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)

Enacted/requested:	*1999 actual*	*2000 est.*	*2001 est.*
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.)*