
10.00 Total new obligations (object class 41.0)		3	
Budgetary resources available for obligation:			
22.00 New budget authority (gross)		3	
23.95 Total new obligations		−3	
New budget authority (gross), detail:			
Mandatory:			
60.27 Appropriation (trust fund, indefinite)		3	
Change in unpaid obligations:			
73.10 Total new obligations		3	
73.20 Total outlays (gross)		−3	
Outlays (gross), detail:			
86.97 Outlays from new mandatory authority		3	
Net budget authority and outlays:			
89.00 Budget authority		3	
90.00 Outlays		3	

ADMINISTRATIVE PROVISIONS

Notwithstanding the limitation on the availability of funds appropriated for "Human space flight", *or* "Science, aeronautics and technology"[, or "Mission support"] by this appropriations Act, when any activity has been initiated by the incurrence of obligations for construction of facilities as authorized by law, such amount available for such activity shall remain available until expended. This provision does not apply to the amounts appropriated [in "Mission support" pursuant to the authorization] for *institutional* minor revitalization and construction of facilities, and *institutional* facility planning and design.

Notwithstanding the limitation on the availability of funds appropriated for "Human space flight", *or* "Science, aeronautics and technology"[, or "Mission support"] by this appropriations Act, the amounts appropriated for construction of facilities shall remain available until September 30, [2003] *2004*.

[Notwithstanding the limitation on the availability of funds appropriated for "Mission support" and "Office of Inspector General", amounts made available by this Act for personnel and related costs and travel expenses of the National Aeronautics and Space Administration shall remain available until September 30, 2001 and may be used to enter into contracts for training, investigations, costs associated with personnel relocation, and for other services, to be provided during the next fiscal year.] Funds for announced prizes otherwise authorized shall remain available, without fiscal year limitation, until the prize is claimed or the offer is withdrawn.

[Unless otherwise provided for in this Act or in the joint explanatory statement of the committee of conference accompanying this Act, no part of the funds appropriated for "Human space flight" may be used for the development of the International Space Station in excess of the amounts set forth in the budget estimates submitted as part of the budget request for fiscal year 2001.]

[No funds in this or any other Appropriations Act may be used to finalize an agreement prior to December 1, 2001 between NASA and a nongovernment organization to conduct research utilization and commercialization management activities of the International Space Station.] *(Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2001, as enacted by section 1(a)(1) of P.L. 106–377.)*

[TITLE XIII—NATIONAL AERONAUTICS AND SPACE ADMINISTRATION]

[ADMINISTRATIVE PROVISION]

[SEC. 1301. Of the proceeds in any fiscal year from the sale of timber on Federal property at the John C. Stennis Space Center, or on additional real property within the restricted easement area adjacent to the Center, any funds that are in excess of the amount necessary for the expenses of commonly accepted forest management practices on such properties may be retained and used by the National Aeronautics and Space Administration for the acquisition from willing sellers of up to a total of 500 acres of real property to establish education and visitor programs and facilities that promote and preserve the regional and national history of the area, including the contributions of Stennis Space Center, and, as necessary, for wetlands mitigation.] *(Division B, Miscellaneous Appropriations Act, 2001, as enacted by section 1(a)(4) of P.L. 106–554.)*

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Federal Funds

General and special funds:

HUMAN SPACE FLIGHT

(INCLUDING TRANSFER OF FUNDS)

For necessary expenses, not otherwise provided for, in the conduct and support of human space flight research and development activities, including research, development, operations, support and services; maintenance; construction of facilities including repair, rehabilitation, revitalization and modification of facilities, construction of new facilities and additions to existing facilities, facility planning and design, environmental compliance and restoration, and acquisition or condemnation of real property, as authorized by law; space flight, spacecraft control and communications activities including operations, production, and services; program management; personnel and related costs, including uniforms or allowances therefor, as authorized by 5 U.S.C. 5901–5902; travel expenses; purchase and hire of passenger motor vehicles; not to exceed ⟦$20,000⟧ *$24,000* for official reception and representation expenses; and purchase, lease, charter, maintenance and operation of mission and administrative aircraft, ⟦$6,912,400,000⟧ *$6,172,900,000*, to remain available until September 30, ⟦2003⟧ *2004*, of which amounts as determined by the Administrator for salaries and benefits; training, travel and awards; facility and related costs; information technology services; science, engineering, fabricating and testing services; and other administrative services may be transferred to "Science, aeronautics and technology" in accordance with section 312(b) of the National Aeronautics and Space Act of 1958, as amended by Public Law 106–377. *(Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2002; additional authorizing legislation required.)*

⟦For emergency expenses to respond to the September 11, 2001, terrorist attacks on the United States, for "Human space flight", $76,000,000, to remain available until expended, to be obligated from amounts made available in Public Law 107–38.⟧ *(Emergency Supplemental Act, 2002.)*

Program and Financing (in millions of dollars)

Identification code 80–0111–0–1–252		2001 actual	2002 est.	2003 est.
	Obligations by program activity:			
	Direct program:			
00.01	Space station	2,089	1,734	1,503
00.02	Payload and ELV support	92	95	88
00.03	Investments and support	152	1,250	1,219
00.04	Space shuttle	3,201	3,152	3,211
00.05	Space communications and data systems	.....	458	136
00.07	Safety, mission assurance & engineering	.....	45	48
09.01	Reimbursable program	176	248	150
10.00	Total new obligations	5,710	6,982	6,355
	Budgetary resources available for obligation:			
21.40	Unobligated balance carried forward, start of year	167	171	310
22.00	New budget authority (gross)	5,673	7,121	6,323
22.10	Resources available from recoveries of prior year obligations	41	.....	.....
23.90	Total budgetary resources available for obligation	5,881	7,292	6,633
23.95	Total new obligations	−5,710	−6,982	−6,355
24.40	Unobligated balance carried forward, end of year	171	310	278
	New budget authority (gross), detail:			
	Discretionary:			
40.00	Appropriation	5,508	6,797	6,173
40.15	Appropriation (emergency)	.....	76	.....
40.77	Reduction pursuant to P.L. 106–554 (0.22 percent)	−12	.....	.....
43.00	Appropriation (total discretionary)	5,496	6,873	6,173
	Spending authority from offsetting collections:			
68.00	Offsetting collections (cash)	174	248	150
68.10	Change in uncollected customer payments from Federal sources (unexpired)	3	.....	.....
68.90	Spending authority from offsetting collections (total discretionary)	177	248	150
70.00	Total new budget authority (gross)	5,673	7,121	6,323
	Change in obligated balances:			
72.40	Obligated balance, start of year	1,813	1,468	1,651
73.10	Total new obligations	5,710	6,982	6,355
73.20	Total outlays (gross)	−6,006	−6,799	−6,496
73.40	Adjustments in expired accounts (net)	−8	.....	.....
73.45	Recoveries of prior year obligations	−41	.....	.....
74.00	Change in uncollected customer payments from Federal sources (unexpired)	−3	.....	.....
74.10	Change in uncollected customer payments from Federal sources (expired)	3	.....	.....
74.40	Obligated balance, end of year	1,468	1,651	1,510
	Outlays (gross), detail:			
86.90	Outlays from new discretionary authority	4,254	4,949	4,373
86.93	Outlays from discretionary balances	1,752	1,850	2,123
87.00	Total outlays (gross)	6,006	6,799	6,496
	Offsets:			
	Against gross budget authority and outlays:			
	Offsetting collections (cash) from:			
88.00	Federal sources	−147	−207	−117
88.40	Non-Federal sources	−30	−41	−33
88.90	Total, offsetting collections (cash)	−177	−248	−150
	Against gross budget authority only:			
88.95	Change in uncollected customer payments from Federal sources (unexpired)	−3	.....	.....
88.96	Portion of offsetting collections (cash) credited to expired accounts	3	.....	.....
	Net budget authority and outlays:			
89.00	Budget authority	5,496	6,873	6,173
90.00	Outlays	5,829	6,551	6,346

Budget Authority and Outlays Excluding Full Funding for Federal Retiree Costs (in millions of dollars)

		2001 actual	2002 est.	2003 est.
	Net budget authority and outlays:			
89.00	Budget authority	5,451	6,830	6,131
90.00	Outlays	5,784	6,508	6,304

This appropriation provides funding for Human Space Flight (HSF) activities, and for safety, mission assurance and engineering activities supporting the Agency. The HSF activities include development and operations of the Space Station and operation of the Space Shuttle. This includes high priority investments to improve the safety of the Space Shuttle, and required construction projects in direct support of Space Station and Space Shuttle programs. This appropriation also provides for: salaries and related expenses; design, repair, rehabilitation, and modification of facilities and construction of new facilities; maintenance, and operation of facilities; and other operations activities supporting human space flight programs; and space operations, safety, mission assurance and engineering activities that support the Agency.

In 2001, the HSF account provided only for the *direct* funding of human space flight activities; space operations services had been funded within the Science, Aeronautics and Technology (SAT) account; and safety, mission assurance and engineering had been funded within the Mission Support account. Since 2002, other than direct costs (which includes Research and Program Management and non-programmatic Construction of Facilities) are allocated to either the HSF or the SAT account based on the number of full time equivalent people.

General and special funds—Continued

HUMAN SPACE FLIGHT—Continued

(INCLUDING TRANSFER OF FUNDS)—Continued

Performance Objectives

Space Station.—The International Space Station (ISS) is a complex of research laboratories in low Earth orbit in which American, Russian, Canadian, European, and Japanese astronauts are conducting unique scientific and technological investigations in a microgravity environment. The goal of the Station is to support scientific research and other activities requiring the unique attributes of humans in space and establish a permanent human presence in Earth orbit. The President's 2003 Budget request provides funding for continued development of the vehicle and for operations in support of continued assembly, logistics resupply, crew exchange, research operations and other utilization. With nine assembly missions successfully completed, the budget includes funding to keep subsequent assembly missions on schedule through U.S. Core Complete (Flight 10A), currently planned for calendar year 2004, to support early research commensurate with the build-up of on-orbit utilization capabilities and resources.

In early calendar year 2001, NASA launched the U.S. Laboratory and the first set of research equipment necessary for conducting experiments on the Space Station. Subsequent flights enabled the installation of the Canadian robotic arm, additional research equipment for the U.S. Laboratory, installation of the Russian docking compartment, and transport of the 3rd and 4th crew expeditions. By mid-calendar year 2001, the U.S. Airlock had been installed, allowing spacewalks to be conducted without the Space Shuttle present, and marking completion of Phase 2 of the Space Station assembly. The first utilization flight in December 2001 greatly expanded the number of research payloads on-orbit, and raised the number of research investigations initiated to over 40. Crew training, payload processing, hardware element processing, and mission operations were supported without major ground anomalies, and all but two on-orbit subsystems performed above predicted levels, resulting in a lower than expected maintenance workload. This lower maintenance workload, coupled with the commitment of the expedition crews to dedicate time for conducting research experiments, resulted in research activities that exceeded expectations. NASA will seek to exceed expectations for research productivity by achieving astronaut time dedicated to research in excess of the planned 20 hours per week. During 2002, three of the major truss elements constituting the power block will be deployed to orbit, Expeditions 5 and 6 will be deployed, and a second utilization flight will expand science capabilities even further. In calendar year 2003, activation of the thermal system will be completed, two of the three remaning solar array modules will be deployed, and both the S6 truss and Node 2, the final components of the U.S. Core Complete, should be delivered to NASA for final integration and preflight test and checkout to support planned launches in calendar year 2004.

As required by both the NASA Authorization Act (PL 106–391) and the 2002 VA/HUD Appropriations Act (P.L. 107–73), the ISS research budget is transferred to the Biological and Physical Research Enterprise in 2002. The remaining ISS budget supports completion of the U.S. Core Complete and allows the program to press ahead with the integration of the partners' research modules. A NASA cost estimate, and an independent cost estimate (ICE) of the cost to assemble and operate the U.S. Core Complete will be completed by September 2002. The 2002 appropriation directed a general reduction in the station budget of $75M, which eliminated reserves fenced for guaranteed carryover into 2003. The appropriation also earmarked $40M for X–38 efforts that was originally planned to cover X–38 plus continued work on Node 3 and the advanced environmental control system. NASA plans to fund the Node 3 and environmental control work into the 2nd quarter of 2002, when a decision will be made to continue those efforts or to cancel them.

Consistent with the recommendations in the ISS Management and Cost Evaluation (IMCE) Task Force, and direction from the Administration, NASA will develop a Cost Analysis Requirements Document (CARD) to support cost estimates of the U.S. Core Complete baseline. NASA will also develop an integrated management action plan based on recommendations of the IMCE Task Force, and begin implementation of those actions. NASA will also report to the Administration and to Congress its plans for a non-governmental organization (NGO) for ISS research, and the results of discussions with the International Partners on ways to increase on-orbit resources for station research, in particular innovative methods for increasing crew availability. The ISS Program is pressing ahead with final flight hardware deliveries, and completion of the current prime contract in December 2003. Requirements for follow-on support are being reviewed and estimated, and a plan to competitively award contracts for the station's operations phase will be released this Spring.

Payload and Expendable Launch Vehicle (ELV) Support.—The Payload Carriers and Support budget provides technical expertise, facilities, flight carrier hardware and capabilities necessary to provide end-to-end servicing of multiple payloads to be flown aboard the Space Shuttle. During 2001, six pallets were used in Space Shuttle missions. In 2002 and 2003, over 20 major and secondary payloads will be supported, including major hardware for International Space Station assembly and operations.

The ELV Mission Support budget provides funds for technical and management insight of commercial launch services, including advanced mission design/analysis and leading-edge integration services, which are provided for the full range of NASA missions under consideration for launch on ELVs. During 2001, eight ELV missions were launched. Integration and technical management of 11 launches, including one secondary, are planned in 2002. In 2003, support for ten launches, including one secondary, is planned.

Investments and Support.—NASA's rocket propulsion test project will ensure that unique capabilities are properly managed and maintained in world-class condition. The project will significantly enhance NASA's ability to properly manage rocket testing activities and infrastructure across all four participating NASA centers. Engineering and technical base (ETB) activity will continue to: support the institutional capability in the operation of space flight laboratories, technical facilities, and testbeds; conduct independent safety, and reliability assessments; and stimulate science and technical competence in the United States. Funding for other direct costs associated with Human Space Flight, which were funded in the Mission Support account prior to 2002, are also funded within investments and support. This includes research and program management costs and non-programmatic construction of facilities costs.

Space Shuttle.—The Space Shuttle is a partially reusable space vehicle that provides several unique capabilities to the United States space program. These include retrieving payloads from orbit for reuse, servicing and repairing satellites in space, safely transporting humans to and from space, launching ISS components and providing an assembly platform in space, and operating and returning space laboratories.

In 2001, the Space Shuttle launched seven flights, all of which were ISS assembly and servicing missions. Seven flights are planned during 2002 including a dedicated microgravity research flight and another HST Servicing Mission (HST-3B) and five ISS assembly and servicing missions. In

2003, four flights are planned, all of which are ISS assembly and servicing missions. In support of the research objectives of the Space Station, the Space Shuttle will commit a minimum of five powered mid-deck lockers on each mission to deliver necessary research equipment and specimens.

NASA will aggressively pursue Space Shuttle competitive sourcing as an important step in transitioning NASA from infrastructure ownership and operation to purchasing space transportation services where possible. NASA will seek industry comment on its plans early this year, leading to release of a solicitation for competitive sourcing. NASA will prepare a Cost Analysis Requirements Document (CARD) to support NASA and independent cost estimates of Space Shuttle operations and safety investments, similar to estimates being done for the Space Station. These estimates, to be completed by September, 2002, will provide an important baseline from which to assess competitive sourcing options.

The President's 2003 Budget supports key Space Shuttle safety investments as part of NASA's Integrated Space Transportation Plan. NASA will seek to accelerate the implementation of safety investments, to begin achieving safety gains in Shuttle operations as quickly as possible. The President's 2003 Budget also supports investments in the Space Shuttle infrastructure, as necessary to address safety issues and critical repair and revitalization activities.

Space Communications and Data Systems.—The program goal is to support NASA's Enterprises and external customers with Space Communications and Data System (SCDS) services that are responsive to customer needs. Additionally, the program performs infrastructure upgrades and replenishment efforts necessary to maintain the service capabilities that satisfy the approved mission model. The program conducts technology and standards infusion efforts to provide more efficient and effective services. The Space Communications Office at Headquarters manages and directs an integrated Agency-wide Space Communications and Data Systems program.

Beginning in 2002, a decentralized management process has been implemented that involves transferring most management and budget responsibilities previously performed by the Space Operations Management Office to the appropriate Enterprises. Beginning in 2003, the Deep Space Network, Ground Network and Western Aeronautical Test Range will be managed by NASA's Enterprises. The Office of Space Flight will continue to perform overall program integration, including the management of Consolidated Space Operations Contract, which is now in its fourth year of providing data services to both NASA and non-NASA customers.

The TDRS–8 spacecraft, which completed on-orbit checkout in September 2000, is working well and meets all user service telecommunications performance requirements except for a Multiple Access (MA) performance anomaly. Modifications to the TDRS–I and TDRS–J spacecraft flight hardware and test program as a result of the MA investigation have been implemented. TDRS–I launch is now planned for February 2002. The launch of TDRS–J is slated for October 2002.

Safety, Mission Assurance and Engineering.—The Safety and Mission Assurance program invests in the safety and success of NASA missions by assuring that sound and robust policies, processes, and tools for safety, reliability, quality assurance, and engineering disciplines are in place and applied throughout NASA. The program also examines long-term technology requirements for NASA's strategic objectives. The Engineering program, managed by the Office of the Chief Engineer (OCE), oversees the conduct and improvement of NASA's engineering practice and independently evaluates ongoing programs, proposed concepts, and options for new programs. The OCE establishes policies, standards, guidance, and support for improving NASA engineering practices and technical capabilities, and manages the NASA Electronics Parts and Packaging Program, which supports evaluation and infusion of advanced electronic parts and packaging technology into NASA programs.

Object Classification (in millions of dollars)

Identification code 80–0111–0–1–252		2001 actual	2002 est.	2003 est.
	Direct obligations:			
	Personnel compensation:			
11.1	Full-time permanent	.....	537	569
11.3	Other than full-time permanent	.....	5	5
11.5	Other personnel compensation	.....	17	16
11.8	Special personal services payments	.....	13	13
11.9	Total personnel compensation	.....	572	603
12.1	Civilian personnel benefits	45	166	173
21.0	Travel and transportation of persons	.....	23	23
22.0	Transportation of things	4	4	4
23.1	Rental payments to GSA	.....	7	7
23.2	Rental payments to others	1	1	1
23.3	Communications, utilities, and miscellaneous charges	40	56	39
24.0	Printing and reproduction	2	2	2
25.1	Advisory and assistance services	56	60	55
25.2	Other services	286	307	282
25.3	Other purchases of goods and services from Government accounts	64	69	63
25.4	Operation and maintenance of facilities	1,955	2,163	1,925
25.5	Research and development contracts	2,667	2,860	2,619
25.7	Operation and maintenance of equipment	32	34	32
26.0	Supplies and materials	164	176	162
31.0	Equipment	96	103	95
32.0	Land and structures	66	71	65
41.0	Grants, subsidies, and contributions	56	60	55
99.0	Direct obligations	5,534	6,734	6,205
99.0	Reimbursable obligations	176	248	150
99.9	Total new obligations	5,710	6,982	6,355

Personnel Summary

Identification code 80–0111–0–1–252		2001 actual	2002 est.	2003 est.
	Direct:			
1001	Total compensable workyears: Full-time equivalent employment	.....	7,143	6,912
	Reimbursable:			
2001	Total compensable workyears: Full-time equivalent employment	.....	30	30

Science, Aeronautics and Technology

(including transfer of funds)

For necessary expenses, not otherwise provided for, in the conduct and support of science, aeronautics and technology research and development activities, including research, development, operations, support and services; maintenance; construction of facilities including repair, rehabilitation, revitalization, and modification of facilities, construction of new facilities and additions to existing facilities, facility planning and design, environmental compliance and restoration, and acquisition or condemnation of real property, as authorized by law; space flight, spacecraft control and communications activities including operations, production, and services; program management; personnel and related costs, including uniforms or allowances therefor, as authorized by 5 U.S.C. 5901–5902; travel expenses; purchase and hire of passenger motor vehicles; not to exceed **[**$20,000**]** *$24,000* for official reception and representation expenses; and purchase, lease, charter, maintenance and operation of mission and administrative aircraft, **[**$7,857,100,000**]** *$8,918,500,000* to remain available until September 30, **[**2003**]** *2004*, of which amounts as determined by the Administrator for salaries and benefits; training, travel and awards; facility and related costs; information technology services; science, engineering, fabricating and testing services; and other administrative services may be transferred to "Human space flight" in accordance with section 312(b) of the National Aeronautics and Space Act of 1958, as amended by Public Law 106–377**[**, except that no funds may be transferred to the program budget element for the Space Station**]**. *(Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2002; additional authorizing legislation required.)*

General and special funds—Continued

SCIENCE, AERONAUTICS AND TECHNOLOGY—Continued

(INCLUDING TRANSFER OF FUNDS)—Continued

[For emergency expenses to respond to the September 11, 2001, terrorist attacks on the United States, for "Science, aeronautics and technology", $32,500,000, to remain available until expended, to be obligated from amounts made available in Public Law 107–38.] *(Emergency Supplemental Act, 2002.)*

Program and Financing (in millions of dollars)

Identification code 80–0110–0–1–999	2001 actual	2002 est.	2003 est.
Obligations by program activity:			
Direct program:			
00.01 Space science	2,326	2,888	3,402
00.02 Biological and physical research	291	846	849
00.03 Earth science	1,445	1,690	1,640
00.04 Aerospace technology	1,382	2,529	2,838
00.05 Space operations	503	18	.....
00.06 Academic programs	132	207	161
00.07 Mission communication services	9	.....	.....
09.01 Reimbursable program	517	598	632
10.00 Total new obligations	6,605	8,776	9,522
Budgetary resources available for obligation:			
21.40 Unobligated balance carried forward, start of year	306	448	385
22.00 New budget authority (gross)	6,752	8,712	9,550
22.10 Resources available from recoveries of prior year obligations	20	.....	.....
23.90 Total budgetary resources available for obligation	7,078	9,160	9,935
23.95 Total new obligations	−6,605	−8,776	−9,522
23.98 Unobligated balance expiring or withdrawn	−25	.....	.....
24.40 Unobligated balance carried forward, end of year	448	385	414
New budget authority (gross), detail:			
Discretionary:			
40.00 Appropriation	6,249	8,082	8,918
40.15 Appropriation (emergency)	.....	32	.....
40.77 Reduction pursuant to P.L. 106–554 (0.22 percent)	−14	.....	.....
43.00 Appropriation (total discretionary)	6,235	8,114	8,918
68.00 Spending authority from offsetting collections: Offsetting collections (cash)	517	598	632
70.00 Total new budget authority (gross)	6,752	8,712	9,550
Change in obligated balances:			
72.40 Obligated balance, start of year	3,046	3,360	4,179
73.10 Total new obligations	6,605	8,776	9,522
73.20 Total outlays (gross)	−6,283	−7,957	−9,063
73.40 Adjustments in expired accounts (net)	−5	.....	.....
73.45 Recoveries of prior year obligations	−20	.....	.....
74.10 Change in uncollected customer payments from Federal sources (expired)	17	.....	.....
74.40 Obligated balance, end of year	3,360	4,179	4,638
Outlays (gross), detail:			
86.90 Outlays from new discretionary authority	3,307	4,826	5,279
86.93 Outlays from discretionary balances	2,976	3,131	3,784
87.00 Total outlays (gross)	6,283	7,957	9,063
Offsets:			
Against gross budget authority and outlays:			
Offsetting collections (cash) from:			
88.00 Federal sources	−493	−550	−590
88.40 Non-Federal sources	−38	−48	−42
88.90 Total, offsetting collections (cash)	−531	−598	−632
Against gross budget authority only:			
88.96 Portion of offsetting collections (cash) credited to expired accounts	14	.....	.....
Net budget authority and outlays:			
89.00 Budget authority	6,235	8,114	8,918
90.00 Outlays	5,752	7,359	8,431

Budget Authority and Outlays Excluding Full Funding for Federal Retiree Costs (in millions of dollars)

	2001 actual	2002 est.	2003 est.
Net budget authority and outlays:			
89.00 Budget authority	6,177	8,047	8,844
90.00 Outlays	5,694	7,292	8,357

This appropriation provides for the Science, Aeronautics and Technology (SAT) supporting the Agency. The SAT activities include space science, biological and physical research including research for the International Space Station, earth science, aerospace technology, and academic programs. This appropriation also provides for salaries and related expenses; design, repair, rehabilitation, and modification of facilities and construction of new facilities; maintenance and operation of facilities; and other operations activities supporting science, aeronautics, and technology programs.

In 2001, the SAT account provided only for the *direct* funding of science, aeronautics and technology activities, and included funding for space operations services which are now funded within the Human Space Flight (HSF) account. Since 2002, other direct costs (which include Research and Program Management and non-programmatic Construction of Facilities) are allocated to either the HSF or the SAT account based on the number of full time equivalent personnel.

Performance Objectives

Space Science.—The Space Science program seeks to answer fundamental questions concerning: the galaxy and the universe; the connection between the Sun, Earth and heliosphere; the origin and evolution of planetary systems; and the origin and distribution of life in the universe. The Space Science program is comprised of many research and development activities, including flight missions, major space-based facilities, technology and mission development programs, and research and data analysis.

In 2001, the Space Science program produced many notable scientific results: The Hubble Space Telescope discovered a supernova blast that occurred very early in the life of the Universe, bolstering the case for the existence of a mysterious form of "dark energy" pervading the Universe. The concept of dark energy, which pushes galaxies away from each other at an ever-increasing speed, was first proposed, then discarded, by Albert Einstein early in the last century. The Hubble discovery also reinforces the startling idea that the expansion of the universe only recently began speeding up.

The Chandra X-ray Observatory enhanced our understanding of black holes on many fronts. Chandra took the deepest X-ray images ever and found the early Universe teeming with black holes, probed the theoretical edge of a black hole known as the event horizon, and captured the first X-ray flare ever seen from the supermassive black hole at the center of our own Milky Way galaxy.

Detailed scientific analysis of high-resolution images obtained by the BOOMERANG (Balloon Observations of Millimetric Extragalactic Radiation and Geophysics) mission provided the most precise measurements to date of several of the key characteristics cosmologists use to describe the Universe. These images were the first to bring the cosmic microwave background (the radiation remaining from the "big bang" that created the Universe) into sharp focus.

In addition to these discoveries that have enhanced our understanding of the origin, evolution, and structure of the Universe, many discoveries in 2001 related to the rapidly growing field of extrasolar planet (planets outside our Solar System) detection. NASA and National Science Foundation-funded astronomers discovered eight new extrasolar planets, bringing the total number of extrasolar planet detections to about eighty. Observations from the Submillimeter Wave As-

tronomy Satellite (SWAS) provided the first evidence that extrasolar planetary systems contain water, a molecule that is an essential ingredient for known forms of life. Also in this field, astronomers using the Hubble Space Telescope have made the first detection and chemical analysis of the atmosphere of a planet outside our Solar System.

Within our Solar System, NASA spacecraft made many stunning achievements in 2001. In a risky flyby, the Deep Space-1 spacecraft successfully navigated past comet Borrelly, giving researchers the best look ever inside a comet's glowing core of icy dust and gas. Deep Space-1 passed just 2,200 kilometers (1,400 miles) from the rocky, icy nucleus of the 10 kilometer-long (more than 6 mile-long) comet. The NEAR (Near Earth Asteroid Rendezvous) Shoemaker spacecraft achieved the first soft landing on an asteroid. The landing was the culmination of a year-long orbital mission at the asteroid Eros during which the mission returned enormous quantities of scientific data and images.

A pair of spacecraft, the Mars Global Surveyor and the Hubble Space Telescope, provided astronomers with a ringside seat to the biggest global dust storm seen on Mars in several decades. The Martian dust storm, larger by far than any seen on Earth, raised a cloud of dust that engulfed the entire planet for several months. The sun-warmed dust raised Martian atmospheric temperatures by 80 degrees Fahrenheit while the shaded Martian surface chilled precipitously. Also in calendar year 2001, the Mars Odyssey 2001 spacecraft successfully achieved orbit around Mars following a six-month, 286-million mile journey. Following aerobraking operations, this spacecraft will be placed in its science-mapping orbit in early calendar year 2002 and will characterize composition of the Martian surface at unprecedented levels of detail.

In the field of Sun-Earth Connections, where we seek to develop a scientific understanding of the physical interactions in the Sun-Earth system, there were several important scientific accomplishments in calendar year 2001. The Solar and Heliospheric Observatory (SOHO) observed the largest sunspot in ten years, with a surface area equivalent to thirteen Earths. This area proved to be a prolific source of stormy solar activity, hurling clouds of electrified gas (known as Coronal Mass Ejections, or CMEs) towards Earth. Other studies conducted by the SOHO spacecraft have provided the first clear picture of what lies beneath sunspots, peering inside the Sun to see swirling flows of electrified gas that create the self-reinforcing cycle that holds a sunspot together.

The calendar year was capped by the successful launch of the TIMED (Thermosphere, Ionosphere, Mesosphere Energetics and Dynamics) mission on December 7, 2001. This is the first mission in the Solar Terrestrial Probes program. It will study a region of the Earth's atmosphere that has never been the subject of a comprehensive, long-term scientific investigation.

The NASA budget request for 2003 features two very significant changes from the previous baseline program: a reformulated planetary program and the inclusion of a nuclear power and propulsion program. In the field of planetary exploration, the 2003 Budget takes a fundamentally different approach from previous years. Given cost growth and schedule delays, all funding for the Pluto-Kuiper Belt mission and the Europa Orbiter mission has been eliminated in 2003 and subsequent years. These missions will be replaced by a revamped planetary program that will incorporate the following principles: clear science priorities that support key goals in understanding the potential existence of life beyond Earth and the origins of life; open competition and rigorous reviews of cost, schedule, and risk to minimize future overruns and delays per the highly successful Discovery Program; and an architectural approach that balances science return in this decade with investments in high-leverage technologies that will enable faster and more frequent missions with greater science return in the next decade. It is envisioned that the new planetary program will be structured and managed along the lines of the highly successful Discovery program. A key element of this new program will be the development and incorporation of nuclear power and propulsion technologies. Building upon ongoing NASA investments in advanced electric propulsion and instrument and electronics miniaturization, investments in nuclear power and nuclear-electric propulsion technologies that will enable much faster and more frequent planetary investigations with greater science capabilities. These investments will allow NASA to undertake fundamentally new approaches to planetary exploration. In the next decade, nuclear-electric propulsion technology will enable affordable planetary missions that: can reach targets in half the time it would take using today's propulsion systems; are not limited by today's power and mass constraints; and can conduct long-term observations of multiple targets.

Nuclear power technology will also be incorporated into the Mars Exploration Program, specifically in the Mars Smart Lander/Mobile Laboratory mission. This mission will now be launched in calendar year 2009 to allow the incorporation of nuclear power, instead of calendar year 2007 as previously planned. By using nuclear power, the time during which the Mars Mobile Laboratory can conduct science operations will be extended from several months to several years. The nearer-term missions in the Mars Exploration Program remain essentially unchanged. In May and June of 2003, two highly capable surface rovers will be launched to Mars, with landings on the surface expected in April and May of 2004. The Mars Reconnaissance Orbiter (MRO) will be launched in calendar year 2005; this powerful scientific orbiter will focus on analyzing the surface at unprecedented levels of detail to follow tantalizing hints of water detected in images from the Mars Global Surveyor spacecraft. MRO will measure thousands of Martian landscapes at 20- to 30-centimeter (8- to 12-inch) resolution. It will be followed by a competitively selected Mars Scout mission in calendar year 2007 and the Smart Lander/Mobile Laboratory in calendar year 2009. This robust program of orbiters, landers, and rovers is poised to unravel the secrets of the red planet's past environments, the history of its rocks, the many roles of water, and, possibly, evidence of past or present life.

This Budget supports the completion of development of many significant missions, including Gravity Probe-B (GP–B), the Space Infrared Telescope Facility (SIRTF), and the Stratospheric Observatory For Infrared Astronomy (SOFIA). GP–B, which will verify a key aspect of Einstein's theory of general relativity, will be launched in October 2002. SIRTF, the fourth and final of the Great Observatories, is scheduled for launch in 2003. SOFIA development activities will continue, with the aircraft door and the telescope to be installed and tested in 2003. Development activities supporting the Solar Terrestrial Relations Observatory (STEREO), the Gammaray Large Area Space Telescope (GLAST), the final Hubble Space Telescope servicing mission, as well as several key missions in the payloads program such as Solar-B and Herschel, will also continue in 2003.

In the Explorer program, the Microwave Anisotropy Probe successfully launched on June 30, 2001, and development of Swift, a multi-wavelength observatory for gammaray burst astronomy, remains on schedule for a September, 2003 launch. Another MIDEX mission, the Full-sky Astrometric Mapping Explorer (FAME), did not pass confirmation review due to cost increases and was not approved for full-scale development. Selection of the MIDEX–5 and MIDEX–6 missions will occur in 2002, and an Announcement of Opportunity for MIDEX–7 and MIDEX–8 will be released in 2003. In the Small-class (SMEX) mission series, three NASA missions and two non-NASA Missions of Opportunity are sup-

General and special funds—Continued

SCIENCE, AERONAUTICS AND TECHNOLOGY—Continued

(INCLUDING TRANSFER OF FUNDS)—Continued

ported. The NASA missions include the Galaxy Evolution Explorer (GALEX), Two Wide-Angle Neutral Atom Spectrometers (TWINS), and the High Energy Solar Spectroscopic Imager (HESSI). The Missions of Opportunity are the Coupled Ion Neutral Dynamics Investigation (CINDI; a cooperative mission with the Air Force), and ASTRO E–2, an X-ray astronomy mission (in cooperation with Japan). ASTRO E–2 is a rebuild of ASTRO E, which was lost due to a failure of the Japanese launch vehicle in February, 2000.

In the Discovery program, the Genesis mission was launched on August 8, 2001; it has begun collecting samples of charged particles from the solar wind, and it will return these samples to Earth for analysis in calendar year 2004. Development activities continue on three other Discovery missions. The Comet Nucleus Tour (CONTOUR) will be launched in July 2002, and it will encounter two comets: comet Encke in calendar year 2003, and comet Schwassman Wachman-3 in calendar year 2006. The Mercury Surface, Space Environment, Geochemistry and Ranging (MESSENGER) mission to orbit Mercury, and the Deep Impact mission to fly by and fire an impactor into comet Temple-1, are both scheduled to launch in early calendar year 2004.

The New Millennium program is providing flight demonstrations of critical new technologies that will reduce the mass and cost of future science and spacecraft subsystems, while maintaining or improving mission capabilities. In calendar year 2003, the Nanosat Constellation Trailblazer (Space Technology-5, or ST–5) will undergo spacecraft and instrument integration and test in preparation for launch in calendar year 2004. Also in calendar year 2003, the Critical Design Review for ST–6 will be conducted, as will the Confirmation Review for ST–7, and the initial confirmation for ST–8.

The President's 2003 Budget also provides funding for focused technology programs in each of the four major Space Science themes: the Astronomical Search for Origins, Structure and Evolution of the Universe, Solar System Exploration, and Sun-Earth Connections, which includes both the Living With A Star Program and the Solar Terrestrial Probes Program. These funds provide for early technology development in support of strategic missions such as the Next Generation Space Telescope and the Space Interferometry Mission. The goal is to retire technology risk early in a mission's lifecycle, before proceeding to full-scale development. Funds are also provided to continue on-going operations of approximately thirty spacecraft, and to conduct robust research and analysis, data analysis, and suborbital research campaigns.

Biological and Physical Research.—The Biological and Physical Research Enterprise (BPRE) seeks to exploit the rich opportunities of space flight for fundamental research in the biological and physical sciences, as well as in commercial development of space, and conducts research to enable efficient and effective systems for protecting and sustaining humans in space. BPRE seeks to achieve advances in biological and physical sciences by understanding nature's forces in space, and achieve an understanding of the human experience in space.

In late 2001, BPRE was created as NASA's fifth strategic enterprise. BPRE closed its first fiscal year with a significant record of accomplishment. It expanded its interagency research collaborations, establishing a new memorandum of understanding with the United States Department of Agriculture, conducting a joint research solicitation with the National Cancer Institute, and continuing work under 18 other agreements with the National Institutes of Health. A BPRE investigator received the Nobel Prize in physics for ground-based research that he plans to extend and expand on the International Space Station. Outfitting the International Space Station (ISS) for research began with the delivery of the Human Research Facility in March 2001. Two research equipment racks were delivered to the ISS in mid-April and an additional two at the beginning of Expedition 3 in August. BPRE initiated a program of research on the ISS to take advantage of available resources during the construction phase. The ISS Expedition 1 and 2 teams were able to exceed expectations for meeting research objectives of the planned experiments, with only one unsuccessful experiment due to technical reasons.

In 2002, BPRE will continue to increase knowledge and demonstrate key technology capabilities for humans in space, address critical questions in crew health and safety, and materials science and commercial research payloads will be flown on both the Space Shuttle and aboard ISS. The Space Station research program is on track to deliver another five equipment racks on orbit by the end of calendar year 2002. BPRE also will complete definition studies leading to award of a contract to manage ISS utilization to a Non-Governmental Organization (NGO). Working with the scientific community, its advisory committees, and the Administration, BPRE will complete the development of research priorities across its portfolio of research endeavors to provide a basis for critical resource allocation decisions. In the area of public outreach and education, BPRE plans to develop electronic and printed educational materials that focus on biological and physical research.

In 2003, BPRE will implement its research priorities and develop ISS flight facilities to achieve a prioritized and productive research program. BPRE will also work with Life Science Museum Network members to explore opportunities for the development of projects, special events, or workshops focused on the life sciences and biology-related research themes to attract and engage public audiences. In addition, BPRE will make available to wide audiences an online database of Commercial Space Center activities, including publications listings, patents, and other information useful to the general public.

Earth Science.—The mission of NASA's Earth Science Enterprise (ESE) is to develop a scientific understanding of the Earth system and its response to natural and human-induced changes to enable improved prediction of climate, weather and natural hazards for present and future generations. ESE seeks to answer a question of fundamental importance to science and society: How is the Earth system changing, and what are the consequences for life on Earth? To do so, ESE is developing the interdisciplinary research field of Earth System Science, which recognizes that the Earth's land surface, oceans, atmosphere, ice sheets, and life itself all interact in a highly dynamic system. Earth system science is an area of research with immense benefit to the Nation, leading to new knowledge and tools that may improve weather forecasting, agriculture, urban and regional planning, environmental quality, and natural disaster management. ESE has established three goals to pursue in order to fulfill its mission: (1) Science—observe, understand, and model the Earth system to learn how it is changing, and the consequences for life on Earth; (2) Applications—expand and accelerate the realization of economic and societal benefits from Earth science, information, and technology; (3) Technology—develop and adopt advanced technologies to enable mission success and serve national priorities.

In ESE Science, 2001 was another year of substantial accomplishment toward understanding the Earth system. Goddard Space Flight Center (GSFC) produced the first global record of the Earth's biosphere, showing the uptake and release of carbon by land and oceans continuously over three years. NASA-sponsored research showed that the growing sea-

son over parts of the Northern hemisphere has lengthened over the past two decades, with an accompanying increase in lushness of vegetation. NASA and the EarthSAT Corporation released the first consistent 30-m resolution land cover map for the U.S., and are nearing completion of the global map. These data are from calendar year 1990 and provide a basis for comparison of future change; plans are being developed to repeat the process for calendar year 2001 and beyond. Results from a major NASA/NSF-led international research campaign indicate that aerosols from dust and pollution may be reducing evaporation and thus slowing the global water cycle. Results from comparing the 2000 and 1997 Antarctic Mapping Missions have led to new estimates of change in the Antarctic ice sheet; ice in the Lambert glacier flows from the interior to the "mouth" where it reaches a rate of 1 kilometer per year. In the Northern hemisphere, NASA researchers identified patterns of change in sea ice extent over a twenty-year period; overall, Arctic sea ice extent has decreased since calendar year 1978. Continued monitoring of global ocean topography showed that the Pacific Decadal Oscillation governs climate impacts of the Pacific in non-El Nino/La Nina years, and allowed the prediction of last winter's chill across the northern U.S. and relative warmth across the South. ESE also made major advances in computing for climate modeling, using a partnership among two NASA Centers and Silicon Graphics, Inc. to simulate 900 days of Earth's climate in one day, up from the prior capability of 70 days per day; performance on end-to-end climate simulation improved ten-fold. This greatly enhances climate modelers' ability to perform the multiple runs of many years of climate simulations needed to generate useful projections of climate change.

In ESE Applications, ESE has entered into a variety of partnerships that will apply the goods and services made possible by ESE's research. ESE provides QuikSCAT data in real time to the National Oceanic and Atmospheric Administration (NOAA) to improve marine weather forecasting, and has used these data to show that severe storms forming over the oceans can be predicted two days in advance. ESE is working with the Federal Emergency Management Agency (FEMA) to use remote sensing tools to update their flood plain maps throughout the U.S. In a partnership called Agriculture 2020 with the U.S. Department of Agriculture (USDA) and four growers associations representing 100,000 farmers, ESE is demonstrating how to increase crop productivity, reduce risks to crop health, and manage environmental impacts. With the National Institutes of Health, we are exploring the use of satellite data to predict spread of infectious diseases such as malaria that are highly influenced by weather and climate. Throughout the summer, three ESE satellites tracked devastating wildfires in the western U.S., providing data to the U.S. Forest Service (USFS) and regional authorities. As a result, USFS is investing in direct broadcast receiving stations to rapidly acquire data from NASA's Terra satellite.

In ESE Technology, the Enterprise's first New Millennium Program satellite to demonstrate a variety of new technologies for Earth Science successfully completed all its demonstration tasks (save one high-risk propulsion task scheduled for near the end of mission life). These include a new instrument to produce a Landsat-type sensor one-fourth the size of the current Landsat 7 instrument, and the first hyperspectral imager in space, which views the land surface in hundreds of spectral channels rather than the conventional five to seven channels. Sponsored technology research with universities, industry and other government laboratories moved 35% of ESE's new remote sensing instrument concepts one step closer to reality on an established scale of technology maturity. These advances will substantially reduce the cost and enhance the capability of new satellites over the next decade or more. ESE also began formation flying of four land imaging satellites, demonstrating that several smaller satellites can be operated in tandem to dramatically increase spatial and temporal coverage.

ESE is in the midst of deployment of the Earth Observing System (EOS), a set of spacecraft and associated interdisciplinary science investigations to initiate a long-term data set of key parameters required for the study of global climate change. The first six EOS satellites are already in orbit, including Jason-1 and SAGE III, launched in December 2001. The remaining EOS satellites will be launched through calendar year 2004, including Aqua (calendar year 2002) to study the water cycle and atmospheric circulation, and Aura (calendar year 2004) to probe the chemistry of the upper and lower atmosphere. Complementing EOS is a series of small, focused Earth System Science Pathfinder missions to explore Earth system processes never before examined globally from space. Data from the EOS satellites already in orbit are being acquired, processed, and distributed by the EOS Data and Information System (EOSDIS), which is currently handling more than 1 terabyte of data per day. EOSDIS handled 12.3 million user queries for over 15 million products in calendar year 2001. EOSDIS continues to evolve as new satellites are launched, and as new partners are added to produce data products with innovative applications.

As it deploys EOS, ESE is also planning for the future. ESE and U.S. Geological Survey (USGS) released a request for proposal for Landsat Data Continuity Mission to succeed Landsat 7; it is being implemented as a commercial data purchase. ESE is also planning for the transition of several of its key research observations to the Nation's weather satellite system. The Department of Defense (DoD), NOAA and NASA have established an Integrated Program Office (IPO) to create a converged civilian and military weather satellite system called the National Polar-orbiting Operational Environmental Satellite System (NPOESS) to replace the present generation of separate systems. NASA and the IPO are jointly funding the NPOESS Preparatory Project (NPP) that will simultaneously continue key measurements begun by EOS and demonstrate instruments for NPOESS. The NPP will save money for both NASA and NOAA by combining essential atmospheric and Earth surface observations on a single platform, and by seeking to meet both climate science and operational weather requirements with the same advanced instruments.

ESE data products and research are a major contribution to the U.S. Global Change Research Program, an interagency collaboration overseen by the Committee on Natural Resources of the National Science and Technology Council. NASA ESE will also contribute to the new Climate Change Initiative, a multiagency effort with strong focus on outcomes. Because Earth science is inherently global in scope, ESE is engaged in a variety of international partnerships with individual nation's space agencies, and with international consortia such as the World Meteorological Organization. ESE seeks and receives scientific advice on a broad range of topics from the various boards and committees of the National Research Council. These partnerships, together with those above, ensure that NASA's Earth Science Enterprise conducts research at the frontiers of Earth science on questions of practical importance to the Nation.

Aerospace Technology.—The Aerospace Technology (AST) Enterprise mission is to pioneer the identification, development, verification, transfer, application, and commercialization of high-payoff aerospace technologies and the development of broad, crosscutting revolutionary innovations critical to a number of NASA missions. The Enterprise plays a key role in: 1) maintaining a safe and efficient national aviation system, 2) enabling affordable, reliable space transportation systems, and 3) developing basic technologies for a broad range of space applications. Research and development pro-

General and special funds—Continued

SCIENCE, AERONAUTICS AND TECHNOLOGY—Continued

(INCLUDING TRANSFER OF FUNDS)—Continued

grams conducted by the Enterprise contribute to NASA's science and exploration missions, national security, economic growth, and the long-term competitiveness of American aerospace companies. 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.

A modern air and space transportation system is fundamental to our national economy, quality of life, and security of the United States. For 75 years, a strong base for aerospace technology research and development has provided enormous contributions to this system, contributions that have fostered the economic growth of our Nation and provided unprecedented mobility for U. S. citizens. Although major technical advances have made our Nation's air and space transportation system the largest and best of its kind, the future holds critical challenges to its continued growth and performance. Because the U. S. air and space transportation system serves both the public good and critical national security needs, ensuring the continued health and preeminence of that system is a key issue for the future of the Nation.

Although NASA technology benefits the aerospace industry directly, the creative application of NASA's advanced technology to disparate design and development challenges has made numerous contributions to other areas such as the environment, surface transportation, and medicine.

In order to develop the aerospace systems of the future, revolutionary approaches to system design and technology development will be necessary. Pursuing technology fields that are in their infancy today, developing the knowledge bases necessary to design radically new aerospace systems, and performing efficient, high-confidence design and development of revolutionary vehicles are challenges that face us in innovation. These challenges are intensified by the demand for safety in our highly complex aerospace systems.

The President's 2003 Budget provides the resources necessary to maintain the progress required to achieve a 21st Century aviation system that is safe, environmentally friendly, efficient and meets the growing demands for increased and predictable performance. The President's 2003 Budget also supports technology development for space transportation systems that are safer and significantly less costly than today's systems. The structure of the Aerospace Technology budget has been changed so that the budget lines are directly linked to the Enterprise Strategic Goals. The first goal, Revolutionize Aviation, addresses fundamental, systemic issues in the aviation system to ensure continued growth and development appropriate to the needs of the national and global economies. These systemic issues—safety, capacity, environmental compatibility, and mobility—cut across markets including large subsonic civil transports, air cargo, commuter and general aviation. NASA coordinates its investments and technology objectives in this area with the Federal Aviation Administration (FAA) and the Department of Defense through the National Research and Development Plan for Aviation Security, Efficiency, and Environmental Compatibility. In 2003, the President's Budget provides for the demonstration of several advanced technologies that when implemented will result in a significant reduction in aviation accidents. Specific flight evaluations will include an integrated Synthetic Vision System and Runway Incursion Prevention System intended for use on commercial and business aircraft, a next-generation cockpit weather information digital datalink and turbulence awareness system, and a smart icing management system which will automatically activate and manage an aircraft's ice protection systems. In addition, ground-based demonstrations of an advanced vehicle health management system, an engine disk crack detection monitoring system and recovery methods for flight critical systems will be accomplished. The Administration's request also provides for continued development of the technologies necessary to reduce the environmental impact of today's aircraft. The sector testing of a jet engine combustor that could reduce nitrous oxide emissions by 70 percent will be complete. Selection of contractors to proceed with full annular testing for large and regional jet engines will also be complete. Additionally, the Administration's request includes funding for the development of a broad suite of advanced technologies that will provide the basis for future emission reductions including carbon dioxide. The request also includes the continuation of the noise reduction technology that in calendar year 2007 will reduce the perceived aircraft noise pollution by a factor of two from the calendar year 1997 baseline set by the International Civil Aviation Organization (ICAO). The budget request also continues to transfer to the Federal Aviation Administration technologies required to safely increase the use of the National Airspace System (NAS). In order to define future technology investments in this area, the Virtual Airspace Modeling and Simulation project will provide state-of-the-art models of the airspace system which have the capability to model the dynamic effects of interactive agents in the NAS. These models will provide the capability to assess the economic impact of new technologies on the operational performance of the NAS and thus guide future technology development. The budget request continues the Small Aircraft Transportation System (SATS) demonstration program. In 2003, SATS will select candidate technologies for experimental flight evaluation based on their impact on mobility—either through reduced system cost, improved doorstep-to-destination time, increased trip reliability, and/or improved safety—and complete initial lower landing minimum and higher volume flight experiments. Building on its altitude world-record-setting performances, the Environmental Research Aircraft and Sensor Technology (ERAST) project will demonstrate a solar power unpiloted air vehicle with the ability to fly 14 hours above 50,000 feet. The accomplishment of this goal could have significant impact on the application of these systems in disaster relief, communications, environmental sensing, and defense.

The second goal, Advance Space Transportation, will create a safe, affordable highway through the air and into space by improving safety, reliability, and operability, and significantly reducing the cost of space transportation systems. With the creation of the Integrated Space Transportation Plan (ISTP), NASA defined a single, integrated investment strategy for all its space transportation efforts, including Space Shuttle safety investments, the Space Launch Initiative (SLI), and 3rd Generation Space Transportation Technology. By investing in a sustained progression of research and technology development, NASA will enable future generations of reusable launch vehicles and in-space transportation systems that will surmount the Earth-to-orbit challenge and allow less costly, more frequent, and more reliable access to neighboring planets and the stars beyond. As planned in the 2002 Budget, the President's 2003 Budget request includes an increase in funding for the Space Launch Initiative (SLI), which supports the 2nd Generation Reusable Launch Vehicle (RLV) Program. In 2001, NASA awarded 23 contracts under the 2nd Generation RLV Program for study and risk reduction activities across many technical areas, including: airframes, vehicle subsystems, operations, integrated vehicle health management, flight mechanics, NASA-unique systems, and propulsion. In 2003, the Main Engine Prototype Critical Design Review and the Systems Requirements Review will be complete and the Architecture Systems Requirements Document will be baselined. Upon completion of these activities, NASA will

downselect to a minimum of two space transportation architectures for continued development based on their ability to meet safety and affordability goals. This selection will determine what architectures and critical technology developments will be continued through 2006. The successful completion of 2nd Generation RLV Program risk reduction and technology development will enable a mid-decade competition to transition all of NASA's launch needs, including human space flight, to safer, lower cost, commercially competitive, privately operated vehicles at the turn of the decade. In 3rd Generation Space Transportation Technology, the Department of Defense and NASA have collaborated on an integrated science and technology plan for hypersonics research, the National Hypersonic Science and Technology Plan (NHP), which defines a national effort to address numerous challenges. The plan addresses airbreathing propulsion or, in some cases, combined rocket/airbreathing (RBCC) or turbine/airbreathing propulsion (TBCC) cycles. While pure rockets have already achieved hypersonic speeds, airbreathing technologies could offer significant benefits over rocket propulsion in performance and cost. In 2003, NASA will complete the independent evaluation of three competing, revolutionary hypersonic propulsion technology systems demonstrations, including an RBCC engine, a TBCC engine and a scramjet engine.

The third goal, Pioneer Technology Innovation, focuses on broad, crosscutting innovations critical to a number of NASA missions and to the aerospace industry in general. Pursuing technology fields that are in their infancy today, developing the knowledge bases necessary to design radically new aerospace systems, and developing tools for efficient, high-confidence design and development will enable a revolution in aerospace. The Administration's request includes a significant investment in computing and information technology developments and also increases investment in biotechnology and nanotechnology—the revolutionary technologies of the 21st Century. To ensure the highest quality research and strong ties to NASA's missions—Space Science, Earth Science, Biological and Physical Research, Human Space Flight, and Aerospace Technology—these investments will be guided by technology development agreements signed by customers in other NASA Enterprises.

Beginning in 2002, NASA will have the National Academy of Sciences undertake reviews of one of these three program areas—Revolutionize Aviation, Advance Space Transportation, and Pioneer Technology Innovation—every three years. These reviews will provide independent assessments of the quality of NASA's technology research and program planning, whether the research can be performed by universities or corporations outside NASA, and how well NASA's technology research integrates with customer needs. In each of these program areas, NASA will also seek to reduce institutional costs at it field centers so more funds can be invested in technology research through openly competed NASA research announcements and through university and industry partnerships.

The fourth goal, Commercialize Technology, extends the commercial application of NASA technology for economic benefit and improved quality of life. By partnering with both aerospace and non-aerospace industry as well as academia, the full range of NASA's assets—technological expertise, new technologies, and research facilities—are made available to help the Nation.

Academic Programs.—Academic Programs has two components: (1) Education Program and (2) Minority University Program. Since the creation of NASA, the agency has made a substantial commitment to education. NASA's contribution to education has been and is based on the Agency's inspiring mission, specialized workforce, close working relationship with the research and education community, and unique world-class facilities. Based on these attributes, NASA has created a comprehensive education program containing a portfolio of activities directed toward education at all levels. The guidance for the Education Program stated in the NASA Strategic Plan: "Educational Excellence: We involve the educational community in our endeavors to inspire America's students, create learning opportunities, and enlighten inquisitive minds." NASA's Education Program brings students and educators at all levels into its missions and its research as participants and partners, providing opportunities for a diverse group of students and educators to experience first hand involvement with NASA personnel, facilities, and research and development activities.

The Minority University Research Program has a goal to: expand NASA's research base by strengthening the research capabilities of minority universities and colleges; contribute to the scientific and technological workforce; and promote educational excellence. The range of activities conducted under this program will continue to capture the interest of all students in science and technology, develop talented students at the undergraduate and graduate levels, provide research opportunities for students and faculty members at NASA centers, and strengthen and enhance the research capabilities of the Nation's colleges and universities.

Together, these two components of the Academic Programs budget provide guidance for the Agency's interaction with both the formal and informal education community.

Object Classification (in millions of dollars)

Identification code 80–0110–0–1–999		2001 actual	2002 est.	2003 est.
	Direct obligations:			
	Personnel compensation:			
11.1	Full-time permanent	.....	895	949
11.3	Other than full-time permanent	.....	17	17
11.5	Other personnel compensation	.....	20	26
11.8	Special personal services payments	.....	2	2
11.9	Total personnel compensation	.....	934	994
12.1	Civilian personnel benefits	58	273	293
21.0	Travel and transportation of persons	.....	32	36
22.0	Transportation of things	4	5	5
23.1	Rental payments to GSA	1	11	11
23.3	Communications, utilities, and miscellaneous charges	74	102	93
24.0	Printing and reproduction	4	5	5
25.1	Advisory and assistance services	104	104	104
25.2	Other services	591	677	742
25.3	Other purchases of goods and services from Government accounts	256	293	321
25.4	Operation and maintenance of facilities	414	489	520
25.5	Research and development contracts	3,217	3,689	4,049
25.6	Medical care	1	.....	.....
25.7	Operation and maintenance of equipment	81	93	102
26.0	Supplies and materials	120	137	151
31.0	Equipment	116	133	146
32.0	Land and structures	83	95	104
41.0	Grants, subsidies, and contributions	964	1,106	1,214
99.0	Direct obligations	6,088	8,178	8,890
99.0	Reimbursable obligations	517	598	632
99.9	Total new obligations	6,605	8,776	9,522

Personnel Summary

Identification code 80–0110–0–1–999		2001 actual	2002 est.	2003 est.
	Direct:			
1001	Total compensable workyears: Full-time equivalent employment	.....	11,552	11,832
	Reimbursable:			
2001	Total compensable workyears: Full-time equivalent employment	.....	67	63

General and special funds—Continued

MISSION SUPPORT

Program and Financing (in millions of dollars)

Identification code 80–0112–0–1–999		2001 actual	2002 est.	2003 est.
	Obligations by program activity:			
	Direct program:			
00.01	Safety, mission assurance, engineering, and advanced concepts	47	3	
00.02	Research and program management	2,316	50	
00.03	Construction of facilities	236	51	42
00.04	Space communication services	7		
01.00	Total direct program	2,606	104	42
09.01	Reimbursable program	59		
10.00	Total new obligations	2,665	104	42
	Budgetary resources available for obligation:			
21.40	Unobligated balance carried forward, start of year	136	146	42
22.00	New budget authority (gross)	2,661		
22.10	Resources available from recoveries of prior year obligations	16		
23.90	Total budgetary resources available for obligation	2,813	146	42
23.95	Total new obligations	−2,665	−104	−42
23.98	Unobligated balance expiring or withdrawn	−2		
24.40	Unobligated balance carried forward, end of year	146	42	
	New budget authority (gross), detail:			
	Discretionary:			
40.00	Appropriation	2,609		
40.77	Reduction pursuant to P.L. 106–554 (0.22 percent)	−6		
41.00	Transferred to other accounts	−1		
43.00	Appropriation (total discretionary)	2,602		
	Spending authority from offsetting collections:			
68.00	Offsetting collections (cash)	58		
68.10	Change in uncollected customer payments from Federal sources (unexpired)	1		
68.90	Spending authority from offsetting collections (total discretionary)	59		
70.00	Total new budget authority (gross)	2,661		
	Change in obligated balances:			
72.40	Obligated balance, start of year	623	623	188
73.10	Total new obligations	2,665	104	42
73.20	Total outlays (gross)	−2,646	−539	−81
73.40	Adjustments in expired accounts (net)	−7		
73.45	Recoveries of prior year obligations	−16		
74.00	Change in uncollected customer payments from Federal sources (unexpired)	−1		
74.10	Change in uncollected customer payments from Federal sources (expired)	6		
74.40	Obligated balance, end of year	623	188	149
	Outlays (gross), detail:			
86.90	Outlays from new discretionary authority	2,023		
86.93	Outlays from discretionary balances	625	539	81
87.00	Total outlays (gross)	2,646	539	81
	Offsets:			
	Against gross budget authority and outlays:			
	Offsetting collections (cash) from:			
88.00	Federal sources	−57		
88.40	Non-Federal sources	−5		
88.90	Total, offsetting collections (cash)	−62		
	Against gross budget authority only:			
88.95	Change in uncollected customer payments from Federal sources (unexpired)	−1		
88.96	Portion of offsetting collections (cash) credited to expired accounts	4		
	Net budget authority and outlays:			
89.00	Budget authority	2,602		
90.00	Outlays	2,584	539	81

In 2001, this appropriation provides funding for mission support and includes: safety, mission assurance, engineering and advanced concepts activities supporting agency programs; salaries and related expenses in support of research in NASA field installations; design, repair, rehabilitation and modification of institutional facilities and construction of new institutional facilities; and other operations activities supporting conduct of agency programs.

Since 2002, NASA has implemented a two-appropriation budget (excluding the Inspector General account). The two-appropriation budget (Human Space Flight (HSF) and Science, Aeronautics and Technology (SAT)) is NASA's first step at transitioning to a full cost budget. While full cost will ultimately integrate institutional and programmatic funds into a single budget, that integration is done in a stepwise manner, by providing for a mission support budget line under each Enterprise and eliminating the present mission support appropriation. This initial step will begin to recognize, budget, and track direct full time eqivalent (FTE) personnel associated at the Enterprise level and then use this FTE data to distribute other-than-direct (OTD) institutional costs (Research and Program Management and non-programmatic Construction of Facilities) using the relative percentages of direct FTE's by Enterprise.

This means the distribution of the OTD resources takes advantage of a basic assumption, to be used prior to the existence of cost and service pools, that FTE's are a reasonable relative indicator at the Enterprise level of required facility and institutional capabilities. Taking this step will help program/project personnel and decision makers begin to understand the potential magnitude of institutional funds that are associated with each Enterprise in preparation for the day when full cost budgeting will distribute these funds most appropriately to the project level via the appropriate cost/service pools.

Beginning in 2002, there is no longer a Mission Support account. Institutional costs will be budgeted within HSF and SAT (as discussed above) and safety, mission assurance and engineering will be budgeted within the HSF account.

NASA plans to control personnel levels through full time permanent (FTP) civil servant positions while continuing to track full time equivalent positions, as done in the past. This will allow NASA more flexibility in the use of non-permanent positions for short-term technical needs as well as co-op and intern programs.

Performance Objectives

Research and program management.—In 2001, this activity provided for the salaries, travel support, other personnel expenses of the entire NASA civil service workforce, and includes vital support to the physical plant at the Centers and at NASA Headquarters.

Construction of facilities.—In 2001, this activity provided for facility construction activities to preserve NASA's infrastructure and enable NASA's missions; environmental compliance and restoration activities, design of facilities projects, and advanced planning and critical functional leadership activities related to future facilities needs. Activities in support of construction projects to repair, revitalize and modernize the basic infrastructure and institutional facilities at NASA centers will continue with the major focus on eliminating safety-related concerns. Increasing attention is being given to activities in support of environmental compliance and restoration requirements.

Object Classification (in millions of dollars)

Identification code 80–0112–0–1–999		2001 actual	2002 est.	2003 est.
	Direct obligations:			
	Personnel compensation:			
11.1	Full-time permanent	1,340		
11.3	Other than full-time permanent	26		

11.5	Other personnel compensation	32		
11.8	Special personal services payments	12		
11.9	Total personnel compensation	1,410		
12.1	Civilian personnel benefits	314		
13.0	Benefits for former personnel	2		
21.0	Travel and transportation of persons	52		
22.0	Transportation of things	6		
23.1	Rental payments to GSA	18		
23.3	Communications, utilities, and miscellaneous charges	28	4	
24.0	Printing and reproduction	6	1	
25.1	Advisory and assistance services	20	1	
25.2	Other services	236	26	
25.3	Other purchases of goods and services from Government accounts	39	3	
25.4	Operation and maintenance of facilities	123	16	
25.5	Research and development contracts	74	15	
25.6	Medical care	7	1	
25.7	Operation and maintenance of equipment	38	10	
26.0	Supplies and materials	18	4	
31.0	Equipment	6	5	
32.0	Land and structures	201	17	42
41.0	Grants, subsidies, and contributions	7	1	
42.0	Insurance claims and indemnities	1		
99.0	Direct obligations	2,606	104	42
99.0	Reimbursable obligations	59		
99.9	Total new obligations	2,665	104	42

Personnel Summary

Identification code 80–0112–0–1–999	2001 actual	2002 est.	2003 est.
Direct:			
1001 Total compensable workyears: Full-time equivalent employment	18,412		
Reimbursable:			
2001 Total compensable workyears: Full-time equivalent employment	98		

Space Flight, Control and Data Communications

Program and Financing (in millions of dollars)

Identification code 80–0105–0–1–252	2001 actual	2002 est.	2003 est.
Change in obligated balances:			
72.40 Obligated balance, start of year	1		
73.20 Total outlays (gross)	−1		
Outlays (gross), detail:			
86.93 Outlays from discretionary balances	1		
Net budget authority and outlays:			
89.00 Budget authority			
90.00 Outlays	1		

Since 1995, NASA's Space flight, control and data communications activities have been performed in Human Space Flight; Science, Aeronautics and Technology; and Mission Support. This account shows spending from balances prior to the account restructuring.

Construction of Facilities

Program and Financing (in millions of dollars)

Identification code 80–0107–0–1–999	2001 actual	2002 est.	2003 est.
Obligations by program activity:			
10.00 Total new obligations (object class 32.0)	2		
Budgetary resources available for obligation:			
21.40 Unobligated balance carried forward, start of year	7	5	7
23.95 Total new obligations	−2		
24.40 Unobligated balance carried forward, end of year	5	7	7
Change in obligated balances:			
72.40 Obligated balance, start of year	12	6	
73.10 Total new obligations	2		
73.20 Total outlays (gross)	−7	−6	
73.40 Adjustments in expired accounts (net)	−1		
74.40 Obligated balance, end of year	6		
Outlays (gross), detail:			
86.93 Outlays from discretionary balances	7	6	
Net budget authority and outlays:			
89.00 Budget authority			
90.00 Outlays	7	6	

Since 1995 NASA's Construction of facilities activities have been performed in Human Space Flight; Science, Aeronautics and Technology; and Mission Support. This account shows spending from balances prior to the account restructuring.

Office of Inspector General

For necessary expenses of the Office of Inspector General in carrying out the Inspector General Act of 1978, as amended, 【$23,700,000】 *$25,600,000. (Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2002; additional authorizing legislation required.)*

Program and Financing (in millions of dollars)

Identification code 80–0109–0–1–252	2001 actual	2002 est.	2003 est.
Obligations by program activity:			
10.00 Total new obligations (object class 12.1)	24	25	26
Budgetary resources available for obligation:			
22.00 New budget authority (gross)	24	25	26
23.95 Total new obligations	−24	−25	−26
New budget authority (gross), detail:			
Discretionary:			
40.00 Appropriation	24	25	26
Change in obligated balances:			
72.40 Obligated balance, start of year	2	3	3
73.10 Total new obligations	24	25	26
73.20 Total outlays (gross)	−23	−25	−26
74.40 Obligated balance, end of year	3	3	3
Outlays (gross), detail:			
86.90 Outlays from new discretionary authority	21	22	23
86.93 Outlays from discretionary balances	2	3	3
87.00 Total outlays (gross)	23	25	26
Net budget authority and outlays:			
89.00 Budget authority	24	25	26
90.00 Outlays	23	25	26

Budget Authority and Outlays Excluding Full Funding for Federal Retiree Costs (in millions of dollars)

	2001 actual	2002 est.	2003 est.
Net budget authority and outlays:			
89.00 Budget authority	23	24	25
90.00 Outlays	22	24	25

The mission of the Office of Inspector General is to conduct audits and investigations of agency activities. The Inspector General keeps the Administrator informed of problems and deficiencies in agency programs and operations.

Object Classification (in millions of dollars)

Identification code 80–0109–0–1–252	2001 actual	2002 est.	2003 est.
11.1 Personnel compensation: Full-time permanent	16	17	18
12.1 Civilian personnel benefits	6	6	6
21.0 Travel and transportation of persons	1	1	1
26.0 Supplies and materials	1	1	1
99.9 Total new obligations	24	25	26

General and special funds—Continued

OFFICE OF INSPECTOR GENERAL—Continued

Personnel Summary

Identification code 80–0109–0–1–252	2001 actual	2002 est.	2003 est.
1001 Total compensable workyears: Full-time equivalent employment	201	213	213

Trust Funds

SCIENCE, SPACE, AND TECHNOLOGY EDUCATION TRUST FUND

Unavailable Collections (in millions of dollars)

Identification code 80–8978–0–7–503	2001 actual	2002 est.	2003 est.
01.99 Balance, start of year	15	15	15
Receipts:			
02.40 Earnings on investments; Science, Space and Technology Education, Trust Fu	1	1	1
04.00 Total: Balances and collections	16	16	16
Appropriations:			
05.00 Science, space, and technology education trust fund	−1	−1	−1
07.99 Balance, end of year	15	15	15

Program and Financing (in millions of dollars)

Identification code 80–8978–0–7–503	2001 actual	2002 est.	2003 est.
Obligations by program activity:			
10.00 Total new obligations (object class 41.0)	1	1	1
Budgetary resources available for obligation:			
22.00 New budget authority (gross)	1	1	1
23.95 Total new obligations	−1	−1	−1
New budget authority (gross), detail:			
Mandatory:			
60.26 Appropriation (trust fund)	1	1	1
Change in obligated balances:			
73.10 Total new obligations	1	1	1
73.20 Total outlays (gross)	−1	−1	−1
Outlays (gross), detail:			
86.97 Outlays from new mandatory authority	1	1	1
Net budget authority and outlays:			
89.00 Budget authority	1	1	1
90.00 Outlays	1	1	1
Memorandum (non-add) entries:			
92.01 Total investments, start of year: Federal securities: Par value	15	15	15
92.02 Total investments, end of year: Federal securities: Par value	15	15	15

NATIONAL SPACE GRANT PROGRAM

Unavailable Collections (in millions of dollars)

Identification code 80–8977–0–7–252	2001 actual	2002 est.	2003 est.
01.99 Balance, start of year			
Receipts:			
02.00 Gifts and donations	3		
Appropriations:			
05.00 National space grant program gift fund	−3		
07.99 Balance, end of year			

Program and Financing (in millions of dollars)

Identification code 80–8977–0–7–252	2001 actual	2002 est.	2003 est.
Obligations by program activity:			
10.00 Total new obligations (object class 41.0)		3	
Budgetary resources available for obligation:			
21.40 Unobligated balance carried forward, start of year		3	
22.00 New budget authority (gross)	3		
23.90 Total budgetary resources available for obligation	3	3	
23.95 Total new obligations		−3	
24.40 Unobligated balance carried forward, end of year	3		
New budget authority (gross), detail:			
Mandatory:			
60.26 Appropriation (trust fund)	3		
Change in obligated balances:			
73.10 Total new obligations		3	
73.20 Total outlays (gross)		−3	
Outlays (gross), detail:			
86.98 Outlays from mandatory balances		3	
Net budget authority and outlays:			
89.00 Budget authority	3		
90.00 Outlays		3	

ADMINISTRATIVE PROVISIONS

Notwithstanding the limitation on the availability of funds appropriated for "Human space flight", or "Science, aeronautics and technology" by this appropriations Act, when any activity has been initiated by the incurrence of obligations for construction of facilities as authorized by law, such amount available for such activity shall remain available until expended. This provision does not apply to the amounts appropriated for institutional minor revitalization and construction of facilities, and institutional facility planning and design.

Notwithstanding the limitation on the availability of funds appropriated for "Human space flight", or "Science, aeronautics and technology" by this appropriations Act, the amounts appropriated for construction of facilities shall remain available until September 30, [2004] *2005*.

Notwithstanding the limitation on the availability of funds appropriated for "Office of Inspector General", amounts made available by this Act for personnel and related costs and travel expenses of the National Aeronautics and Space Administration shall remain available until September 30, [2002] *2003* and may be used to enter into contracts for training, investigations, costs associated with personnel relocation, and for other services, to be provided during the next fiscal year. Funds for announced prizes otherwise authorized shall remain available, without fiscal year limitation, until the prize is claimed or the offer is withdrawn.

[No funds in this Act or any other appropriations Act may be used to finalize an agreement prior to December 1, 2002 between NASA and a nongovernment organization to conduct research utilization and commercialization management activities of the International Space Station.] *(Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2002.)*

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Federal Funds

General and special funds:

SCIENCE, AERONAUTICS AND EXPLORATION

(INCLUDING TRANSFER OF FUNDS)

For necessary expenses, not otherwise provided for, in the conduct and support of science, aeronautics and exploration research and development activities, including research, development, operations, support and services; maintenance; construction of facilities including repair, rehabilitation, revitalization, and modification of facilities, construction of new facilities and additions to existing facilities, facility planning and design, and restoration, and acquisition or condemnation of real property, as authorized by law; environmental compliance and restoration; space flight, spacecraft control and communications activities including operations, production, and services; program management; personnel and related costs, including uniforms or allowances therefor, as authorized by 5 U.S.C. 5901–5902; travel expenses; purchase and hire of passenger motor vehicles; not to exceed $24,000 for official reception and representation expenses; and purchase, lease, charter, maintenance and operation of mission and administrative aircraft, $7,660,900,000, to remain available until September 30, 2005, of which amounts as determined by the Administrator for salaries and benefits; training, travel and awards; facility and related costs; information technology services; science, engineering, fabricating and testing services; and other administrative services may be transferred to "Space Flight capabilities" in accordance with section 312(b) of the National Aeronautics and Space Act of 1958, as amended by Public Law 106–377.

Note.—A regular 2003 appropriation for this account had not been enacted at the time the budget was prepared; therefore, this account is operating under a continuing resolution (P.L. 107–229, as amended). The amounts included for 2003 in this budget reflect the Administration's 2003 policy proposals.

Program and Financing (in millions of dollars)

Identification code 80–0114–0–1–999		2002 actual	2003 est.	2004 est.
	Obligations by program activity:			
00.01	Space science			3,809
00.02	Earth science			1,475
00.03	Biological & physical research			924
00.04	Aeronautics			907
00.05	Education programs			161
09.01	Reimbursable program			617
10.00	Total new obligations			7,893
	Budgetary resources available for obligation:			
22.00	New budget authority (gross)			8,278
23.95	Total new obligations			−7,893
24.40	Unobligated balance carried forward, end of year			385
	New budget authority (gross), detail:			
	Discretionary:			
40.00	Appropriation			7,661
68.00	Spending authority from offsetting collections: Offsetting collections (cash)			617
70.00	Total new budget authority (gross)			8,278
	Change in obligated balances:			
73.10	Total new obligations			7,893
73.20	Total outlays (gross)			−4,602
74.40	Obligated balance, end of year			3,291
	Outlays (gross), detail:			
86.90	Outlays from new discretionary authority			4,602
	Offsets:			
	Against gross budget authority and outlays:			
	Offsetting collections (cash) from:			
88.00	Federal sources			−540
88.40	Non-Federal sources			−77
88.90	Total, offsetting collections (cash)			−617
	Net budget authority and outlays:			
89.00	Budget authority			7,661
90.00	Outlays			3,985
	Additional net budget authority and outlays to cover cost of fully accruing retirement:			
99.00	Budget authority			63
99.01	Outlays			63

This appropriation provides for the full costs associated with the Science, Aeronautics and Exploration (SAE) activities of the Agency, which consist of the Space Science, Earth Science, Biological and Physical Research, Aeronautics, and Education Programs. The full costs include both the direct and the indirect costs supporting these programs, and provide for all of the research; development; operations; salaries and related expenses; design, repair, rehabilitation, and modification of facilities and construction of new facilities; maintenance and operation of existing facilities; and other general and administrative activities supporting Science, Aeronautics and Exploration programs. This account includes activities that were previously funded in the Science, Aeronautics, and Technology account.

Performance Objectives

Detailed performance goals associated with the Science, Aeronautics and Exploration (SAE) activities are addressed in NASA's FY 2004 President's Budget. The SAE activities include: Space Science, Earth Science, Biological and Physical Research, Aeronautics, and Education Programs; and are described below.

Space Science.—NASA's Space Science program seeks to answer fundamental questions concerning: the galaxy and the universe; the connections among the Sun, Earth and heliosphere; the origin and evolution of planetary systems; and the origin and distribution of life in the universe. The Space Science program is comprised of many research and development activities, including flight missions, major space-based facilities, technology and mission development programs, and research and data analysis.

NASA will proceed in the development of several major missions, including the Stratospheric Observatory for Infrared Astronomy (SOFIA), the Solar Terrestrial Relations Observatory (STEREO), the Gamma-ray Large-Area Space Telescope (GLAST), the Solar Dynamics Observatory (SDO) and the final Hubble Space Telescope (HST) Servicing Mission. SOFIA development will continue in preparation for a spring 2005 first science flight. STEREO, scheduled for launch in November 2005, will advance our understanding of the Sun's corona (its outer "atmosphere"), the origin of huge eruptions of solar material known as coronal mass ejections (CMEs), and the interaction between CMEs and the Earth's environment. GLAST, which will investigate the high-energy world of black holes and neutron stars, is on track for launch in the fall of 2006. SDO will increase our understanding of the Sun's magnetic field, solar wind, energetic particles, and variations in solar irradiance. Development of SDO begins in 2004. During the final HST Servicing Mission, also scheduled for 2004, astronauts will install the Cosmic Origins Spectrograph (COS) and Wide Field Camera 3 (WFC3) to extend the telescope's operational life to 2010. Development activities supporting several key missions in the payloads program, such as Solar-B and Herschel, will also continue in 2004.

General and special funds—Continued

SCIENCE, AERONAUTICS AND EXPLORATION—Continued

(INCLUDING TRANSFER OF FUNDS)—Continued

Support for the Explorer and New Millennium programs will continue. Small- and Medium-class Explorer missions provide frequent flight opportunities for a diverse array of world-class scientific investigations—recently selected projects will examine diffuse intergalactic radiation and ice in Earth's mesosphere. Another Small Explorers mission, the second of the Two Wide-angle Imaging Neutral-atom Spectrometers (TWINS), will be launched in 2004 to provide stereoscopic images of the Earth's magnetosphere for the first time. The New Millennium Program provides flight demonstrations of critical new technologies that will reduce the mass and cost of future science and spacecraft subsystems, while maintaining or improving mission capabilities. Several of these innovative Space Technology projects (ST–5, 6, and 7) are scheduled for launch from 2004 through 2006.

The Discovery Program provides frequent access to space for small planetary missions that will perform high-quality scientific investigations. Both Deep Impact, the first space mission to probe beneath the surface of a comet and reveal the secrets of its interior, and the Mercury Surface, Space Environment, Geochemistry and Ranging (MESSENGER) mission to orbit Mercury are scheduled for launch in 2004. The Kepler Mission to explore the structure and diversity of planetary systems, with a special emphasis on detecting Earth-size planets in the habitable zones around other stars, will be in development in 2004, as will the Dawn mission to study the asteroids 1 Ceres and 4 Vesta.

Focused technology programs are included in each of the five major Space Science themes: Astronomical Search for Origins, Structure and Evolution of the Universe, Solar System Exploration, Mars Exploration Program, and Sun-Earth Connection. Funding is provided for early technology development in support of strategic missions, such as the James Webb (formerly "Next Generation") Space Telescope and the Living With a Star Program. The goal is to retire technology risk early in a mission's lifecycle, before proceeding to full-scale development. Funds are also provided to continue ongoing operations of approximately thirty spacecraft, and to conduct robust research and analysis, data analysis, and sub-orbital research campaigns.

The budget request for 2004 features two new initiatives: Optical Communication and the Jupiter Icy Moons Tour. Optical Communication seeks to use lasers to improve by many orders of magnitude the communication data rate for deep space missions. Current limitations on data transfer using radio constrain scientific discovery and public participation in our space missions. The Jupiter Icy Moons Tour will explore the icy moons of Jupiter (Europa, Ganymede, and Callisto), providing a full characterization of the moons through orbital reconnaissance. This will set the stage for the next phase of Jovian exploration, to include surface chemical and organic investigations, and a probe to explore the sub-surface environment. This mission will be part of Project Prometheus, an effort started last year to demonstrate nuclear power and nuclear electric propulsion technology that can open the solar system to detailed research and exploration.

Earth Science.—NASA's Earth Science Program contributes to the Agency's mission to understand and protect our home planet by developing a scientific understanding of the Earth system and its response to both natural and human-induced changes to enable improved prediction of climate, weather and natural hazards for present and future generations.

The Earth Science Program seeks to answer a question of fundamental importance to science and society: How is the Earth system changing, and what are the consequences for life on Earth? In pursuit of this question, NASA has pioneered the interdisciplinary research field of Earth System Science, which recognizes that the Earth's land surface, oceans, atmosphere, ice sheets, and life itself all interact in a highly dynamic system. Employing a constellation of over 15 Earth observing satellites routinely making measurements with over 80 remote sensing instruments, NASA has made it an Agency goal to understand the Earth system and apply Earth System Science to improve prediction of climate, weather, and natural hazards. Within this goal, we have defined two strategic objectives: (1) Science—observe, analyze, and model the Earth system to discover how it is changing and the consequences for life on Earth; and (2) Applications—expand and accelerate the realization of economic and societal benefits from Earth science information and technology; with Earth System Science and Earth Science Applications as the corresponding budget themes.

Within Earth System Science, NASA works with the science community to identify questions on the frontiers of science that have profound societal importance, and to which remote sensing of the Earth can make a defining contribution. These science questions become the foundation of a research strategy, which defines requirements for scientific observations, and a roadmap for combining the technology, observations, modeling efforts, basic research, and partnerships needed to answer the questions over time. We are responding to the scientific community's call for comprehensive observation of the Earth's major components using the Earth Observing System (EOS). NASA uses the global view from space to contribute to the U.S. Government's Global Change Research Program (USGCRP) and Climate Change Research Initiative (CCRI). We have identified key areas of investment that will enable us to do more, and do it more rapidly, with a targeted investment in observations, research, and modeling of uncertainties surrounding the forces acting on the climate system.

Within Earth Science Applications, NASA enables the application of information and knowledge gained through partnerships with other federal agencies. These partnerships focus on innovative approaches for using Earth science information and knowledge to provide decision support information. This information supports myriad operational applications, as well as policy discussions, and is used to address a variety of national priorities, including economic issues and homeland security. Through the Earth Science Applications program, NASA is working with organizations with the appropriate information infrastructure to apply NASA's Earth science results to help manage coastal environments, agriculture and water resources, and aviation safety; monitor air and water quality, forest fires, and the impacts of infectious diseases and invasive species; and conduct hurricane forecasting and disaster relief efforts. The potential socioeconomic benefits of these applications are significant.

Biological and Physical Research.—NASA's Biological and Physical Research (BPR) Enterprise addresses the opportunities and challenges of space flight through basic and applied research on the ground and in space. The program exploits the rich opportunities of space flight in pursuit of answers to a broad set of scientific questions that support NASA's goals to explore the fundamental principles of physics, chemistry and biology through research in the unique natural laboratory of space, and to extend the duration and boundaries of human space flight to create new opportunities for scientific exploration and discovery. The major outcomes of this research include fundamental scientific progress and safer more efficient space travel. BPR includes three themes: Biological Sciences Research, Physical Sciences Research, and Research Partnerships and Flight Support.

Physical Science Research supports basic and applied research that takes advantage of the unique environment of space to expand our understanding of the fundamental laws

of nature. The theme supports NASA's mission to explore the universe and search for life both through applied research to improve safety and performance and through exploratory research on the fundamental laws of nature. The theme supports NASA's mission to understand and protect our home planet by producing research results that have direct application to industrial products and processes.

Biological Science Research conducts basic and applied research to enable and support a safe human presence in space in support of NASA's mission to explore the universe and search for life. This theme includes a basic biology research component that pursues fundamental biological research questions as an integral element of understanding how space affects life at all levels, from genes to cells to organisms. This theme supports research to define and control the physiological and psychological challenges to human health associated with space flight, including research on radiation risks, risks associated with microgravity, and risks associated with prolonged isolation and small group dynamics. The theme also includes research and development to improve the reliability and performance of life support systems and spacecraft crew interfaces.

The FY 2004 budget request reflects the results of the NASA Advisory Council's Research Maximization and Prioritization (ReMaP) Task Force recommendations. The request expands planned biomedical research and countermeasures experiments, including a new Human Research Initiative; initiates a limited flight program in high priority advanced human support technology; places additional emphasis on physical science research, including applications to human space flight; and reinstates funding for plant and animal habitats for planned centrifuge research on the International Space Station (ISS).

Implementing ReMaP in the FY 2004 budget is a crucial first step in a longer running planning and prioritization process. In the near term, research and facility development are aligned with the ReMaP priorities in the FY 04 Budget. At the same time, BPR has responded to NASA's new strategic plan by adopting a 5-year direction consistent with overall agency vision, mission and goals. This direction has identified major research thrusts, consistent with the agency strategic plan and the management changes required to support these thrusts.

Aeronautics.—Aeronautics Technology addresses the Agency's goal to "enable a safer, more secure, efficient, and environmentally friendly air transportation system" by performing research and technology to: decrease the aircraft fatal accident rate and the vulnerability of the air transportation system to threats; protect the local and global environmental quality by reducing aircraft noise and emissions; and enable more people and goods to travel faster and farther with fewer delays. NASA works closely with the Federal Aviation Administration (FAA) in setting these goals. Additionally, in support of the Agency goal "to create a more secure world and improve the quality of life by investing in technologies and to collaborate with other agencies, industry and academia," Aeronautics Technology supports national security through aeronautical partnerships with the Department of Defense and other government agencies. Finally, this theme enables pioneering aeronautical concepts to support earth and space science missions and new commercial markets in support of the Agency goal to "enable revolutionary capabilities through new technology."

Three research and technology programs compose the Aeronautics Technology theme. The Aviation Safety and Security Program develops and demonstrates technologies and strategies for the prevention, intervention, and mitigation of factors contributing to aviation accidents. This theme gives highest priority to the factors that are most strongly tied to accident and fatality rates, as well as those that address multiple classes of hazards, including hazardous weather, controlled flight into terrain, accidents and incidents caused by human error, and mechanical or software malfunctions. The program develops and integrates 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 accidents occur. NASA develops, validates and transfers these advanced concepts, technologies and procedures through a partnership with the Federal Aviation Administration (FAA) and in cooperation with the U.S. aeronautics industry.

To enable increased capacity and mobility of the nation's air transportation system, the Airspace Systems program develops and demonstrates technology for revolutionary improvements to, and modernization of, the air traffic management (ATM) system. The technology enables new ATM decision support tools and airspace concepts as well as new systems for aircraft whose operation can take advantage of the improved, modern ATM system. The resultant benefit to the traveling public will be reduced flight delays and shorter door-step-to-destination times. Users of the technologies that result from this program include: the FAA, state and local airport authorities and their systems suppliers, existing and new commercial and personal aviation operators, and the aircraft developers and their system suppliers. This program directly supports the FAA's "Free Flight" activities and the Operational Evolution Plan (OEP) and maintains pace with a continually evolving technical environment.

The Vehicle Systems program develops breakthrough technologies to enable new capability and functionality in future aircraft. Technologies from this program are then further developed in the Aviation Safety and Security Program and the Airspace Systems program to reduce aircraft emissions and noise, enable more people and goods to travel faster and farther, and to increase air system safety and security. The Vehicle Systems program also supports development of common advanced air vehicle technologies with the DOD.

Education.—Since its establishment, NASA has served the Nation's educational interests by sharing its unique mission, facilities, personnel, and research results with inquisitive minds throughout the United States and around the globe. The results have opened the minds of people of all ages, races and background to the universe, new technologies and expanded possibilities. As the 21st century begins, and new national challenges are before us, it is appropriate that NASA re-examine and re-energize the Agency's education mission and organization. To that end, a NASA Education Office has been established as a new, mission-focused organization that will aggregate NASA's education programs, management and staff. This Office will position NASA to more effectively leverage its resources to encourage student interest in math, science, and technology education—to inspire the next generation of explorers, as only NASA can.

The NASA Education Office will work toward achieving four priorities: (1) motivating K–16+ students to pursue careers in science, math and engineering; (2) providing educators with unique teaching tools and compelling teaching experiences; (3) seeking to ensure that we are investing the taxpayer's resources wisely; and (4) engaging minority and underrepresented students, educators and researchers in NASA's education program. An important and visible component of the NASA Education Office is the Minority University Research and Education Program, insuring that minority education programs are a high priority for the Agency.

Object Classification (in millions of dollars)

Identification code 80–0114–0–1–999	2002 actual	2003 est.	2004 est.
Direct obligations:			
Personnel compensation:			
11.1 Full-time permanent	.....	.....	789

General and special funds—Continued

SCIENCE, AERONAUTICS AND EXPLORATION—Continued

(INCLUDING TRANSFER OF FUNDS)—Continued

Object Classification (in millions of dollars)—Continued

Identification code 80–0114–0–1–999	2002 actual	2003 est.	2004 est.
11.3 Other than full-time permanent			16
11.5 Other personnel compensation			15
11.8 Special personal services payments			8
11.9 Total personnel compensation			828
12.1 Civilian personnel benefits			199
21.0 Travel and transportation of persons			32
22.0 Transportation of things			6
23.1 Rental payments to GSA			14
23.3 Communications, utilities, and miscellaneous charges			73
24.0 Printing and reproduction			4
25.1 Advisory and assistance services			134
25.2 Other services			671
25.3 Other purchases of goods and services from Government accounts			261
25.4 Operation and maintenance of facilities			238
25.5 Research and development contracts			3,209
25.7 Operation and maintenance of equipment			81
26.0 Supplies and materials			154
31.0 Equipment			101
32.0 Land and structures			186
41.0 Grants, subsidies, and contributions			1,085
99.0 Direct obligations			7,276
99.0 Reimbursable obligations			617
99.9 Total new obligations			7,893

Personnel Summary

Identification code 80–0114–0–1–999	2002 actual	2003 est.	2004 est.
Direct:			
Total compensable workyears:			
1001 Civilian full-time equivalent employment			9,184
Reimbursable:			
2001 Total compensable workyears: Civilian full-time equivalent employment			63

SPACE FLIGHT CAPABILITIES

(INCLUDING TRANSFER OF FUNDS)

For necessary expenses, not otherwise provided for, in the conduct and support of space flight capabilities research and development activities, including research, development, operations, support and services; maintenance; construction of facilities including repair, rehabilitation, revitalization and modification of facilities, construction of new facilities and additions to existing facilities, facility planning and design, and acquisition or condemnation of real property, as authorized by law; environmental compliance and restoration; space flight, spacecraft control and communications activities including operations, production, and services; program management; personnel and related costs, including uniforms or allowances therefor, as authorized by 5 U.S.C. 5901–5902; travel expenses; purchase and hire of passenger motor vehicles; not to exceed $24,000 for official reception and representation expenses; and purchase, lease, charter, maintenance and operation of mission and administrative aircraft, $7,782,100,000, to remain available until September 30, 2005, of which amounts as determined by the Administrator for salaries and benefits; training, travel and awards; facility and related costs; information technology services; science, engineering, fabricating and testing services; and other administrative services may be transferred to "Science, aeronautics and exploration" in accordance with section 312(b) of the National Aeronautics and Space Act of 1958, as amended by Public Law 106–377.

Note.—A regular 2003 appropriation for this account had not been enacted at the time the budget was prepared; therefore, this account is operating under a continuing resolution (P.L. 107–229, as amended). The amounts included for 2003 in this budget reflect the Administration's 2003 policy proposals.

Program and Financing (in millions of dollars)

Identification code 80–0115–0–1–252	2002 actual	2003 est.	2004 est.
Obligations by program activity:			
00.01 Space flight			5,804
00.02 Crosscutting technology			1,591
09.01 Reimbursable program			328
10.00 Total new obligations			7,723
Budgetary resources available for obligation:			
22.00 New budget authority (gross)			8,110
23.95 Total new obligations			−7,723
24.40 Unobligated balance carried forward, end of year			387
New budget authority (gross), detail:			
Discretionary:			
40.00 Appropriation			7,782
68.00 Spending authority from offsetting collections: Offsetting collections (cash)			328
70.00 Total new budget authority (gross)			8,110
Change in obligated balances:			
73.10 Total new obligations			7,723
73.20 Total outlays (gross)			−5,613
74.40 Obligated balance, end of year			2,110
Outlays (gross), detail:			
86.90 Outlays from new discretionary authority			5,613
Offsets:			
Against gross budget authority and outlays:			
Offsetting collections (cash) from:			
88.00 Federal sources			−272
88.40 Non-Federal sources			−56
88.90 Total, offsetting collections (cash)			−328
Net budget authority and outlays:			
89.00 Budget authority			7,782
90.00 Outlays			5,285
Additional net budget authority and outlays to cover cost of fully accruing retirement:			
99.00 Budget authority			63
99.01 Outlays			63

This appropriation provides for the full costs associated with the capabilities that support Agency research, which consist of the Space Flight and Crosscutting Technology Programs. The full costs include both the direct and the indirect costs supporting these programs, and provide for all of the research; development; operations; salaries and related expenses; design, repair, rehabilitation, and modification of facilities and construction of new facilities; maintenance and operation of existing facilities; and other general and administrative activities supporting Science, Aeronautics and Exploration programs. This account includes activities that were previously funded in the Human Space Flight and Science, Aeronautics, and Technology accounts.

Performance Objectives

Detailed performance goals associated with the Enabling Capabilities activities are addressed in NASA's FY 2004 President's Budget. The Enabling Capabilities activities include Space Flight and Crosscutting Technology, and are described below.

Space Flight.—Space Flight encompasses the following themes: International Space Station (ISS), Space Shuttle Program, and Space and Flight Support.

The ISS is a complex of research laboratories in low Earth orbit (LEO) in which American, Russian, Canadian, European, and Japanese astronauts are conducting unique scientific and technological investigations in a micro-gravity environment. The objectives of the Station are to support scientific research and other activities requiring the unique attributes of humans in space, and establish a permanent

human presence in Earth orbit. Program estimates have been determined to be credible by independent assessment teams, however, concerns were raised in regard to the sufficiency of funding levels to cover risks to program performance and to expand research. To this end, the FY 2004 Budget request provides increased funding for continued development of the vehicle and for operations in support of continued assembly, logistics re-supply, crew exchange, research operations and other utilization. With fourteen U.S. assembly and logistic missions successfully completed, the budget includes funding to keep subsequent assembly missions on schedule through U.S. Core Complete (Flight 10A), currently planned for calendar year 2004, and to continue to expand research opportunities commensurate with the build-up of on-orbit utilization capabilities and resources.

The Space Shuttle Program plays a vital role in NASA's strategic goal to advance human exploration, use, and development of space by providing safe, routine access to space in support of permanent human operations in Low Earth Orbit. NASA planning assumes the Space Shuttle will need to be capable of supporting assembly and operation of the Space Station for at least this decade. Specific program investments are required in order to maintain this human transport capability through this decade. These investments are consistent with NASA's strategy of ensuring the Space Shuttle remains viable until a new transportation system is operational. The FY 2004 budget request will allow NASA to meet the intended flight rates, provide appropriate contingency planning to assure transportation and assembly support to the ISS program and include high priority projects for safety and supportability. These projects will combat obsolescence of vehicles, ground systems, and facilities, in order to maintain the program's safety and viability through this decade.

Space and Flight Support is comprised of separate "enabling capabilities" programs that provide on-going customer support for a wide range of services including environmental activities, space communications, Space Shuttle payloads processing, expendable launch vehicles, and rocket propulsion systems testing. These services are critical for the conduct of space exploration, aeronautical research and physiological research. They are provided to a wide range of customers including NASA, other U.S. federal agencies, foreign governments and commercial interests. Space and Flight Support also includes the Advanced Systems program, which will enable NASA to take a "stepping stone" approach to future NASA missions through by advanced research and technology development.

Crosscutting Technology.—The Aerospace Technology Enterprise includes three themes in Crosscutting Technology: Space Launch Initiative, Mission & Science Measurement Technology, and Innovative Technology Partnerships.

The Space Launch Initiative (SLI) will develop the Orbital Space Plan (OSP) to help assure safe, affordable, and reliable U.S.-based crew access and return from the Space Station. The OSP will start as a crew return vehicle, launched on an Evolved Expendable Launch Vehicle (EELV). Initially, the OSP will provide crew return capability by 2010. By 2012, the Orbital Space Plane will evolve to be flown on a human-rated EELV and will transfer crew, and possibly limited cargo, to and from the International Space Station. This capability will serve as a complement and backup to the Space Shuttle for taking crew into space. Later, the Orbital Space Plane could become the basis for a crew transfer vehicle on a new reusable launch vehicle. Funds for the OSP will support an aggressive effort to assess options and complete a preliminary design by 2005. If the Orbital Space Plane is approved for full-scale development, the program will be managed in a streamlined approach to reduce the cost of development and maintain an aggressive schedule. The Next Generation Launch Technology (NGLT) program will be responsible for making the investments relating to the next SLI goal, that focuses on making future space transportation systems safer, more affordable, and more reliable. NASA will make focused, strategic investments in key technology areas—including propulsion, structures and operations—to be applied to both reusable and expendable launch systems. The NGLT program will enable future development decisions on launch systems that support NASA's space transportation needs for the upcoming decades.

The Mission and Science Measurement Technology (MSM) theme enables revolutionary capabilities through new technology. MSM objectives are to develop science-driven architectures and technology, to create knowledge from scientific data, and to develop capabilities for assessing and managing mission risk. The advanced system concepts, fundamental technologies, and engineering tools developed by MSM are unique to NASA needs, and are applicable across many classes of missions in multiple Enterprises. These products may require many years to progress from initial concept definition to mission infusion. Three programs have been formulated to accomplish MSM objectives: the Computing, Information, and Communications Technologies (CICT) Program, that develops breakthrough information and communication systems to increase our understanding of scientific data and phenomena; the Engineering for Complex Systems (ECS) Program, that develops the capabilities to assess and manage risk in the synthesis of complex systems; and the Enabling Concepts and Technologies (ECT) Program, that defines new system concepts, and develops new technologies to enable new science measurements for the NASA Enterprises.

NASA's Innovative Technology Partnership activities consist of: Commercial Programs, Technology Transfer agents, the Enterprise Engine, and the Small Business Research programs. In FY 2004, NASA will initiate an orderly phase-out of the existing Commercial Technology Program, and a new concept—the Enterprise Engine—will be introduced. The Enterprise Engine will create partnerships between NASA, industrial firms and the venture capital community to address NASA's new technology mission needs through innovative technology development partnerships. NASA's Small Business Research programs will continue. They include the Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) programs, which were created by Congress, and promote awards of NASA research contracts to the small business community and promote commercialization of the products of this research by the small business community. These programs help NASA develop innovative technologies by providing competitive research contracts to U.S. owned small businesses.

Object Classification (in millions of dollars)

Identification code 80–0115–0–1–252		2002 actual	2003 est.	2004 est.
	Direct obligations:			
	Personnel compensation:			
11.1	Full-time permanent			780
11.3	Other than full-time permanent			16
11.5	Other personnel compensation			15
11.8	Special personal services payments			7
11.9	Total personnel compensation			818
12.1	Civilian personnel benefits			196
21.0	Travel and transportation of persons			31
22.0	Transportation of things			6
23.1	Rental payments to GSA			1
23.3	Communications, utilities, and miscellaneous charges			59
24.0	Printing and reproduction			5
25.1	Advisory and assistance services			39
25.2	Other services			360
25.3	Other purchases of goods and services from Government accounts			102
25.4	Operation and maintenance of facilities			2,499

General and special funds—Continued

SPACE FLIGHT CAPABILITIES—Continued

(INCLUDING TRANSFER OF FUNDS)—Continued

Object Classification (in millions of dollars)—Continued

Identification code 80–0115–0–1–252	2002 actual	2003 est.	2004 est.
25.5 Research and development contracts			2,848
25.7 Operation and maintenance of equipment			46
26.0 Supplies and materials			169
31.0 Equipment			96
32.0 Land and structures			100
41.0 Grants, subsidies, and contributions			20
99.0 Direct obligations			7,395
99.0 Reimbursable obligations			328
99.9 Total new obligations			7,723

Personnel Summary

Identification code 80–0115–0–1–252	2002 actual	2003 est.	2004 est.
Direct:			
Total compensable workyears:			
1001 Civilian full-time equivalent employment			9,422
Reimbursable:			
2001 Total compensable workyears: Civilian full-time equivalent employment			24

HUMAN SPACE FLIGHT

Program and Financing (in millions of dollars)

Identification code 80–0111–0–1–252	2002 actual	2003 est.	2004 est.
Obligations by program activity:			
Direct program:			
00.01 Space station	1,752	1,573	75
00.02 Payload and ELV support	96	92	4
00.03 Investments and support	1,001	1,233	31
00.04 Space shuttle	3,290	3,117	160
00.05 Space communications and data systems	444	162	6
00.07 Safety, mission assurance & engineering	46	49	2
09.01 Reimbursable program	277	346	
10.00 Total new obligations	6,906	6,572	278
Budgetary resources available for obligation:			
21.40 Unobligated balance carried forward, start of year	171	373	278
22.00 New budget authority (gross)	7,063	6,477	
22.10 Resources available from recoveries of prior year obligations	45		
23.90 Total budgetary resources available for obligation	7,279	6,850	278
23.95 Total new obligations	−6,906	−6,572	−278
24.40 Unobligated balance carried forward, end of year	373	278	
New budget authority (gross), detail:			
Discretionary:			
40.00 Appropriation	6,988	6,131	
40.73 Reduction pursuant to P.L. 107–206	−5		
41.00 Transferred to other accounts	−210		
43.00 Appropriation (total discretionary)	6,773	6,131	
Spending authority from offsetting collections:			
68.00 Offsetting collections (cash)	267	346	
68.10 Change in uncollected customer payments from Federal sources (unexpired)	23		
68.90 Spending authority from offsetting collections (total discretionary)	290	346	
70.00 Total new budget authority (gross)	7,063	6,477	
Change in obligated balances:			
72.40 Obligated balance, start of year	1,468	1,697	1,773
73.10 Total new obligations	6,906	6,572	278
73.20 Total outlays (gross)	−6,608	−6,496	−1,821
73.40 Adjustments in expired accounts (net)	−1		
73.45 Recoveries of prior year obligations	−45		
74.00 Change in uncollected customer payments from Federal sources (unexpired)	−23		
74.10 Change in uncollected customer payments from Federal sources (expired)	−1		
74.40 Obligated balance, end of year	1,697	1,773	230
Outlays (gross), detail:			
86.90 Outlays from new discretionary authority	5,086	4,515	
86.93 Outlays from discretionary balances	1,522	1,981	1,821
87.00 Total outlays (gross)	6,608	6,496	1,821
Offsets:			
Against gross budget authority and outlays:			
Offsetting collections (cash) from:			
88.00 Federal sources	−244	−312	
88.40 Non-Federal sources	−27	−34	
88.90 Total, offsetting collections (cash)	−271	−346	
Against gross budget authority only:			
88.95 Change in uncollected customer payments from Federal sources (unexpired)	−23		
88.96 Portion of offsetting collections (cash) credited to expired accounts	4		
Net budget authority and outlays:			
89.00 Budget authority	6,773	6,131	
90.00 Outlays	6,336	6,150	1,821
Additional net budget authority and outlays to cover cost of fully accruing retirement:			
99.00 Budget authority	39	44	
99.01 Outlays	39	44	

NASA's "Human Space Flight" (HSF) account included the International Space Station; Space Shuttle; Payload and ELV Support; Human Exploration and Development of Space (HEDS) Investments and Support; Space Communications and Data Systems; and Safety, Mission Assurance and Engineering (SMA&E). With the exception of SMA&E, these activities, along with the Crosscutting portion of Aerospace Technology, will be included under the "Enabling Capabilities" account. Beginning in FY 2004, SMA&E is allocated as an indirect charge to all programs. This account shows spending from balances prior to the account restructuring.

Object Classification (in millions of dollars)

Identification code 80–0111–0–1–252	2002 actual	2003 est.	2004 est.
Direct obligations:			
Personnel compensation:			
11.1 Full-time permanent	500	569	
11.3 Other than full-time permanent	8	5	
11.5 Other personnel compensation	12	16	
11.8 Special personal services payments	8	13	
11.9 Total personnel compensation	528	603	
12.1 Civilian personnel benefits	125	131	
21.0 Travel and transportation of persons	21	23	
22.0 Transportation of things	6	6	
23.1 Rental payments to GSA	1	1	
23.3 Communications, utilities, and miscellaneous charges	56	51	3
24.0 Printing and reproduction	5	5	
25.1 Advisory and assistance services	37	34	2
25.2 Other services	340	312	16
25.3 Other purchases of goods and services from Government accounts	96	88	4
25.4 Operation and maintenance of facilities	2,357	2,170	110
25.5 Research and development contracts	2,646	2,430	125
25.6 Medical care	5		
25.7 Operation and maintenance of equipment	43	39	2
26.0 Supplies and materials	159	146	7
31.0 Equipment	91	84	4
32.0 Land and structures	94	86	4
41.0 Grants, subsidies, and contributions	19	17	1
99.0 Direct obligations	6,629	6,226	278
99.0 Reimbursable obligations	277	346	
99.9 Total new obligations	6,906	6,572	278

Personnel Summary

Identification code 80–0111–0–1–252	2002 actual	2003 est.	2004 est.
Direct:			
Total compensable workyears:			
1001 Civilian full-time equivalent employment	6,531	6,912	.....
Reimbursable:			
2001 Total compensable workyears: Civilian full-time equivalent employment	26	30	.....

Science, Aeronautics and Technology

Program and Financing (in millions of dollars)

Identification code 80–0110–0–1–999	2002 actual	2003 est.	2004 est.
Obligations by program activity:			
Direct program:			
00.01 Space science	2,863	3,428	161
00.02 Biological and physical research	816	882	37
00.03 Earth science	1,616	1,734	74
00.04 Aerospace technology	2,539	2,803	118
00.06 Academic programs	212	176	24
09.01 Reimbursable program	455	642	.....
10.00 Total new obligations	8,501	9,665	414
Budgetary resources available for obligation:			
21.40 Unobligated balance carried forward, start of year	448	593	414
22.00 New budget authority (gross)	8,616	9,486	.....
22.10 Resources available from recoveries of prior year obligations	30	.....	.....
23.90 Total budgetary resources available for obligation	9,094	10,079	414
23.95 Total new obligations	−8,501	−9,665	−414
24.40 Unobligated balance carried forward, end of year	593	414	.....
New budget authority (gross), detail:			
Discretionary:			
40.00 Appropriation	7,890	8,844	.....
40.76 Reduction pursuant to P.L. 107–206	−5	.....	.....
42.00 Transferred from other accounts	210	.....	.....
43.00 Appropriation (total discretionary)	8,095	8,844	.....
Spending authority from offsetting collections:			
68.00 Offsetting collections (cash)	587	642	.....
68.10 Change in uncollected customer payments from Federal sources (unexpired)	−66	.....	.....
68.90 Spending authority from offsetting collections (total discretionary)	521	642	.....
70.00 Total new budget authority (gross)	8,616	9,486	.....
Change in obligated balances:			
72.40 Obligated balance, start of year	3,360	3,748	4,494
73.10 Total new obligations	8,501	9,665	414
73.20 Total outlays (gross)	−8,130	−8,917	−4,048
73.40 Adjustments in expired accounts (net)	−37	.....	.....
73.45 Recoveries of prior year obligations	−30	.....	.....
74.00 Change in uncollected customer payments from Federal sources (unexpired)	66	.....	.....
74.10 Change in uncollected customer payments from Federal sources (expired)	18	.....	.....
74.40 Obligated balance, end of year	3,748	4,494	861
Outlays (gross), detail:			
86.90 Outlays from new discretionary authority	4,805	5,241	.....
86.93 Outlays from discretionary balances	3,325	3,676	4,048
87.00 Total outlays (gross)	8,130	8,917	4,048
Offsets:			
Against gross budget authority and outlays:			
Offsetting collections (cash) from:			
88.00 Federal sources	−562	−551	.....
88.40 Non-Federal sources	−36	−91	.....
88.90 Total, offsetting collections (cash)	−598	−642	.....
Against gross budget authority only:			
88.95 Change in uncollected customer payments from Federal sources (unexpired)	66	.....	.....
88.96 Portion of offsetting collections (cash) credited to expired accounts	11	.....	.....
Net budget authority and outlays:			
89.00 Budget authority	8,095	8,844	.....
90.00 Outlays	7,532	8,275	4,048
Additional net budget authority and outlays to cover cost of fully accruing retirement:			
99.00 Budget authority	72	75	.....
99.01 Outlays	72	75	.....

NASA's "Science, Aeronautics and Technology" (SAT) account included Space Science, Biological and Physical Research, Earth Science, Aerospace Technology, and Academic Programs. Beginning in 2004, Space Science, Biological and Physical Research, Earth Science, the Aeronautics portion of Aerospace Technology, and Academic Programs (which, beginning in FY 2004, is renamed Education Programs), will be included under the "Science, Aeronautics and Exploration" (SAE) account. This account shows spending from balances prior to the account restructuring.

Object Classification (in millions of dollars)

Identification code 80–0110–0–1–999	2002 actual	2003 est.	2004 est.
Direct obligations:			
Personnel compensation:			
11.1 Full-time permanent	921	949	.....
11.3 Other than full-time permanent	18	17	.....
11.5 Other personnel compensation	20	26	.....
11.8 Special personal services payments	1	2	.....
11.9 Total personnel compensation	960	994	.....
12.1 Civilian personnel benefits	212	219	.....
21.0 Travel and transportation of persons	33	36	.....
22.0 Transportation of things	7	8	.....
23.1 Rental payments to GSA	15	17	.....
23.3 Communications, utilities, and miscellaneous charges	80	91	5
24.0 Printing and reproduction	5	6	.....
25.1 Advisory and assistance services	147	167	9
25.2 Other services	734	834	44
25.3 Other purchases of goods and services from Government accounts	286	325	17
25.4 Operation and maintenance of facilities	260	295	16
25.5 Research and development contracts	3,551	4,035	216
25.7 Operation and maintenance of equipment	89	101	5
26.0 Supplies and materials	169	192	10
31.0 Equipment	111	126	7
32.0 Land and structures	203	231	12
41.0 Grants, subsidies, and contributions	1,184	1,346	73
99.0 Direct obligations	8,046	9,023	414
99.0 Reimbursable obligations	455	642	.....
99.9 Total new obligations	8,501	9,665	414

Personnel Summary

Identification code 80–0110–0–1–999	2002 actual	2003 est.	2004 est.
Direct:			
Total compensable workyears:			
1001 Civilian full-time equivalent employment	11,835	11,832	.....
Reimbursable:			
2001 Total compensable workyears: Civilian full-time equivalent employment	79	63	.....

Mission Support

Program and Financing (in millions of dollars)

Identification code 80–0112–0–1–999	2002 actual	2003 est.	2004 est.
Obligations by program activity:			
Direct program:			
00.01 Safety, mission assurance, engineering, and advanced concepts	5	.....	.....
00.02 Research and program management	41	.....	.....
00.03 Construction of facilities	70	47	.....
01.00 Total direct program	116	47	.....
09.01 Reimbursable program	4	.....	.....
10.00 Total new obligations	120	47	.....

General and special funds—Continued

Mission Support—Continued

Program and Financing (in millions of dollars)—Continued

Identification code 80–0112–0–1–999	2002 actual	2003 est.	2004 est.
Budgetary resources available for obligation:			
21.40 Unobligated balance carried forward, start of year	146	47	.....
22.00 New budget authority (gross)	5	.....	.....
22.10 Resources available from recoveries of prior year obligations	7	.....	.....
22.22 Unobligated balance transferred from other accounts	10	.....	.....
23.90 Total budgetary resources available for obligation	168	47	.....
23.95 Total new obligations	−120	−47	.....
23.98 Unobligated balance expiring or withdrawn	−1	.....	.....
24.40 Unobligated balance carried forward, end of year	47	.....	.....
New budget authority (gross), detail:			
Spending authority from offsetting collections:			
Discretionary:			
68.00 Offsetting collections (cash)	15	.....	.....
68.10 Change in uncollected customer payments from Federal sources (unexpired)	−10	.....	.....
68.90 Spending authority from offsetting collections (total discretionary)	5	.....	.....
Change in obligated balances:			
72.40 Obligated balance, start of year	623	187	89
73.10 Total new obligations	120	47	.....
73.20 Total outlays (gross)	−556	−145	−89
73.40 Adjustments in expired accounts (net)	−10	.....	.....
73.45 Recoveries of prior year obligations	−7	.....	.....
74.00 Change in uncollected customer payments from Federal sources (unexpired)	10	.....	.....
74.10 Change in uncollected customer payments from Federal sources (expired)	8	.....	.....
74.40 Obligated balance, end of year	187	89	.....
Outlays (gross), detail:			
86.90 Outlays from new discretionary authority	5	.....	.....
86.93 Outlays from discretionary balances	551	145	89
87.00 Total outlays (gross)	556	145	89
Offsets:			
Against gross budget authority and outlays:			
Offsetting collections (cash) from:			
88.00 Federal sources	−15	.....	.....
88.40 Non-Federal sources	−7	.....	.....
88.90 Total, offsetting collections (cash)	−22	.....	.....
Against gross budget authority only:			
88.95 Change in uncollected customer payments from Federal sources (unexpired)	10	.....	.....
88.96 Portion of offsetting collections (cash) credited to expired accounts	7	.....	.....
Net budget authority and outlays:			
89.00 Budget authority	.....	.....	.....
90.00 Outlays	534	145	89

NASA's "Mission Support" account included Research and Program Management (R&PM) and Construction of Facilities (CoF), which have not been included in a separate appropriation since 2001. Instead, those "Mission Support" activities are budgeted as part of the full costs associated with projects in the Science, Aeronautics and Exploration account or the Enabling Capabilities account (except for environmental activities, which had previously been included in CoF, and is now budgeted separately under Enabling Capabilities). This account shows spending from balances prior to the account restructuring.

Object Classification (in millions of dollars)

Identification code 80–0112–0–1–999	2002 actual	2003 est.	2004 est.
Direct obligations:			
23.1 Rental payments to GSA	4	.....	.....
24.0 Printing and reproduction	1	.....	.....
25.1 Advisory and assistance services	1	.....	.....
25.2 Other services	28	.....	.....
25.3 Other purchases of goods and services from Government accounts	5	.....	.....
25.4 Operation and maintenance of facilities	6	.....	.....
25.5 Research and development contracts	8	.....	.....
25.7 Operation and maintenance of equipment	5	.....	.....
26.0 Supplies and materials	3	.....	.....
31.0 Equipment	2	.....	.....
32.0 Land and structures	52	47	.....
41.0 Grants, subsidies, and contributions	1	.....	.....
99.0 Direct obligations	116	47	.....
99.0 Reimbursable obligations	4	.....	.....
99.9 Total new obligations	120	47	.....

Construction of Facilities

Program and Financing (in millions of dollars)

Identification code 80–0107–0–1–999	2002 actual	2003 est.	2004 est.
Obligations by program activity:			
00.01 Construction of facilities	−5	.....	.....
10.00 Total new obligations (object class 32.0)	−5	.....	.....
Budgetary resources available for obligation:			
21.40 Unobligated balance carried forward, start of year	5	.....	.....
22.21 Unobligated balance transferred to other accounts	−10	.....	.....
23.90 Total budgetary resources available for obligation	−5	.....	.....
23.95 Total new obligations	5	.....	.....
Change in obligated balances:			
72.40 Obligated balance, start of year	6	.....	.....
73.10 Total new obligations	−5	.....	.....
73.20 Total outlays (gross)	−2	.....	.....
Outlays (gross), detail:			
86.93 Outlays from discretionary balances	2	.....	.....
Net budget authority and outlays:			
89.00 Budget authority	.....	.....	.....
90.00 Outlays	2	.....	.....

Beginning in 2004, NASA's Construction of Facilities (CoF) activities will be performed in the Science, Aeronautics and Exploration or Enabling Capabilities accounts. From 1995 to 2003, CoF facilities activities were included in Human Space Flight; Science, Aeronautics and Technology; and Mission Support. This account shows spending from balances prior to the account restructuring.

Office of Inspector General

For necessary expenses of the Office of Inspector General in carrying out the Inspector General Act of 1978, as amended, $26,300,000.

Note.—A regular 2003 appropriation for this account had not been enacted at the time the budget was prepared; therefore, this account is operating under a continuing resolution (P.L. 107–229, as amended). The amounts included for 2003 in this budget reflect the Administration's 2003 policy proposals.

Program and Financing (in millions of dollars)

Identification code 80–0109–0–1–252	2002 actual	2003 est.	2004 est.
Obligations by program activity:			
00.01 Direct program activity	23	25	26
10.00 Total new obligations	23	25	26
Budgetary resources available for obligation:			
22.00 New budget authority (gross)	24	25	26
23.95 Total new obligations	−23	−25	−26
New budget authority (gross), detail:			
Discretionary:			
40.00 Appropriation	24	25	26

	Change in obligated balances:			
72.40	Obligated balance, start of year	3	3	3
73.10	Total new obligations	23	25	26
73.20	Total outlays (gross)	−24	−25	−26
74.40	Obligated balance, end of year	3	3	3
	Outlays (gross), detail:			
86.90	Outlays from new discretionary authority	21	22	23
86.93	Outlays from discretionary balances	3	3	3
87.00	Total outlays (gross)	24	25	26
	Net budget authority and outlays:			
89.00	Budget authority	24	25	26
90.00	Outlays	24	25	26
	Additional net budget authority and outlays to cover cost of fully accruing retirement:			
99.00	Budget authority	1	1	1
99.01	Outlays	1	1	1

The mission of the Office of Inspector General is to conduct audits and investigations of agency activities. The Inspector General keeps the Administrator informed of problems and deficiencies in agency programs and operations.

Object Classification (in millions of dollars)

Identification code 80–0109–0–1–252		2002 actual	2003 est.	2004 est.
11.1	Personnel compensation: Full-time permanent	16	18	19
12.1	Civilian personnel benefits	5	5	5
21.0	Travel and transportation of persons	1	1	1
26.0	Supplies and materials	1	1	1
99.9	Total new obligations	23	25	26

Personnel Summary

Identification code 80–0109–0–1–252		2002 actual	2003 est.	2004 est.
	Direct:			
	Total compensable workyears:			
1001	Civilian full-time equivalent employment	200	213	213

Trust Funds

Science, Space, and Technology Education Trust Fund

Unavailable Collections (in millions of dollars)

Identification code 80–8978–0–7–503		2002 actual	2003 est.	2004 est.
01.99	Balance, start of year			
	Receipts:			
02.40	Earnings on investments; Science, Space and Technology Education, Trust Fu	1	1	1
	Appropriations:			
05.00	Science, space, and technology education trust fund	−1	−1	−1
07.99	Balance, end of year			

Program and Financing (in millions of dollars)

Identification code 80–8978–0–7–503		2002 actual	2003 est.	2004 est.
	Obligations by program activity:			
00.01	Direct program activity	1	1	1
10.00	Total new obligations (object class 41.0)	1	1	1
	Budgetary resources available for obligation:			
21.40	Unobligated balance carried forward, start of year	15	15	15
22.00	New budget authority (gross)	1	1	1
23.90	Total budgetary resources available for obligation	16	16	16
23.95	Total new obligations	−1	−1	−1
24.40	Unobligated balance carried forward, end of year	15	15	15
	New budget authority (gross), detail:			
	Mandatory:			
60.26	Appropriation (trust fund)	1	1	1
	Change in obligated balances:			
73.10	Total new obligations	1	1	1
73.20	Total outlays (gross)	−1	−1	−1
	Outlays (gross), detail:			
86.97	Outlays from new mandatory authority	1	1	1
	Net budget authority and outlays:			
89.00	Budget authority	1	1	1
90.00	Outlays	1	1	1
	Memorandum (non-add) entries:			
92.01	Total investments, start of year: Federal securities: Par value	14	14	15
92.02	Total investments, end of year: Federal securities: Par value	14	15	15

National Space Grant Program

Program and Financing (in millions of dollars)

Identification code 80–8977–0–7–252		2002 actual	2003 est.	2004 est.
	Obligations by program activity:			
00.01	Direct program activity		3	
10.00	Total new obligations (object class 41.0)		3	
	Budgetary resources available for obligation:			
21.40	Unobligated balance carried forward, start of year	3	3	
23.95	Total new obligations		−3	
24.40	Unobligated balance carried forward, end of year	3		
	Change in obligated balances:			
73.10	Total new obligations		3	
73.20	Total outlays (gross)		−3	
	Outlays (gross), detail:			
86.98	Outlays from mandatory balances		3	
	Net budget authority and outlays:			
89.00	Budget authority			
90.00	Outlays		3	

Administrative Provisions

Notwithstanding the limitation on the availability of funds appropriated for "Science, aeronautics and exploration", or "Space flight capabilities" by this appropriations Act, when any activity has been initiated by the incurrence of obligations for construction of facilities as authorized by law, such amount available for such activity shall remain available until expended. This provision does not apply to the amounts appropriated for institutional minor revitalization and construction of facilities, and institutional facility planning and design.

Notwithstanding the limitation on the availability of funds appropriated for "Science, aeronautics and exploration", or "Space flight capabilities" by this appropriations Act, the amounts appropriated for construction of facilities shall remain available until September 30, 2006.

From amounts made available in this Act for these activities, the Administration may transfer amounts between aeronautics of the "Science, Aeronautics and Exploration" account and crosscutting technologies of the "Space flight capabilities" account.

Funds for announced prizes otherwise authorized shall remain available, without fiscal year limitation, until the prize is claimed or the offer is withdrawn.

The unexpired balances of prior appropriations to NASA for activities for which funds are provided under this Act may be transferred to the new account established for the appropriation that provides such activity under this Act. Balances so transferred may be merged with funds in the newly established account and thereafter may be accounted for as one fund under the same terms and conditions.

2004