National Aeronautics and Space Administration

Budget Estimates

Fiscal Year 1993

Volume III

Research and Program Management

Special Analyses

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1993 ESTIMATES

VOLUME III

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RESEARCH AND
PROGRAM
MANAGEMENT

SUMMARY
INFORMATION

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1993 ESTIMATES

GENERAL STATEMENT

The Research and Program Management (R&PM) appropriation provides the salaries, other personnel related costs and travel support for NASA's civil service workforce.

The Fiscal Year 1992 Appropriation Act authorized NASA to realign its appropriation accounts. The Research and Program Management (R&PM) appropriation formerly consisted of three major functions: Personnel and Related Costs, Travel, and Operation of Installation. The "new" R&PM will consist only of Personnel and Related Costs and Travel. The Operation of Installation function has been transferred to the Research and Development and Space Flight, Control and Data Communications appropriations. For FY 1993, an appropriation of $1,660,027,000 is requested for the 24,731 workyears of effort required for the NASA programs.

This civil service workforce is the underpinning of the successful accomplishment of the Nation's civil aeronautics and space programs. These are the people who plan the programs; conduct and oversee the research; seleet and monitor the contractors; manage the various research, development, and test activities; and oversee all of NASA's operations. The salaries and benefits of this workforce comprise approximately 93% of the requested appropriation. The remaining 7 percent of the requested appropriation is required to fund travel necessary to manage NASA and its programs; to provide the training for NASA personnel and to accommodate the full year costs for the contractor conversions to be completed during FY 1992.

There are no new initiatives in the FY 1993 request. It represents an increase over FY 1992 levels to accommodate the civilian pay and benefit increases and inflationary growth for travel and training. The requested FY 1993 level represents a 5% increase over FY 1992.

The increase in workyears from 24,531 to 24,731 represents the full year impact of the phased conversion of 500 contractor positions to civil servants planned for completion during FY 1992. The costs for these conversions are not additive to the total NASA appropriation since the contracts had previously been funded by other appropriation accounts. These contractor conversions, categorized as "Project Core", were identified as part of a 1990 NASA internal staffing review which indicated that some functions being performed by contractors should be more properly performed by civil servants. The 1992 Appropriation Act provided for the conversions. Specific positions identified involve the performance of inherently governmental functions, i.e. functions which exercise government discretion, fiduciary or contractual responsibility or result in employee to employer relationships between a contract employee and a civil servant.

In response to a recommendation of the Advisory Committee on the Future of the U.S. Space Program (December 1990), a review of the roles and mission of each of the NASA centers and Headquarters was undertaken during 1991. That review has resulted in a decision to sharpen the focus at the NASA field installations by creating "Centers of Excellence". This budget does not fully implement the realignment of activities resulting from this decision, however, the transition will be phased in over the next several years. This realignment may result in some shifts of staffing allocation and responsibilities among NASA Centers.

NASA field centers report to the Program Associate Administrator responsible for the major portion of their technical programs. The principal roles assigned to each installation, based on demonstrated capabilities and capacities to meet NASA's overall program goals, are described below:

Office of Space Flight:

Johnson Space Center - Management of Space Station Freedom's Work Package 2 and the manned tended phase; selection and training of astronauts and mission specialists; and Shuttle Flight operations, including mission planning, operational procedures and flight control.

Kennedv Space Center - Management of Shuttle Launch Operations, including orbiter processing, final payload checkout and integration with the Shuttle, Shuttle launch and post landing; and Space Station operational launch readiness planning.

Marshall Space Flight Center - Management of the Space Shuttle Main Engine, Solid Rocket Booster and External Tank projects; management of Space Station Freedom's Work Package 1 and the permanently manned capability; the propulsion system of the New Launch System (NLS); management of NASA's activities on the Spacelab project; and conduct and development of experiments in materials processing in space.

Stennis Space Center - Space Shuttle engine testing; preparing for NLS testing; and Earth resources research and technology transfer.

Office of Space Science and Applications:

Goddard Space Flight Center - Development and operation of Earth orbital flight experiments and automated spacecraft to conduct scientific investigations and to demonstrate practical applications; management of tracking and data acquisition activities; management and launch of sounding rockets and balloons; operation of an instrumented flight range for aeronautical and space research and procurement of expendable launch services for small and medium payloads. The Goddard Space Flight Center has also begun development of the Earth Observing Systems (EOS) and its associated data system. The Wallops Flight Facility is an operational element and component installation of the Goddard Space Flight Center.

Office of Aeronautics, Space and Technology:

Ames Research Center - Conduct of activities involving computational aerodynamics and flight testing, computational/numerical simulation rotorcraft technology, short and vertical takeoff and landing technology, life sciences dealing with gravitational biology, CELSS, and exobiology, human factors, autonomous systems, guidance and control, and operation of an alternate landing site for the Space Shuttle missions. The Dryden Flight Research Facility is an operational element and component installation of the Ames Research Center.

Langley Research Center - Conduct of airframe aerodynamics and structures research and technology; hypersonic propulsion; experimental and theoretical aerodynamics; environmental quality monitoring by remote sensing; advanced conceptual space system design independent assessments; research in the areas of structures and materials, guidance and controls; and airframe/propulsion integration of the transatmospheric research and technology program. Langley is the lead Center for the National Aerospace Plane.

Lewis Research Center - Conduct of aeronautical propulsion, nuclear space propulsion, electric space propulsion and space power research and technology; space communications research and technology; development of microgravity sciences for fluid physics and combustion science; management of Space Station Freedom's Work Package 4; and procurement of expendable launch services on intermediate and large payload vehicles.

NASA Headquarters - Overall executive direction of NASA's programs and activities, including program management of such programs as Space Station Freedom and the STS and functional management of such areas as personnel policies and development, EEO, procurement, financial management, information resource management, logistics, etc.

The 1993 Budget provides the necessary resources to apply these in-house capabilities to program activities. Detailed data on funding requirements are provided in the section on each installation. **A** summary description of, and the funding required by functional category, includes:

I. Personnel and Related Costs ($1,604,535,000): Includes salaries and benefits, the Government's contribution to personnel benefits for **NASA** civil service employees, and for personnel of other Government agencies detailed to **NASA.** In 1993, the budget provides for 24,731 FTE exclusive of the Inspector General. This category also includes other personnel related costs, such as moving expenses (excluding the associated travel of people), recruiting and personnel investigation services provided by the Office of Personnel Management; the training of **NASA** civil service employees; and funding for the continued performance of several functions in the R&PM budget previously performed by contractors that will now be performed by civil servants. The General Schedule pay raise projected for January 1993 is also included in this estimate.

11. Travel ($55.492.000): Includes the cost of transportation, per diem, and related travel expenses--domestic and foreign--of civil service employees who travel for coordination and management of **NASA** program activities including contract management; flight mission support; meetings and technical seminars and symposia; and for permanent and temporary relocations.

SUMMARY OF THE BUDGET PLAN BY FUNCTION

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
			(Thousands of Dollars)		
I.	Personnel and Related Costs	1.400.588	1.512.522	1.526.823	1.604.535
11.	Travel	47.761	54.056	50.821	55.492
111.	Operation of Installation	763.283	885.722	0	0
	A. Facilities Services	(322,681)	(368,843)	0	0
	B. Technical Services	(191,715)	(202,519)	0	0
	C. Management and Operations	(248,887)	(276,455)	0	0
	D. Implementation of Project CORE	0	37.905	0	0
	Total, NASA	2.211.632	2.452.300	1.577.644	1.660.027

<u>SUMMARY OF CHANGES FROM THE 1992 BUDGET TO THE 1992 CURRENT ESTIMATE</u>

The 1992 budget request of $2,452.3 million is revised to $1,577.6 million. The current R&PM plan includes the following changes:

1992 Budget Request..........................	$2,452.3
Congressional Action:	
Reductions...................................	- 210.0
Transfer to R&D and SFCDC....................	- 664.7
FY 1992 Current Estimate.....................	$1,577.6

The transfer of $437.0 million to Research and Development and $227.7 million to Space Flight, Control and Data Communications is consistent with the FY 1992 Appropriation Act which authorized transfer "... up to $675.7 million to the Research and Development and Space Flight, Control and Data Communications" appropriations.

BASIS OF THE 1993 ESTIMATE

Th 1993 Budget Estimate of $1,660,027,000, an increase of $82,383,000 over th current FY 1992 R&PM plan, provides for: a civil service ceiling of 24,731 workyears; the full year cost of the 1992 pay raise; and projected 1993 pay raises. It provides for travel consistent with increased travel costs and program requirements.

The Research and Program Management appropriation request for 1993, by functional category, is summarized below:

I. Personnel and Related Costs ($1,604,535,000): The 1993 estimate of Personnel and Related Costs is $77.7 million higher than 1992. Of the increase: $11.0 million is for compensation, benefits and supporting costs which support contractor conversions completed in FY 1992; $15.8 million is for the full year cost of the 1992 pay raise; $40.3 million is budgeted for pay raises projected to be effective in January 1993. The remaining $10.6 million is for personnel actions such as promotions and within grade increases and military detailees.

11. Travel ($55,492,000): NASA relies very heavily on contracts with the private sector for the actual accomplishment of its programs and providing responsible oversight of these contractors requires considerable travel to the contractor plants. Additionally, the launch of a major payload on the STS involves the integration and coordination of a very large number of people and activities and this can only be effectively accomplished by holding many pre-launch meetings in one central location. In total, program travel is approximately two-thirds of our travel expenditures. The remaining travel funds are required to coordinate Agency management and administration, for professional development and training, and for the transportation of new and transferred employees to their new duty station. The 1993 increase in travel is intended to respond to increased travel costs and program and project management and supervision.

In summary, the 1993 budget requirement of $1,660,027,000 is to provide for 24,731 full-time equivalent civil service workyears, including the 1993 pay raise, to support the activities at eight NASA installations and Headquarters, and Space Station Level II activities in Reston, Virginia, consistent with the Research and Development, Space Flight, Control and Data Communications, and Construction of Facilities program plans.

DETAIL OF CONTENTS BY FUNCTION

I. Personnel and Related Costs

A. Compensation and Benefits:

1. Compensation:

a. Permanent Positions: This part of Personnel and Related Costs covers the salaries of the full-time permanent civil service workforce and is the largest portion of this functional category.

b. Other Than Full-Time Permanent Positions: This category includes the salaries of NASA's non-permanent workforce. Programs such as Presidential Management Interns, students participating in cooperative training, summer employment, youth opportunity, and temporary clerical support are covered in this category.

c. Reimbursable Detailees: In accordance with existing agreements, NASA reimburses the parent Federal organization for the salaries and related costs of persons detailed to NASA.

d. Overtime and Other Compensation: Overtime, holiday, post and night differential, and hazardous duty pay are included in this category. Also included are incentive awards for outstanding achievement and superior performance.

2. Benefits: In addition to compensation, NASA, as authorized and required by law, makes the employer's contribution to personnel beqefits. These benefits include contributions to the Civil Service Retirement Fund, the Federal Employees Retirement System, employees' life and health insurance, payments to the Medicare fund for permanent employees, and social security contributions. Payments to the civil service retirement fund for re-employed annuitants and severance pay to former employees involuntarily separated through no fault of their own are also included.

B. Supporting Costs:

1. Transfer of Personnel: Provided under this category are relocation costs required by law, such as the expenses of selling and buying a home, subsistence expenses and the movement and storage of household goods.

2. Investigative Services and Core Conversions: The Office of Personnel Management is reimbursed for activities such as security investigations on new hires, recruitment advertising, and Federal wage system surveys. "Project Core" involves converting contractor positions to civil servants in areas where contractor personnel perform inherently governmental functions. These funds will be moved to the appropriate salaries and benefits categories as the civil servants are hired to perform the functions.

3. Personnel Training: Training is provided within the framework of the Government Employees Training Act of 1958. Part of the training costs are for courses offered by other Government agencies, and the remainder is for training through nongovernment sources.

11. Travel

A. Program Travel: The largest part of travel is for direction, coordination, and management of program activities including international programs and activities. The complexity of the programs and the geographical distribution of NASA installations and contractors necessitate this category of travel. As projects reach the flight stage, support is required for prelaunch activities, including overseas travel to launch and tracking sites. The amount of travel required for flight projects is significant as it is directly related to the number of systems and subsystems, the number of design reviews, and the number and complexity of the launches and associated ground operations.

B. Scientific and Technical Development Travel: Travel to scientific and technical meetings and seminars permits employees engaged in research and development to participate in both Government sponsored and nongovernment sponsored activities. This participation allows personnel to benefit from exposure to technological advances which arise outside NASA, as well as allowing personnel to present both accomplishments and problems to their associates and provides for the dissemination of technical results to the United States community.

C. Management and Operations Travel: Management and operations travel provides for the direction and coordination of general management matters and travel by officials to review the status of programs. It includes travel by functional managers in such areas as personnel, financial management and procurement. This category also includes the cost of travel of unpaid members of research advisory committees; and initial duty station, permanent change of assignment and related travel expenses.

DISTRIBUTION OF FULL TIME EQUIVALENT WORKYEARS BY INSTALLATION

	1991 ACTUAL	1992 BUDGET ESTIMATE	1992 CURRENT ESTIMATE	1993 BUDGET ESTIMATE
JOHNSON SPACE CENTER	3,624	3,617	3,631	3,631
KENNEDY SPACE CENTER	2,503	2,509	2,517	2,510
MARSHALL SPACE FLIGHT CENTER	3,640	3,650	3,650	3,650
STENNIS SPACE CENTER	205	216	216	216
GODDARD SPACE FLIGHT CENTER	3,883	3,975	3,983	3,985
AMES RESEARCH CENTER	2,219	2,227	2,225	2,225
LANGLEY RESEARCH CENTER	2,931	2,925	2,925	2,925
LEWIS RESEARCH CENTER	2,799	2,791	2,790	2,707
HEADQUARTERS	1.892	2.030	2,006	2,006
SUBTOTAL, FULL-TIME PERMAMENT WORKYEARS	23,696	23,940	23,943	23,935
OTHER THAN FULL-TIME PERMAMENT WORKYEARS	300	291	288	296
SUBTOTAL, CEILING CONTROLLED FTE	23,996	24,231	24,231	24,231
CORE		595	300	500
GRAND TOTAL, CEILING CONTROLLED FTE	23,996	24,826	24,531	24,731

SUMMARY OF BUDGET PLAN BY INSTALLATION
(THOUSANDS OF DOLLARS)

	1991 ACTUAL	1992 BUDGET ESTIMATE	1992 CURRENT ESTIMATE	1993 BUDGET ESTIMATE
JOHNSON SPACE CENTER	338,460	363,006	244,007	255,441
KENNEDY SPACE CENTER	298,955	320,786	155,840	164,413
MARSHALL SPACE FLIGHT CENTER	286,155	324,482	227,047	237,137
STENNIS SPACE CENTER	28,536	30,633	14,845	16,322
GODDARD SPACE FLIGHT CENTER	303,006	338,211	250,675	264,580
AMES RESEARCH CENTER	211,155	236,850	162,065	172,228
LANGLEY RESEARCH CENTER	214,531	231,189	172,115	179,665
LEWIS RESEARCH CENTER	230,060	255,409	173,063	183,138
HEADQUARTERS	300.774	351.734	177.987	187.103
TOTAL, RESEARCH AND PROGRAM MANAGEMENT	2,211,632	2,452,300	1,577,644	1.660.027

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DISTRIBUTION OF FULL TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

NASA TOTAL	1991 ACTUAL	1992 BUDGET ESTIMATE	1992 CURRENT ESTIMATE	1993 BUDGET ESTIMATE
SPACE STATION	2,152	2,530	2,314	2,370
SPACE FLIGHT PROGRAMS	5,938	5,798	5,795	5,679
SPACE TRANSPORTATION CAPABILITY DEV	1,670	1,607	1,599	1,600
SPACE TRANSPORTATION OPERATIONS	4,268	4,191	4,196	4,079
SPACE SCIENCE AND APPLICATIONS	4,445	4,463	4,666	4,680
PHYSICS AND ASTRONOMY	2,072	2,082	2,187	2.175
LIFE SCIENCES	317	272	324	324
PLANETARY EXPLORATION	229	197	230	229
SPACE APPLICATIONS	1,827	1,912	1.925	1,952
AERONAUTICS AND SPACE TECHNOLOGY	5,050	5,299	5,063	5,103
AERONAUTICAL RESEARCH AND TECHNOLOGY	3,178	3,232	3,212	3,271
SPACE RESEARCH AND TECHNOLOGY	1,729	1,885	1,705	1,724
TRANSATMOSPHERIC RESEARCH AND TECH	143	182	146	108
SPACE EXPLORATION	165	0	110	105
COMMERCIAL PROGRAMS	128	137	159	161
SAFETY, RELIABILITY & QUALITY ASSURANCE	120	133	137	141
ACADEMIC PROGRAMS	23	28	26	26
TRACKING AND DATA PROGRAMS	720	717	716	713
SUBTOTAL - DIRECT FULL-TIME PERM R E S	18,741	19,105	18,986	18,978
CENTER MANAGEMENT AND OPERATIONS	4,955	4,835	4,957	4.957
SUBTOTAL - FULL-TIME PERM R E S	23,696	23,940	23,943	23,935
OTHER R E S	300	291	288	296
SUBTOTAL - FULL-TIME EQUIVALENTS	23,996	24,231	24,231	24,231
PROJECT CORE	0	595	300	500
GRAND TOTAL - FULL-TIME EQUIVALENTS	23,996	24,826	24,531	24,731

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND PROGRAM MANAGEMENT - FY 1993 ESTIMATES
DISTRIBUTION OF BUDGET PLAN BY FUNCTION BY INSTALLATION

FUNCTION	TOTAL NASA	JOHNSON SPACE CENTER	KENNEDY SPACE CENTER	MARSHALL SPACE FLIGHT CENTER	STENNIS SPACE CENTER	GODDARD SPACE FLIGHT CENTER	AMES RESEARCH CENTER	LANGLEY RESEARCH CENTER	LEWIS RESEARCH CENTER	HEADQUARTERS
PERSONNEL AND RELATED COSTS										
1991 ACTUAL	1,400,588	221,940	141,190	205,705	12,206	222,415	140,616	156,117	157,621	142,778
1992 BUDGET	1,512,522	237,246	153,446	219,474	13,351	240,638	144,506	166.138	172,027	165,696
1992 CURRENT	1,526,823	237,252	151,494	220,455	14,215	243,575	157,195	167.412	168,738	166,487
1993 BUDGET	1,604,535	248,105	159,687	230,002	15,641	256,800	166,900	174,500	178,400	174,500
TRAVEL										
1991 ACTUAL	47,761	7,147	4,140	6,282	599	6,684	4,578	4.516	4,200	9,615
1992 BUDGET	54,056	7,777	4,890	7,615	674	7,100	5,278	4,799	4,423	11,500
1992 CURRENT	50,821	6,755	4,346	6,592	630	7,100	4,870	4,703	4,325	11,500
1993 BUDGET	55,492	7,336	4,726	7,135	681	7,780	5,328	5,165	4,738	12,603
OPERATION OF INSTALLATION										
1991 ACTUAL	763,283	109,373	153,625	74,168	15,731	73,907	65,961	53,898	68,239	148,381
1992 BUDGET	885,722	117,983	162,450	97,393	16,608	90,473	87,066	60,252	78,959	174,538
TOTAL										
1991 ACTUAL	2,211,632	338,460	298,955	286,155	28,536	303,006	211,155	214,531	230,060	300,774
1992 BUDGET	2,452,300	363,006	320,786	324.482	30,633	338,211	236,850	231,189	255,409	351.734
1992 CURRENT	1,577,644	244.007	155,840	227,047	14,845	250,675	162,065	172,115	173,063	177,987
1993 BUDGET	1,660,027	255,441	164,413	237.137	16,322	264,580	172,228	179,665	183,138	187.103

INSTALLATION
JUSTIFICATION

JOHNSON
SPACE CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1993 ESTIMATES

LYNDON B. JOHNSON SPACE CENTER

DESCRIPTION

The Lyndon B. Johnson Space Center (JSC) is located approximately 20 miles southeast of downtown Houston, Texas. Total NASA owned land at the Houston site consists of 1,618 acres. The Center also utilizes an additional 60,552 acres at the White Sands Test Facility, Las Cruces, New Mexico. The total capital investment of the JSC, including fixed assets in progress and contractor-held facilities at various locations and the White Sands Test Facility, as of September 30, 1991, was $994,673,000.

CENTER ROLES AND MISSIONS

JSC was established in November 1961 in response to the need in NASA for a Center to manage the design, development and manufacture of manned spacecraft; for selection and training of astronaut crews; and the conduct of manned space flight missions. This need continued as the Nation proceeded towards more ambitious undertakings such as the Apollo program, the Skylab program, the Apollo-Soyuz Test Project, the Space Shuttle program, and the Space Station Freedom program. To meet this responsibility, JSC has developed unique areas of recognized technical excellence within the civil service staff and facilities of superior merit, which constitute a National resource. The principal and supporting roles are:

Principal Roles:

Space Station - A major work package development center for specific Space Station elements, including the pre-integrated/truss, airlock and outfitting of the resource nodes as well as several subsystems including propulsion, Extravehicular Activity (EVA), overall integration, mission operations, and crew safety,

Space Shuttle Production and Operations Capability - Modification of the orbiters, system modifications and improvements, and support to NASA Headquarters for management of the Shuttle system including: Shuttle configuration management; Shuttle system engineering and integration; and detailed program planning, direction, and scheduling; and development, acquisition and/or modifications of support aircraft for astronaut training and Shuttle flight operations.

Space Transportation System Operations - Operational planning, crew selection and training, medical operations, STS flight control, experiment/payload flight control for attached payloads and STS utilization planning/payload accommodation studies.

Environmental and Crew Support Systems - Develop and demonstrate Environmental Control and Life Support Systems (ECLSS) and Extravehicular Activity (EVA) systems suitable for STS and advanced needs.

Environmental Effects Analysis - Manage efforts to develop the data base and conduct analyses to ascertain any environmental impact of STS operations.

Supporting Technology Advanced Developments - Development of prototypes, long lead time systems and new procedures and software for advanced systems.

Advanced Missions - Manage studies to define advanced transportation and orbital systems.

Spacelab Development - Crew training in conjunction with flight hardware, and development and operation of simulators.

Pavload Integration - Involved with integrating the Inertial Upper Stage, the Transfer Orbit Stage, and the Payload Assist Module with the orbiter.

Pavload Operations - Provides analytical tasks, special analysis or modification of support hardware for payloads to be flown on the Shuttle.

Manned Vehicles - Development of manned space vehicles and associated supporting technology.

Life Science - Perform medical research to establish human baseline data, investigate and develop couhter measures to solve space medicine problems, and develop information techniques and equipment to support medical operation and medical experiments; develop nutritional requirements and food preparation and packaging systems in support of human space flight; develop Spacelab life sciences research capability through common use of clinical and research equipment; define and develop in-flight biomedical experiments.

Supporting Roles:

Lunar and Planetary Geosciences - Develop and maintain technical discipline base for lunar and planetary geosciences and planetary material handling techniques.

Technology Experiments in Space - Manage the Orbiter experiments program; define and develop experiments in areas consistent with other JSC space roles.

DISTRIBUTION OF FULL TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

JOHNSON	1991 ACTUAL	1992 BUDGET ESTIMATE	1992 CURRENT ESTIMATE	1993 BUDGET ESTIMATE
SPACE STATION	744	977	797	826'
SPACE FLIGHT PROGRAMS	2,011	1,854	1,936	1,905
SPACE TRANSPORTATION CAPABILITY DEV	568	551	517	511
SPACE TRANSPORTATION OPERATIONS	1,443	1.303	1,419	1,394
SPACE SCIENCE AND APPLICATIONS	144	127	138	141
PHYSICS AND ASTRONOMY	15	21	13	13
LIFE SCIENCES	91	76	88	91
PLANETARY EXPLORATION	36	26	33	33
SPACE APPLICATIONS	2	4	4	4
AERONAUTICS AND SPACE TECHNOLOGY	57	138	77	75
AERONAUTICAL RESEARCH AND TECHNOLOGY	0	0	0	0
SPACE RESEARCH AND TECHNOLOGY	57	138	77	75
TRANSATMOSPHERIC RESEARCH AND TECH	0	0	0	0
SPACE EXPLORATION	74	0	82	83
COMMERCIAL PROGRAMS	12	10	16	16
SAFETY, RELIABILITY & QUALITY ASSURANCE	0	0	0	0
ACADEMIC PROGRAMS	0	0	0	0
TRACKING AND DATA PROGRAMS	0	0	0	0
SUBTOTAL - DIRECT FULL-TIME PERM FTEs	3,042	3,106	3,046	3,046
CENTER MANAGEMENT AND OPERATIONS	582	511	585	585
SUBTOTAL - FULL-TIME PERM FTEs	3,624	3,617	3,631	3,631
OTHER FTEs	39	48	34	34
SUBTOTAL - FULL-TIME EQUIVALENTS	3,663	3,665	3,665	3,665
PROJECT CORE	0	12	9	20
GRAND TOTAL - FULL-TIME EQUIVALENTS	3,663	3,677	3,674	3,685

PROGRAM DESCRIPTION

	Permanent Civil Service Workyears
RESEARCH AND DEVELOPMENT	
SPACE STATION....................................	826

As one of NASA's three major development centers for the Space Station Freedom program, JSC is responsible for the design, development, test, and certification of specific elements, systems, and subsystems necessary to meet the baseline configuration capability. The staffing for FY 1993 provides for the management of development functions in support of the man-tended Capability (MTC) Critical Design Review (CDR) activities. Specific JSC Space Station project responsibilities include the pre-integrated truss, mobile transporter, airlock and outfitting of the resource nodes. The JSC Space Station project is also assigned system responsibility for the propulsion system; the data management system; the external thermal control system; the communications and tracking system (except internal audio and video); the guidance, navigation, and control system; EVA systems; fluids and utility distribution; and, software. The Space Station Program level integration activity has been assigned to JSC with the integration office responsible for element and systems integration across the Space Station program. Within this envelope of responsibility, the system integration office at JSC is responsible for the overall system functional definition and performance assessment. In addition, JSC provides technical management of the design and development of the manned systems hardware in the Marshall Space Flight Center development contract, and provides support for environmentally controlled life support systems testing. JSC is also responsible for crew training and mission control. The training effort includes developing facilities (primarily the Space Station Training Facility) as well as conducting simulations and crew instruction. JSC's mission control function includes the development and manpower for the Space Station control center that provides ground control of the on-orbit Space Station.

SPACE FLIGHT PROGRAMS...............................	1,905
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT.........	511

Payload integration activities involve both the upper stages project and the tethered satellite system. For the upper stages, duties include the efforts necessary to integrate the interface between the Orbiter and the payload. JSC is involved with integrating the Inertial Upper Stage, the Transfer Orbit **Stage**, and the Payload Assist Module. JSC provides the support for payload-unique integration requirements for the Tethered Satellite System.

The Engineering and Technicgl Base (ETB) provides the base research and engineering capability necessary to support ongoing and future efforts. One goal of ETB is to support a one-shift operation **of** the JSC laboratories and a three-shift operation of the Central Computer Facility. Operation of the Class VI computer and support to the Shuttle Safety, Reliability and Quality Assurance (SR&QA) program are also included.

Payload operations and support equipment provide optional services for payloads. These efforts involve performing analytical tasks for the payloads that require special analysis, and the building and modification of unique hardware for payloads, integration hardware that supports specific classes of payloads, or hardware that provides interfaces between the payload and the Orbiter. In addition, Shuttle support to the Space Station is provided in this category. These activities include procurement of extravehicular mobility units, an upgrade to the remote manipulator system and development of a system for berthing the orbiter to the Space Station.

The advanced programs activities at JSC are planned and administered to support current and future Agency programs. Major activities at JSC are designed to promote more efficient operations ***of*** the Space Shuttle and emphasis has been placed on developing and enhancing satellite services. Support to the development of upper stages and the integration of payloads have been and will continue to be major center responsibilities. Supporting technology activities are conducted to advance the use of artificial intelligence and its applications and to the real time mission control and training facilities. Studies to define the orbital debris environment and measures to deal with it are also included.

	Permanent Civil Service Workvears
SPACE TRANSPORTATION OPERATIONS.............................	*1,394*

The 1992 staffing provides for continuation of the Shuttle activities to support a schedule consistent with the major program milestones. It also provides development, integration, and operations support for the Mission Control Center (MCC) and the Shuttle Mission Simulator (SMS).

Activities consistent with operation of the orbiter fleet and procurement of necessary flight and ground support equipment will be continued. Also included are those activities necessary to manage the modification of orbiter vehicles to enable extended on-orbit duration capability. The Space Shuttle Program Office of JSC has the responsibility to support NASA Headquarters in the day-to-day management of the Space Shuttle Program. This includes detailed program planning, direction, scheduling, and Shuttle configuration management. Overall management of the production of the Orbiter system is also provided. This includes management of various elements of the total Orbiter system (e.g., structures, propulsion, power, avionics, etc.) and to lower elements within the systems. JSC is responsible for a large quantity of supporting equipment. Examples of such equipment are: extra-vehicular mobility unit, closed circuit television, survival radio sets, dosimetry, crew equipment, photographic camera systems, and bioinstrumentation.

To integrate all vehicle systems into an efficient operating system, many detailed interfaces and functional performance features must be identified and defined. Specific interface control documents are identified and established, including both flight systems and flight to ground systems. General capability and performance criteria are established for special areas of consideration such as electromagnetic compatibility and lightning protection. Systems operations require the preparation of systems performance data and operations information.

Since the orbiter represents an integrated complex of technical and engineering disciplines, specific subtasks have been assigned to a variety of technical organizations at JSC. Included in these tasks are: providing technical expertise in the orbiter life support systems; performing engineering analysis and performance evaluation for communication and tracking systems ground testing; providing expertise in guidance, navigation, control, instrumentation and electrical power distribution; management and operation of orbital maneuvering system components, reaction control engine Performance, and reaction control system engine valve detection techniques; analysis of vehicle attachment and separation systems; analysis of total Shuttle systems, Shuttle/payload interface, crew station evaluation, and engineering analysis to determine overall vehicle performance characteristics in the area of aerodynamic performance, flight characteristics, performance, and dynamics including aeroelasticity.

The successful flight and operations performance of the Space Shuttle is dependent on the proper functioning of integrated electronic equipment. Collectively, these are termed the Integrated Avionics System. Avionics provides the Shuttle pilots and crew with the total assessment and command capability necessary to manage, fly, operate and land the vehicle. Because of the critical nature of this system, very close attention is given to the identification of performance requirements and integrated performance.

The variety of avionic elements included within the Space Shuttle system, require the attention of a group of technical experts. These elements include: guidance, navigation and control, data processing, communication and tracking, instrumentation, displays and control, solid rocket booster interface, electrical power distribution and control, and external tank instrumentation interface.

The space transportation operations staffing provides for Shuttle operational flight program management including vehicle system integration; Mission Control Center (MCC) operations; replenishment of crew equipment, crew equipment processing, and crew training; flight mission planning and operations; and procurement of Orbiter hardware.

Mission flight support includes a wide variety of planning activities ranging from operational concepts and techniques to detailed systems operational procedures and checklists. Tasks include preparation of development system and software handbooks, flight rules, detailed crew activity plans and procedures, development of MCC and network systems requirements, and operations input to the planning for the selection and operation of Shuttle payloads.

Operation flight design includes: the identification of operational requirements €or the design of systems; and the development of nominal and contingency flight profiles for all Shuttle missions. This includes conceptual level profile development and analysis, beginning about two years before the flight, and operational profile development and analysis, accomplished immediately prior to the flight. The software activities for operational flights also include the continued development, definition, and verification support of the guidance, targeting, and navigation systems software requirements of the Orbiter and MCC. Software changes for Orbiter improvements will upgrade vehicle capabilities and performance.

Specific flight planning activity encompasses the flight design, flight analysis, and software preparation activities. The flight design tasks include supporting the crew training simulations and development of flight techniques. Flight design products include conceptual flight profiles and operational flight profiles which are issued for each flight. The software activities include the development, formulation, and verification support for the guidance, targeting, and navigation systems software requirements in the Orbiter and MCC. In addition, the flight dependent data co-located in the erasable memory (mission-to-mission changes) is developed from the flight design process for incorporation into the Orbiter software and MCC systems.

Avionics and software testing and checkout in the Electronics Systems Test Laboratory and the Shuttle

Avionics Integration Laboratory will continue. The purpose of these laboratories is to ensure verification of the functional performance of the Shuttle Integrated Avionics Systems, and continue validation of the system design, and verify compatibility of the various radio frequency communication links.

Orbiter avionics software development will provide payload support, which will include general capabilities for Spacelab and Upper Stages, with flexibility available to implement specific payload requirements as optional services.

	Permanent Civil Service Workvears
SPACE SCIENCE AND APPLICATIONS	**141**
PHYSICS AND ASTRONO..	**13**

JSC has the role of mission manager for the Spacelab flights and of providing mission support with the **MSFC.** These responsibilities include the integration of all physics and astronomy experiments that are placed in the Spacelab modules, pallets, and in the mid-deck. In some cases, JSC also designs and develops the individual experiments to be used on the missions.

Space applications flight project responsibilities at **JSC** center around Space Shuttle payload integration, operation, and postflight data dissemination. **JSC** is assigned mission management responsibilities for the Earthward-looking remote sensing missions, Space Radar Laboratory (SRL)-1, **SRL-2,** and the atmospheric investigations/hardware evaluation that will be accomplished on Lidar in Space Technology Experiment (LITE). This includes the mission planning, real-time mission control, mission requirements definition, and experiment integration.

LIFE SCIENCES.....................................	**91**

The Center has the lead role in evaluating human physiological changes associated with the space flight environment and developing effective countermeasures to assure crew health and optimal performance during all phases of flight. Currently, ground-based and flight investigations are focusing on developing countermeasures for known and potential biomedical problems Space Shuttle crews may have during re-entry, landing, and egress as a result of adaptation to the weightless environment of space flight. A variety of ground-based studies are being implemented to develop a data base which will enable the definition of requirements for biomedical investigations and countermeasures development for extended duration manned missions on Space Station Freedom. These activities will pave the way for developing medical investigations and crew health care capabilities required for the support of lunar base and manned Mars exploration missions. In addition to solving operational biomedical issues, experiments are designed to utilize the weightless space environment to accomplish medical and biological research.

Other operationally oriented medical activities include defining and developing on-board health care systems and environmental monitoring systems; crew medical training; ground-based support of missions; developing a longitudinal crew health data base; and developing medical and psychological crew selection criteria.

Integral to these activities is the development of dedicated Life Sciences Spacelab experiments and missions and biomedical Detailed Supplementary Objectives (DSO). To this end, various Spacelab and DSO investigations have been selected and experiment hardware is in various stages of development. JSC has mission management responsibility for dedicated life sciences payloads which includes systems engineering and integration management of the payload hardware, crew experiment/payload training, operation of the payload during flights, and pre- and post-flight experiment data collection on flight crews.

These combined activities are supportive of the Center's responsibility for assuring flight crew health and safety, both during flight and on the ground. The accomplishment of these objectives requires a well defined and continuing program that incorporates medical research, laboratory support, clinical medicine and operations.

	Permanent Civil Service Workyears
PLANETARY EXPLORATION.............................	33

The Center supports the Agency's planetary science program in the area of geosciences where a strong, active research group is required to support potential future programs, provide curatorial support for lunar materials, assist in information dissemination and interact with outside scientists. To provide this support, the research group pursues research on the compositions, structures and evolutionary histories of the solid bodies of the solar system. The Center has an ongoing program of analysis of planetary materials and of remote sensing data, a theoretical studies program and a program which is involved in the development of remote sensing instrumentation. The definition of geoscience requirements for future planetary flight missions involves extensive interaction with the planetary science community.

	Permanent Civil Service Workyears
SPACE APPLICATIONS	4

JSC has established a center for the support of biotechnology applications in microgravity. The support includes identification of proteins which are induced or repressed in the microgravity environment, and complexity variant cell culture systems for the ground-based exploration of low gravity applications. All leading to the discovery of tissue models for the advancement of growth factor isolation, medical chemo/immunotherapeutics, and human tissue transplantation.

AERONAUTICS AND SPACE TECHNOLOGY	75
SPACE RESEARCH AND TECHNOLOGY	75

JSC is developing a series of technologies to support the continued evolution of the Space Shuttle, to support the current development and subsequent evolution of the Space Station Freedom, the development of transportation systems beyond space shuttle, and the return to human exploration of the Moon, Mars, and other planetary endeavors. The specific technologies include: space environmental effects on materials and structures; space flight experiments involving the orbiter spacecraft and in-space research involving the long duration environment facility; experiments compatible with STS operational capabilities; transportation systems analyses for shuttle, space stations, and other transportation systems; information controls and computer control, and avionics/guidance-navigation systems; improvement of man-machine interaction in space, zero-G suit technology and crew station design; in-space experiments for debris collision warning and electrolysis; advanced thermal concepts; autonomous landing and rendezvous/docking; regenerative life support systems; EVA systems for surface activity; human factors integration, test, and evaluation; automation and robotics.

	Permanent Civil Service Workyears
SPACE EXPLORATION.......	83

JSC is going to take the lead in the development of manned vehicles that will provide continued access to space, particularly as we explore beyond low earth orbit. We are beginning the effort by studying long-term manned transportation systems. JSC is committed to providing the management capability, the technology base, and an environment that guarantees a well balanced approach to our dependence on current systems as we develop future capabilities. We will be following five basic objectives in order to meet exploration goals: a) Ensure continued access to space, b) Conduct a continuum of life science research, c) Build and operate manned facilities in space, d) Develop the strategy for returning to the Moon, and traveling to Mars, and e) Develop manned vehicles and human-related surface systems.

COMMERCIAL PROGRAMS................................	16

The objectives of the Commercial Use of Space Programs are to stimulate and foster the use of space as a market place for U.S. Industry. This objective is being supported by the development of close working relationships with the private sector and the academic community, the use of NASA developed technologies to facilitate private sector entry into the space business, access to government facilities, and the maintenance of a stable business environment to encourage private sector investment activities. The current commercial space policy and the consistent NASA-wide implementation of that policy are key factors in the success of this program. The following are specific activities at the Johnson Space Center supporting the commercialization of space.

The Technology Utilization program identifies, acquires, and disseminates results of NASA research and development information through a variety of technology transfer mechanisms to strengthen the national economy and industrial productivity. In order to accelerate and facilitate the application of NASA-related technology to meet technical needs in the industrial and public sectors, the program increasingly focuses on participation by all NASA and contractor scientific and engineering personnel.

The Small Business Innovative Research (SBIR) program provides seed money to small businesses for the development of innovative space technologies. This program is intended to provide entry to new businesses and to stimulate the flow of innovative ideas into the space program. These innovative technologies can serve as the bases for future commercial space ventures.

Commercial Space Ventures is an approach to the development of space technology in partnership with industry and the academic community. In those cases where there is a clear commercial application as well as a government space application for a new technology, then a partnership in the development of that technology is appropriate. This approach leverages both the government and industry resources in the development of new technologies and stimulates U.S. industry through the early entry of these innovative technologies into the marketplace.

In support of private sector research initiatives, the NASA Office of Commercial Programs (OCP) is offering flight opportunities on the Space Shuttle for the commercial development of space. These flight opportunities sustain the commercial development of various technologies and processes which require manned space vehicle accommodations (i.e., cargo space and crew operation) in excess of those currently available in the Orbiter middeck compartment. This enhanced microgravity research capability will be provided through government lease, on a firm fixed price basis, of spacecraft resources on a Commercial Middeck Augmentation Module (CMAM) along with supporting mission integration services. The OCP has asked JSC to provide technical management and administrative services for the CMAM contract.

	Permanent Civil Service Workyears
CENTER MANAGEMENT AND OPERATIONS SUPPORT............	585

Center Management and Operations Support is provided to all JSC organizations. The civil service personnel involved in this support include the following:

Director and Staff - The Center Director, Deputy Director and immediate staff, e.g, Legal, Personnel, Equal Opportunity, Technical Planning, and Public Affairs.

Management Support - Personnel providing information and control service supporting all levels of Center management, both program and functional. Specific functions include resources and financial management, program control, contracting and procurement, property management, and management systems and analysis.

Operations Support - Personnel managing and providing for the operation and maintenance of institutional facilities, buildings, systems, and equipment, including those who provide technical services such as automatic data processing, reliability and quality assurance, medical care, and photographic support.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
			(Thousands of Dollars)		
I.	PERSONNEL AND RELATED COSTS	221,940	237,246	237,252	248.105
II.	TRAVEL	7,147	7,777	6,755	7,336
III.	OPERATION OF INSTALLATION	109,373	117,983	0	0
	A. Facilities Services	38,392	44,105	0	0
	B. Technical Services	33,142	34,889	0	0
	C. Management and Operations	37,839	38,492	0	0
	D. Implementation of Project CORE	0	497	0	0
	Total, Fund Requirement	338,460	363,006	244,007	255,441

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

RESOURCES REQUIREMENTS BY FUNCTION

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
I. PERSONNEL AND RELATED COSTS	221,940	237,246	237.252	248.105

Summary of Fund Requirements

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A. Compensation and Benefits				
1. Compensation				
a. Full-time permanent	173,144	183,190	184,187	191,819
b. Other than full-time permanent	2,641	2,817	2,714	2,518
c. Reimbursable detailees	5,834	6,601	5,802	6,486
d. Overtime and other compensation	3,160	3,970	3,226	2,984
Subtotal, Compensation	184,779	196,578	195,929	203,807
2. Benefits	33,258	36,645	36,538	38,406
Subtotal, Compensation and Benefits	218,037	233,223	232,467	242,213

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)			
B.	Supporting Costs				
	1. Transfer of personnel	590	1,073	965	590
	2. Investigative Svcs & CORE Conv	0	0	500	1,900
	3. Personnel training	3,313	2,950	3,320	3,402
	Subtotal, Supporting Costs	3,903	4,023	4,785	5,892
	Total, Personnel and Related Costs	221,940	237,246	237,252	248,105

Explanation of Fund Requirements

A. Compensation and Benefits

1. Compensation

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
a.	Full-time permanent	173,144	183,190	184,187	191,819

The increase in the 1992 Current Estimate from the 1992 Budget Estimate reflects the additional pay raise from 4.0% to 4.2% and repricing due to less attrition than anticipated. The 1993 Estimate includes funding for a full year of the 1992 pay raise, the 1993 pay raise, and full year funding for promotions, within grade increases, and other personnel actions. In 1993, we plan to fund our approved ceiling FTE by maximizing our lapse savings, hiring more freshouts and reducing discretionary salary growth factors.

Basis of Cost for Permanent Positions

In 1993, the cost of full-time workyears will be $191,819,000. The increase from 1992 is calculated as follows:

Cost of full-time permanent workyears in 1992.....		$184,187
Cost of increases in 1993........................		11,186
Within grade and career advances:		
Full year effect of 1992 actions..............	2,243	
Partial year effect of 1993 actions...........	1,963	
Full year cost of 1992 pay raise..............	2,097	
Partial year cost of 1993 pay raise...........	4,883	
Cost Changes in 1993............................		- 3,554
Full year effect of 1992 actions..............	-1,151	
Partial year effect of 1993 actions...........	-1,707	
Fewer paid days in 1993......................	-696	
Cost of full-time permanent workyears in 1993.....		$191,819

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1,993 Budget Estimate
	(Thousands of Dollars)			
b. Other than full-time permanent				
(1) cost	2,641	2,817	2,714	2,518

This category includes funding for the Co-Op Program, although the FTE are no longer shown as part of our ceiling FTE. The decreases from the 1992 Budget Estimate to the 1992 Current Estimate to the 1993 Budget Estimate is the reduction in temporary personnel and moving the PMIP FTE's to the full time permanent category.

c. Reimbursable detailees	5,834	6,601	5,802	6,486

The military personnel detailed to the Johnson Space Center on a reimbursable basis are experienced in manned space flight and related fields. Each performs a function essential and critical to current and future programs. The net decrease from the 1992 Budget Estimate to the 1992 Current Estimate is due primarily to a decrease in the number of detailees, and changes to the hire/loss phasing plan. The 1993 Budget Estimate reflects the full year effect of the 1992 pay raise, the anticipated FY 1993 pay raise, and an increase in head count from 58 to 64 detailees for new astronaut program hires.

d. Overtime and other compensation	3,160	3,970	3,226	2,984

The overtime and other compensation category consists of overtime, holiday pay, incentive awards, night differential, Sunday premium pay and overseas assignments. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate is due to a constrained budget and the decision to divert overtime funding to pay for the current approved FTE. Overtime in 1992 will be used primarily to support Shuttle flights, but is also used for crew training and related support activities. The 1993 Budget Estimate reflects a decreased level of effort also due to a constrained budget and diversion of funds.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
2. Benefits	33,258	36,645	36,538	38,406

The following are the amounts of contribution by category:

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
Retirement Fund and Thrift Plan	17,984	19,343	19,463	20,226
Employee Life Insurance	320	346	324	328
Employee Health Insurance	7,888	8,814	8,738	9,612
Workers' Compensation	629	771	771	802
FICA	4,164	5,897	4,455	4,543
Medicare	2,246	1,438	2,757	2,864
Other Benefits	27	36	30	31
Total	33,258	36,645	36,538	38,406

The 1993 Budget Estimate reflects the full year funding of the 1992 pay raise, the planned 1993 pay raise and anticipated increases for health insurance and new FERS hires.

B. Supporting Costs

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Transfer of Personnel	590	1,073	965	590

The supporting costs category includes movement of household goods, subsistence and temporary expenses, real estate costs, and miscellaneous moving expenses related to change-of-duty-station. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate reflects a decrease in the number of employees who are eligible for these benefits. The decrease in the 1993 Budget Estimate reflects an effort to control these costs and divert funds to compensation to maintain the current approved FTE level.

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
			(Thousands of Dollars)		
2.	Investigative Svcs & CORE Conv	0	0	500	1,900

The 1992 Current Estimate reflects the implementation of the approved Core conversions. The 1993 Estimate includes the full year funding of 1992 Core conversions and the transfer of the security investigation responsibility from Headquarters to the centers.

3.	Personnel Training	3,313	2,950	3,320	3,402

The purpose of the JSC training program is to continue to develop the skills and knowledge of civil service employees in order to more efficiently support Center roles and missions. The benefits derived by NASA from training and educational programs are: enhancement of scientific and engineering leadership in the scientific community; maintenance of a high degree of professional competency with the administrative and clerical force; development of needed skills and knowledge required in Center mission activities; extending our Center's workforce capability, increasing productivity; and emphasizing "Upward Mobility" training of women and minorities and Equal Opportunity Seminars. The increase from the 1992 Budget Estimate to the 1992 Current Estimate results from an increased emphasis on total quality management (TQM) and estimates of costs associated with scheduled training. The 1993 Budget Estimate reflects the same level of effort with a small inflation increase.

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)			
II.	TRAVEL	7,147	7,777	6,755	7,336

Summary of Fund Requirements

A.	Program Travel	5,671	6,147	5,360	5,883
B.	Scientific and Technical Development Travel	384	492	363	378
C.	Management and Operations Travel	1,092	1,138	1,032	1,075
	Total, Travel	7,147	7,777	6,755	7,336

Explanation of Fund Requirements

A.	Program Travel	5,671	6,147	5,360	5,883

Program travel is specifically required for the accomplishment of the Center's mission. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate is based on a reduction in the planned number of trips as a result of the re-evaluation of available funds to meet center priorities. The increase from 1992 to 1993 is attributed to anticipated inflation.

B.	Scientific and Technical Development Travel	384	492	363	378

Scientific and technical development travel permits employees to participate in meetings and technical seminars with other representatives of the aerospace community. The decrease from 1992 Budget Estimate to the 1992 Current Estimate is the result of a re-evaluation of available funds. The 1993 Estimate reflects essentially the same level as 1992.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
C. Management and Operations Travel	1,092	1,138	1,032	1,075

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters and other NASA Centers; and local transportation. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate is based on a reduction in the planned number of trips as a result of reallocation of funds based on center priorities. The increase in 1993 is attributed to inflation and represents essentially the same number of trips.

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)			
III.	OPERATION OF INSTALLATION	109,373	117,983	0	0

Summary of Fund Requirements

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A.	Facilities Services				
1.	Rental of Real Property	1,098	1,061	0	0
2.	Maintenance and Related Services	10,844	16,093	0	0
3.	Custodial Services	10,820	8,874	0	0
4.	Utility Services	15,630	18,077	0	0
	Total, Facilities Services	38,392	44,105	0	0
B.	Technical Services				
1.	Automatic Data Processing	23,050	23,519	0	0
2.	Scientific and Technical Information	4,447	4,988	0	0
3.	Shop and Support Services	5.645	6.382	0	0
	Total, Technical Services	33,149	34,889	0	0

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
C. Management and Operations				
1. Administrative Communications	7,442	6,940	0	0
2. Printing and Reproduction	1,641	2,036	0	0
3. Transportation	3,763	4,770	0	0
4. Installation Common Services	24,993	24,746	0	0
Total, Management and Operations	37,839	38,492	0	0
D. Implementation of Project CORE	0	497	0	0
Total, Operation of Installation	109,373	117,983	0	0

Explanation of Fund Requirements

Operation of Installation provided a broad range of services, supplies, and equipment in support of the Center's institutional activities. These are divided into three major functional areas: Facilities Services, the cost of maintaining and repairing institutional facilities and equipment, and the cost of custodial services and utilities; Technical Services, the cost of automatic data processing for management activities, and the cost of educational and informational programs and technical shops supporting institutional activities; and Management and Operations, the cost of administrative communications, printing, transportation, medical, supply, administrative support, and related services. Additionally, in 1992 Operation of Installation included funding for the implementation of Project CORE, which will convert certain functions from contractors to civil servants.

The activities that had been budgeted in the Operation of Installation account are no longer included in the Research and Program Management (R&PM) budget. Project CORE funds are budgeted in the Salary and Related

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

Costs account and the remainder are included in the Research and Development and Space Flight, Control and Data Communications budgets.

A. Facilities Services

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Rental of Real Property	1,098	1,061	0	0

Provided for the rental of buildings off-site for source evaluation boards, rental of hangar space at El Paso, Texas International Airport for the T-38 and Shuttle training vehicles, and rental of warehouse storage in Bell, California for tooling and assembly hardware for the Shuttle.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
2. Maintenance and Related Services	10,844	16,093	0	0

This activity involved routine maintenance and facilities support for Johnson Space Center at Houston, as well as WSTF and Ellington Air Force Base, and included such activities as administrative facility alterations and painting; grounds maintenance; and other facility and system design and modification tasks.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
3. Custodial Services	10,820	8,874	0	0

This activity involved support contractor effort at JSC to provide security guard services such as protection of government facilities, equipment, and classified information and badging for all on-site personnel and official visitors; janitorial services (including highly specialized clean-room services); and fire protection services such as maintenance of alarms and fixed fire fighting equipment.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
4. Utility Services	15,630	18,077	0	0

This category included purchased utilities and support contractor effort for the operation and support service contractor maintenance of the utility distribution system.

B. Technical Services

1. Automatic Data Processing	23,050	23,519	0	0

This activity provided support to all JSC administrative ADP functions; included within this area are institutional portions of lease and maintenance costs of hardware systems within the Central Computer Facility, as well as contractor effort for computer programming, operations, keypunch, and other support personnel. The ADP systems supported included institutional management, finance and accounting, procurement, contract status and tracking, personnel management, payroll, and utility tracking.

2. Scientific and Technical Information	4,447	4,988	0	0

A part of this funding provided for the technical library at JSC, which is a multi-disciplinary facility responsible for providing library services to nearly 14,000 civil service and contract employees. These services included basic circulation support on existing collections, document cataloging, interlibrary loans, reference and research using both paper and electronic media, technical specifications and standards repository administration, collection management, and acquisition of JSC journal and periodical subscriptions.

This activity also provided for a public affairs educational and informational program and support to the Center by providing various scientific and technical information services. Included in the public affairs program are: motion picture production from script to screen; film clip preparation; exhibit management and

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			

refurbishment; visitor orientation tours; lecturing; mail answering services; and other public affairs activities.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
3. Shop and Support Services	5,645	6,382	0	0

These funds provided the support contractor manpower at JSC for graphics and photographic services as well as test safety support. Graphics materials are used in presentations for senior management reviews; photo services are used primarily by Public Affairs for photo distribution; and test safety engineers provide critical safety support for all new and modified facilities.

C. Management and Operations

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Administrative Communications	7,442	6,940	0	0

Communications support for JSC and WSTF consisted of local and long distance telephone service and other communication services which include ROLM, a lease-to-ownership communication system. Local service includes Centrex lines and telephones at JSC and WSTF. Long distance service includes the cost for commercial toll calls, and a small number of dedicated voice circuits. Other communications services include teletype and wire news services; the operation and maintenance of a closed circuit TV system; and local radio networks for fire, security and custodial uses.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
2. Printing and Reproduction	1,641	2,036	0	0

Funding provided for printing services which were located on-site and at off-site facilities. The on-site printing plant, operated by JSC personnel, produces approximately 78 million units each year. In addition to this on-site printing plant, JSC also purchases printing from private firms through Government Printing Office

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			

contracts, about 77,000,000 units each year. Purchased printing is overflow requirements that cannot be handled on-site and printing which requires capabilities not available at the on-site plant.

3. Transportation	3,763	4,770	0	0

Transportation funding provided administrative aircraft maintenance and fuel costs, lease of passenger vehicles and trucks including GSA drivers and dispatchers and maintenance of vehicles.

4. Installation Common Services	24,993	24,746	0	0

These funds supported center management and staff activities, provided medical services, and covered various installation support services. Center management and staff functions include legal, personnel, procurement, and EEO activities. Medical services provided include occupational medicine and environmental health, consisting of the operation of the Johnson Space Center on-site clinic; emergency assistance at Ellington Field; providing physicals for JSC personnel at Downey, California; medical consultation and crew test support; industrial hygiene; radiological health; and an environmental health laboratory. Installation support services include administrative supplies, materials and equipment at the Center and at WSTF; JSC's share of operating costs at Ellington; and miscellaneous administrative support.

D. Implementation of Project CORE	0	497	0	0

The Johnson Space Center had planned to convert 12 positions from contractors to civil servants. Because of Congressional action, these plans are under review. Until this review is completed, funds for such conversions are being held in the Salary and Related Costs account.

National Aeronautics & Space Administration

Johnson Space Center

Proj. EOFY Staffing Summary

	FY-92	FY-93
GS/GM-15	387	380
OWOM-14	636	625
All other GS/GM	2566	2124
Wage Grade		
TOTAL	3664	3604

Director / Deputy Director / Assistant Director

	FY-92	FY-93
SES	7	7
NASA Excepted	0	0
ST	0	0
GS/GM-[illegible]	[illegible]	[illegible]
GS/GM-14	0	0
All other GS/GM	9	9
Wage Gr[illegible]	0	0
TOTAL	17	17

Office of Inspector General JSC

Comptrollers Office

	FY-92	FY-93
SES	1	1
NASA Excepted	0	0
ST	0	0
OWOM-11	5	5
GS/GM-14	14	14
All other GS/GM	125	123
Wage Grade	0	0
TOTAL	145	143

Human Resources Office

	FY-92	FY-93
SES	1	1
NASA Excepted	0	0
ST	0	0
GS/GM-15	0	0
GS/GM-14	6	6
All other GS/GM	55	54
Wage Grade	0	0
TOTAL	62	61

Equal Opportunity Programs Office

	FY-92	FY-93
SES	0	0
NASA Excepted	0	0
ST	0	0
GS/GM-15	1	1
GS/GM-14	0	0
All other GS/GM	7	7
Wage Grade	0	0
TOTAL	8	8

Legal Office

	FY-92	FY-93
SES	1	1
NASA Excepted	0	0
ST	0	0
GS/GM-15	3	3
GS/GM-14	8	8
All other GS/GM	4	4
Wage Grade	0	0
TOTAL	16	16

Public Affairs Office

	FY-92	FY-93
SES	1	1
NASA Excepted	0	0
ST	0	0
GS/GM-15	1	1
GS/GM-14	2	2
All other GS/GM	29	29
Wage Grade	0	0
TOTAL	33	33

New Initiatives Office

	FY-92	FY-93
SES	2	2
NASA Excepted	0	0
ST	0	0
GS/GM-15	20	20
GS/GM-14	22	22
All other GS/GM	43	42
Wage Grade	0	0
TOTAL	87	86

Director Safety, Reliability, and Quality Assurance

	FY-92	FY-93
SES	1	2
NASA Excepted	0	0
ST	0	0
GS/GM-15	15	15
GS/GM-14	21	21
All other GS/GM	141	136
Wage Grade	0	0
TOTAL	179	174

Space Station Program & Operations Office

	FY-92	FY-93
SES	0	0
NASA Excepted	0	0
ST	0	0
GS/GM-15	7	7
GS/GM-14	2	2
All other GS/GM	3	3
Wage Grade	0	0
TOTAL	12	12

Space Station Projects Office

	FY-92	FY-93
SES	3	3
NASA Excepted	0	0
ST	0	0
GS/GM-15	18	17
GS/GM-14	45	44
All other GS/GM	42	42
Wage Grade	0	0
TOTAL	108	lo1

Orbiter and GFE Projects Office

	FY-92	FY-93
SES	3	3
NASA Excepted	0	0
ST	0	0
GS/GM-15	26	24
GS/GM-14	33	34
All other GS/GM	70	70
Wage Grade	0	0
TOTAL	132	131

Space Shuttle Program Office

	FY-92	FY-93
SES	0	0
NASA Excepted	0	0
ST	0	0
GS/GM-15	37	36
GS/GM-14	68	67
All other GS/GM	85	85
Wage Grade	0	0
TOTAL	190	188

Space Shuttle Operations Office

	FY-92	FY-93
SES	0	0
NASA Excepted	0	0
ST	0	0
GS/GM-15	2	2
GS/GM-14	3	3
All other GS/GM	1	1
Wage Grade	0	0
TOTAL	6	6

Lunar & Mars Exploration

	FY-92	FY-93
SES	2	2
NASA Excepted	0	0
ST	0	0
GS/GM-15	4	4
GS/GM-14	9	9
All other GS/GM	14	14
Wage Grade	0	0
TOTAL	29	29

Director Flight Crew Operations

	FY-92	FY-93
SES	4	4
NASA Excepted	0	0
ST	0	0
GS/GM-15	30	30
GS/GM-14	33	32
All other GS/GM	106	106
Wage Grade	0	0
TOTAL	173	172

Director Mission Operations

	FY-92	FY-93
SES	9	9
NASA Excepted	0	0
ST	0	0
GS/GM-15	51	50
GS/GM-14	104	101
All other GS/GM	450	444
Wage Grade	0	0
TOTAL	614	604

Director Information Systems

	FY-92	FY-93
SES	2	2
NASA Excepted	0	0
ST	1	1
GS/GM-15	13	13
GS/GM-14	27	27
All other GS/GM	86	85
Wage Grade	0	0
TOTAL	129	128

Director Engineering

	FY-92	FY-93
SES	9	9
NASA Excepted	0	0
ST	2	2
GS/GM-15	77	76
GS/GM-14	139	134
All other GS/GM	598	583
Wage Grade	0	0
TOTAL	825	804

White Sands Test Facility

	FY-92	FY-93
SES	1	1
NASA Excepted	0	0
ST	0	0
GS/GM-15	3	3
GS/GM-14	7	7
All other GS/GM	39	38
Wage Grade	0	0
TOTAL	50	49

Director Space and Life Sciences

	FY-92	FY-93
SES	5	5
NASA Excepted	0	0
ST	7	7
GS/GM-15	48	47
GS/GM-14	53	52
All other GS/GM	127	124
Wage Grade	0	0
TOTAL	240	235

Director Administration and Program Support

	FY-92	FY-93
SES	3	3
NASA Excepted	0	0
ST	0	0
GS/GM-15	14	14
GS/GM-14	23	23
All other GS/GM	232	228
Wage Grade	0	0
TOTAL	272	268

Director Center Operations

	FY-92	FY-93
SES	2	2
NASA Excepted	0	0
ST	0	0
GS/GM-15	11	11
GS/GM-14	17	17
All other GS/GM	300	295
Wage Grade	7	7
TOTAL	337	332

KENNEDY
SPACE CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1993 ESTIMATES

JOHN F. KENNEDY SPACE CENTER

DESCRIPTION

The John F. Kennedy Space Center (KSC) is located 50 miles east of Orlando, Florida. The total land and water area occupied by the installation is 139,305 acres. NASA owns 82,943 acres of that total. The remainder is comprised of the Banana River Causeway Easement (271 acres), the Indian River Causeway Easement (296 acres), and Florida-owned submerged lands with Deed of Dedication (55,795 acres).

Space Shuttle flights began at KSC in 1981. Expendable Launch Vehicle (ELV) operations are conducted at both the Air Force's Eastern Range, at Cape Canaveral Air Force Station, Florida, and the Western Range at Vandenberg Air Force Base (VAFB), California, which is located six miles west of Lompoc, California. Activities at VAFB are accomplished within a host-tenant agreement with the Air Force.

The NASA capital investment at KSC, Cape Canaveral Air Force Station, and VAFB, including fixed assets in progress and contractor-held facilities as of September 30, 1991, was $2,076,386.000.

CENTER ROLES AND MISSIONS

The Launch Operations Center was established at Cape Canaveral, Florida, in July 1962 to serve as the primary NASA center for the test, checkout, and launch of space vehicles. In late 1963, it was named the John F. Kennedy Space Center and in 1964 the Center was relocated to Merritt Island. This site was chosen because of its unique geographical characteristics, climate, local growth capability, accessibility, and availability. The Center has since become the major launch site in the western world with a unique civil service staff of unparalleled expertise in the test, checkout and launch of space vehicles and in the design of associated ground support equipment. The specialized facilities developed at KSC represent a recognized national resource. The principal roles of the Center are:

Space Shuttle Ground Operations - This includes Space Shuttle launch preparation, including Spacelab assembly and checkout and payload experiment integration; upper stages processing; orbiter, Spacelab, and Ground

Support Equipment (GSE) logistics; and operation and maintenance of GSE.

Space Station - Space Station Freedom (SSF) ongoing efforts at KSC consist of activities in the areas of facility utilization planning, system engineering and integration, and the development and maintenance of GSE and facilities required for SSF support.

Expendable Launch Vehicle Operations - This includes government oversight of all launch processing and checkout activities for all NASA contracted ELV launch services both at KSC and VAFB, payload checkout and processing, and NASA launch management responsibility.

DISTRIBUTION OF FULL TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

KENNEDY	1991 ACTUAL	1992 BUDGET ESTIMATE	1992 CURRENT ESTIMATE	1993 BUDGET ESTIMATE
SPACE STATION	187	207	218	233
SPACE FLIGHT PROGRAMS	1,815	1,786	1,796	1,766
SPACE TRANSPORTATION CAPABILITY DEV	339	317	330	336
SPACE TRANSPORTATION OPERATIONS	1,476	1,469	1,466	1,430
SPACE SCIENCE AND APPLICATIONS	118	105	110	110
PHYSICS AND ASTRONOMY	98	91	90	90
LIFE SCIENCES	20	14	20	20
PLANETARY EXPLORATION	0	0	0	0
SPACE APPLICATIONS	0	0	0	0
AERONAUTICS AND SPACE TECHNOLOGY	3	7	3	3
AERONAUTICAL RESEARCH AND TECHNOLOGY	0	0	0	0
SPACE RESEARCH AND TECHNOLOGY	3	7	3	3
TRANSATMOSPHERIC RESEARCH AND TECH	0	0	0	0
SPACE EXPLORATION	1	0	2	2
COMMERCIAL PROGRAMS	5	14	6	6
SAFETY, RELIABILITY & QUALITY ASSURANCE	0	0	0	0
ACADEMIC PROGRAMS	0	0	0	0
TRACKING AND DATA PROGRAMS	0	0	0	0
SUBTOTAL - DIRECT FULL-TIME PERM FTEs	2129	2,119	2,135	2,120
CENTER MANAGEMENT AND OPERATIONS	374	390	382	390
SUBTOTAL - FULL-TIME PERM FTEs	2,503	2,509	2,517	2,510
OTHER FTEs	23	26	18	25
SUBTOTAL - FULL-TIME EQUIVALENTS	2,526	2,535	2,535	2,535
PROJECT CORE	0	0	0	0
GRAND TOTAL - FULL-TIME EQUIVALENTS	2,528	2,535	2,535	2,535

PROGRAM DESCRIPTION

Permanent Civil
Service Workyears

RESE AND D

SPACE STATION...................................... 233

For Space Station Freedom, KSC has the responsibility to assure that the flight hardware elements delivered by the development Centers receive the required assembly, checkout, servicing, and packaging for integration into the Shuttle Orbiter. KSC will continue the design and development of facilities and equipment necessary for launch site processing. This includes launch site facilities, ground support equipment, and payload integration and interface test equipment. Additional responsibilities include logistics operational capability development and launch site Safety, Reliability and Quality Assurance assessments.

SPACE FLIGHT PROGRAMS.............................. 1,766

SPACE TRANSPORTATION CAPABILITY DEVELOPMENT......... 336

The upper stages currently consist of the Inertial Upper Stage (IUS), Transfer Orbit Stage (TOS), and the Payload Assist Module (PAM). These upper stages are expendable, propulsive stages intended for use in the deployment of Space Shuttle or ELV's transported payloads to high energy orbits or planetary trajectories not attainable by the Space Shuttle or ELVs.

The Center's role in the Spacelab program is similar to that of the Space Shuttle; that is, KSC is responsible for launch site development and for ground operations leading to the launch. KSC has responsibility for verifying that the Spacelab flight and ground systems are compatible with the Spacelab system, with each other, and with safety requirements.

The Center's role in payload operations and support is to provide facilities and support to the various customers during processing of their payloads and in concert with other NASA organizations, to analyze potential payload users' requirements and activities. Based on experience gained during the ELV program and thus far in the Shuttle program, KSC will continue to monitor payload activity from conception; participate in design reviews to ensure compatibility with KSC facilities; and coordinate support activities during the payload checkout and launch at KSC.

Advanced program planning and technology development activities require the preparation of conceptual plans for the extension or enhancement of on-going programs/projects and for new and innovative future space programs. Inputs from other NASA elements are integrated to provide KSC management with long-range forecasts and required visibility for planning capability.

	Permanent Civil Service Workyears
SPACE TRANSPORTATION OPERATIONS............................	1,430

The design, modification or acquisition, installation and checkout of equipment and facilities to be used in support of Space Shuttle launch requirements will continue. This includes equipment provided by KSC contractors, as well as equipment to be supplied by development contractors as part of their flight vehicle responsibilities.

Although installation and checkout of initial operational systems are complete and the ground support equipment installed, there are ongoing new requirements such as installation of the Extended Duration Orbiter (EDO) and drag chute modifications to the remainder of the fleet, as well as modifications to existing GSE systems. KSC ground support equipment and associated subsystems have been in place since the mid-1970's and must be upgraded/replaced due to obsolescence and to take advantage of new equipment/system capabilities. These include replacement of the Launch Processing System in order to sustain the Shuttle flight rate, as well as major subsystems on the launch pads and other ground processing facilities. Support will continue for launch construction activities, Launch Complex 39 modifications, and other modifications to facilities or equipment to meet program requirements.

The operations role includes the test and checkout of each flight element as it arrives for launch; the integration of elements (orbiter, external tank, solid rocket boosters and their subsystems) into the Space Shuttle vehicle, and the integrated testing of the stacked configuration, propellant loading, and launch. Subsequent to landing, the orbiter is refurbished by KSC in preparation for the next mission. KSC is responsible for retrieval and disassembly of the solid rocket boosters. The Center will also continue the refurbishment of selected existing support equipment for reuse in the Space Shuttle system. KSC is responsible for the operation and maintenance of worldwide contingency and secondary landing sites and for ferrying the orbiter from the landing site back to KSC.

The Center is responsible for oversight of the launch processing and checkout of all NASA contracted for ELV launch services at both the Eastern and Western Ranges, payload checkout and processing, and NASA launch management responsibility.

	Permanent Civil Service Workvears
SPACE SCIENCE AND APPLICATIONS....................	110
PHYSICS AND ASTRONQ	90

KSC is responsible for planning and coordinating the integration of the Spacelab experiments with the Spacelab hardware systems. Interfaces are established and maintained with the NASA discipline program offices, the principal investigators, and appropriate engineering groups to assure that scientific objectives of the mission are met.

LIFE SCIENCES......................................	20

KSC will continue its support role in the definition, development and integration of biomedical experiments on the Space Shuttle for life sciences research. Included is the responsibility for providing and managing a Life Sciences Principal Investigator Support Facility and assisting in the conduct of life sciences synchronous ground control experiments and procedures required for these payloads. Experiments are designed to use the environment of space to accomplish medical and biological research.

AERONAUTICS AND SPACE TECHNOLOGY..................	3
SPACE AND RESEARCH TECHNOLOGY......................	3

In 1993, technology applications and demonstrations will continue in the areas of telerobotics, artificial intelligence, regenerative life support, and space flight research and technology.

	Permanent Civil Service Workyears
SPACE EXPLORATION	2

Personnel providing support to a range of advanced studies associated with the Lunar Mars mission. The **1993** studies effort deals with ground operations support for heavy lift vehicles and early human lunar return.

COMMERCIAL PROGRAMS	6

The objectives of the Commercial Use of Space program are to establish close working relations with the private sector and academia to: encourage investment in space technology and the use of such technology to facilitate private sector space activities through access to government capabilities; encourage private sector investment that is independent of NASA funding; and insure consistent implementation of commercial space policy. This effort established an organizational focal point to foster commercial use and access to space.

The Technology Utilization program identifies, acquires and disseminates the results of NASA research and development in useful forms and through a variety of technology transfer mechanisms to strengthen the national economy and industrial productivity. In order to accelerate and facilitate the application of NASA-related technology to meet technical needs in the industrial and public sectors, the program encourages participation by all NASA and contractor scientific and engineering personnel.

CENTER MANAGEMENT AND OPERATIONS SUPPORT	390

Center Management and Operations Support provides support to all Kennedy Center organizations. The civil service personnel involved are:

Director and Staff - The Center Director, Deputy Director, and the immediate staff, e.g., Legal, Patent Counsel, Equal Opportunity, and Public Affairs.

Management Support - Personnel providing administrative and management services including resources and financial management, program control, contracting and procurement, property management, personnel management, and management systems and analysis.

Operations Support - Personnel providing for the operations and maintenance of institutional facilities, buildings, systems and equipment, including those who manage or provide technical services such as automatic data processing, supply and transportation, reproduction services, medical care, and photographic support.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

			1992		1993
		1991 Actual	Budget Estimate	Current Estimate	Budget Estimate
		(Thousands of Dollars)			
I.	PERSONNEL AND RELATED COSTS	141,190	153,446	151,494	159,687
II.	TRAVEL	4,140	4,890	4,346	4,726
III.	OPERATION OF INSTALLATION	153,625	162,450	0	0
	A. Facilities Services	95,492	101,990	0	0
	B. Technical Services	13,159	13,794	0	0
	C. Management and Operations	44,974	46,666	0	0
	D. Implementation of Project CORE	0	0	0	0
	Total, Fund Requirement	298,955	320,786	155,840	164,413

RESOURCES REQUIREMENTS BY FUNCTION

I.	PERSONNEL AND RELATED COSTS	141,190	153,446	151,494	159,687

Summary of Fund Requirements

A.	Compensation and Benefits				
1.	Compensation				
a.	Full-time permanent	109,960	117,628	118,376	124,059
b.	Other than full-time permanent	1,773	1,821	2,058	2,286
c.	Reimbursable detailees	9	0	0	0
d.	Overtime and othet compensation	4,950	6,856	4,883	4,887
	Subtotal, Compensation	116,692	126,305	125,317	131,232
2.	Benefits	21,485	23,900	23,664	25,297
	Subtotal, Compensation and Benefits	138,177	150,205	148,981	156,529

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
B. Supporting Costs				
1. Transfer of personnel	1,017	1,556	528	947
2. Investigative Svcs and CORE Conv	0	0	0	538
3. Personnel training	1,996	1,685	1,985	2,073
Subtotal, Supporting Costs	3,013	3,241	2,513	3,158
Total, Personnel and Related Costs	141,190	153,446	151,494	159,687

Explanation of Fund Requirements

A. Compensation and Benefits

1. Compensation

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
a. Full-time permanent	109,960	117,628	118,376	124,059

The increase in the 1992 Current Estimate from the 1992 Budget Estimate reflects the change in the January pay raise from 4.0 percent to 4.2 percent, a revised estimate reflecting an increase of actual on-board strength at the beginning of FY 1992, offset by a redistribution of FTE's resulting in the transfer of FTE's to "other than full-time permanents from "full-time permanents". The 1993 Estimate includes funding for a full year of the 1992 pay raise, the anticipated 1993 pay raise, and full year funding for promotions, within grade increases, and other personnel actions. We plan to fund our approved ceiling FTE by maximizing our lapse savings, hiring more freshouts, and reducing discretionary salary growth factors.

Basis of Cost for Civil Service Workyears

In 1993, the cost of full-time workyears will be $124,059,000. The increase from 1992 is calculated as follows:

Cost of full-time permanent workyears in 1992......		$118,376
Cost of increases in 1993.........................		8,813
Within grade and career advances:		
Full year effect of 1992 actions...............	2,018	
Partial year effect of 1993 actions............	2,213	
Full year cost of 1992 pay raise...............	1,457	
Partial year cost of 1993 pay raise............	3,125	
Cost Decreases in 1993...........................		- 3,130
Turnover Effects:		
Full year effect of 1992 actions...............	-1,137	
Partial year effect of 1993 actions............	-1,579	
One less day in 1993	- 414	
Cost of full-time permanent workyears in 1993......		$124,059

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
b. Other than full-time permanent				
(1) cost	1,773	1,821	2,058	2,286

Other than full-time permanent includes the Co-op program for funding requirements, but the FTE are no longer included in our approved FTE ceiling. The increase from the 1992 Budget Estimate to the 1992 Current Estimate results from an increase in Co-op FTE's; some higher salaried temporaries; and an additional 0.2% pay raise. The 1993 increase includes an increase in Co-op positions, full year funding of the 1992 pay raise and the cost of the anticipated pay raise in January 1993.

c. Reimbursable detailees	9	0	0	0

The Kennedy Space Center no longer has military personnel detailed on a reimbursable basis in 1992 and none are planned in 1993.

d. Overtime and other compensation	4,950	6,856	4,883	4,887

The overtime and other compensation budget category consists of overtime, holiday pay, incentive awards, night differential, Sunday premium pay and overseas assignments. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate is based on a reassessment of the previously planned Shuttle processing requirements. The 1993 Budget Estimate reflects a decision to hold overtime to a constrained level to divert funding to compensation to maintain our FTE program.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
2. Benefits	21,485	23,900	23,664	25,297

The following are the amounts of contribution by category:

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
Retirement Fund and Thrift Plan..................	11,272	12,305	12,279	12,964
Employee Life Insurance.........................	221	274	253	267
Employee Health Insurance.......................	5,371	6,395	6,133	6,746
Workers' Compensation..........................	338	463	463	482
FICA..	2,581	3,144	2,640	2,824
Medicare..	1,491	1,115	1,743	1,804
Other Benefits, OPM Annuity & Unemployed Compensation	211	204	153	210
Total...	21,485	23,900	23,664	25,297

The decrease from the 1992 Budget Estimate to the 1992 Current Estimate is due to a re-estimate of benefit components. Reductions have occurred in retirement programs, FICA and health insurance, offset by increases in medicare and the additional 0.2 percent of the 1992 pay raise. The 1993 increase reflects the full year effect of the 1992 pay raise, the anticipated 1993 pay raise and expected increases above the pay raise in health insurance, retirement programs, and FICA.

B. Supporting Costs

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Transfer of Personnel	1,017	1,556	528	547

The supporting cost category includes movement of household goods, subsistence and temporary quarters expenses, real estate costs and miscellaneous moving expenses related to change of duty station. The decrease in the 1992 Budget Estimate to the 1992 Current Estimate reflects a reduction in the number and mix of planned

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

new hires and an effort to control relocation costs. The increase in the 1993 Budget Estimate reflects inflation above FY 1992.

2. Investigative Svcs and CORE Conv	0	0	0	538

The cost of the OPM services in the 1993 Budget Estimate reflects the transfer of responsibility for employee security investigations from Headquarters to the Center.

3. Personnel Training	1,996	1,685	1,985	2,073

The purpose of the KSC training program is to continue to develop the skills and knowledge of civil service employees in order to more efficiently support Center roles and missions. The benefits derived by NASA from training and educational programs are: enhancement of scientific and engineering leadership in the scientific community; maintenance of a high degree of professional competency with the administrative and clerical force; development of needed skills and knowledge required in center mission activities; extending our Center's workforce capability; increasing productivity; and emphasizing "Upward Mobility" training of women and minorities and Equal Opportunity Seminars. The increase from the 1992 Budget Estimate to the 1992 Current Estimate results from the addition of a strong Total Quality Management Training program. The 1993 Budget Estimate reflects continuation of the 1992 level plus expected inflation.

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)			
II.	TRAVEL	4,140	4,890	4,346	4,726

Summary of Fund Requirements

A.	Program Travel	2,801	3,802	3,167	3,501
B.	Scientific and Technical Development Travel	112	83	110	114
C.	Management and Operations Travel	1,227	1,005	1,069	1,111
	Total, Travel	4,140	4,890	4,346	4,726

Explanation of Fund Requirements

A.	Program Travel	2,801	3,802	3,167	3,501

Prdgram travel is directly related to the accomplishment of KSC's mission. Program travel reflects the continued involvement in Shuttle requirements reviews and launch and landing operations; the design, manufacturing, and testing of ground support equipment; construction of facilities; and participation in Space Station Freedom Program requirements reviews. The decrease in program travel from the 1992 Budget Estimate td the 1992 Current Estimate is due to a reduction in launch and landing support requirements consistent with a reduction of planned Shuttle launches. The 1993 Budget Estimate reflects a continuation of the 1992 program level of activity including support for a planned additional ELV launch at Vandenberg AFB, CA, and the effects of projected inflation.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
B. Scientific and Technical Development Travel	112	83	110	114

Scientific and technical development travel provides funds for employees to participate in meetings and technical seminars with other representatives of the aerospace community. This participation allows personnel to benefit from exposure to technological advances outsfde KSC, as well as to present both accomplishments and problems to associates. The increase to the 1992 Current Estimate is a restoration of funds to a level which reflects 1991 experience. The 1993 Budget Estimate represents a continuation of the 1992 level of activities adjusted for the projected effects of inflation.

C. Management and Operations Travel	1,227	1,005	1,069	1,111

Management and operations travel is used for the direction and coordination of general management matters. It includes travel concerning such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters, and other NASA Centers; and local transportation. Local travel includes travel in and around the official station of the employer, including tolls, parking fees, and taxis. Non-NASA travel includes transportation of persons, per diem and other incidental expenses for all non-NASA employees, unpaid advisory committee members and pre-employment interviews. The increase from the 1992 Budget Estimate to the 1992 Current Estimate reflects a greater number of planned management reviews and reprioritization of available funds to meet center requirements. The 1993 Budget Estimate represents a continuation of the 1992 level of activities adjusted for the effects of inflation.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
III. OPERATION OF INSTALLATION	153.625	162.450	0	0

Summary of Fund Requirements

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A. Facilities Services				
1. Rental of Real Property	0	0	0	0
2. Maintenance and Related Services	29,271	29,885	0	0
3. Custodial Services	31,825	33,459	0	0
4. Utility Services	34,396	38,646	0	0
Total, Facilities Services	95,492	101,990	0	0
B. Technical Services				
1. Automatic Data Processing	8,392	8,252	0	0
2. Scientific and Technical Information	1,378	1,698	0	0
3. Shop and Support Services	3.389	3.844	0	0
Total, Technical Services	13,159	13,794	0	0

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
C. Management and Operations				
1. Administrative Communications	4,632	3,746	0	0
2. Printing and Reproduction	8,566	9,528	0	0
3. Transportation	7,459	7,339	0	0
4. Installation Common Services	24,317	26,053	0	0
Total, Management and Operations	44,974	46,666	0	0
D. Project CORE	0	0	0	0
Total, Operation of Installation	153,625	162,450	0	0

Explanation of Fund Requirements

Operation of Installation provided a broad range of services, equipment, and supplies and materials in support of the Center's roles and missions. These are divided into three major functional areas: Facilities Services, such as, the maintenance and repair of institutional facilities and equipment, custodial services, and utilities; Technical Services, such as, automatic data processing supporting management activities, technical shops supporting institutional activities, and the cost of educational and informational programs; and Management and Operations, which included printing, transportation, administrative communications, medical, supply, administrative support and related services.

The activities that had been budgeted in the Operation of Installation account are no longer included in the Research and Program Management budget, These activities are now included in the Research and Development and Space Flight, Control. and Data Communications budgets,

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
A. Facilities Services				
1. Rental of Real Property	0	0	0	0
2. Maintenance and Related Services	29,271	29,885	0	0

Funding provided for the necessary management, engineering, and operation and maintenance required to plan, initiate, and perform services on institutional facilities, systems, and equipment. It included roads and grounds maintenance; the development and implementation of a maintenance program for all institutional government furnished and contractor acquired systems, facilities, and equipment; and the operations and maintenance support at the KSC Resident Office at Vandenberg Air Force Base (VAFB), California. It also provided for monitoring all construction contracts, maintenance of construction management documentation files, and also provided for the necessary functions required during pre-contract award phase. Included was contractor support to provide various facility engineering management activities such as: the collection, and review of preliminary and detailed project cost estimates; engineering support and data/documentation to perform the KSC facility master planning function; and support to operations and maintenance of the physical space management system; and support to the operational maintenance documentation (OMD's) for shuttle activities. The support contractor also provided environmental engineering work including the processing of environmental management documentation, and the reporting and correction of pollution incidents and other recurring problems having environmental consequences.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
3. Custodial Services	31,825	33,459	0	0

Funds provided for janitorial services, including highly specialized clean room areas and orbiter support equipment; fire protection services, such as, inspections of facilities, systems, and equipment, standby support during operational tests, in addition to, fighting fires; and security protection of personnel and property including support of hazardous tests and operations, badging of all on-site personnel and official visitors, safeguarding flight hardware, protection of classified information; maintaining area surveillance,

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

and traffic control. Other activities in this category consisted of pest control services, laundry services, and supplies and equipment used by the support contractors performing these functions.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
4. Utility Services	34,396	38,646	0	0

Funds provided for the purchase of utilities and related contractor support services. The major utility used at KSC is electrical energy purchased from Florida Power and Light Company through an Air Force contract. Other utilities included: fuel oil purchased from a local supplier; water services purchased from the City of Cocoa, Florida, and sewage treatment accomplished on-site. Utility plant supervision and operations and maintenance of the utility distribution systems are provided by a support contractor and by the Air Force. The support contractor is responsible for implementing and managing energy conservation projects and for audits and inspections of facilities to insure conformance with energy conservation policy and to identify new energy initiatives. These energy initiatives included modifications, operational changes, and energy studies and awareness. At the KSC Resident Office at VAFB, California, utilities are purchased through the United States Air Force.

B. Technical Services

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Automatic Data Processing	8,392	8,252	0	0

Automatic Data Processing (ADP) funds provided for the lease, purchase, and maintenance of ADP equipment along with programming and operations support. Support contractor activities included programming services for payroll, general accounting, resources and financial management, supply, procurement, preventive maintenance, contract surveillance, personnel security, and other related institutional and management information. The support contractor also provided operations, maintenance, and sustaining engineering to the Center's Office Automation System (OAS) which provided an integrated systems capability for information exchange between KSC organizational elements. The OAS included word processing, electronic mail, and data management capabilities.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
2. Scientific and Technical Information	**1,378**	**1,698**	0	**0**

This funding provided for operation of a technical library at KSC and for technical and administrative documentation services, including support to the Public Affairs educational and information programs. The library facilities were operated by the base operations contractor and provided technical and management books and periodicals in addition to the military, federal, and professional society specifications and standards. The contractor also operated the Shuttle and Spacelab documents repository which catalogs, classifies, and indexes documents and provides document reference and distribution services. Support to Public Affairs provided for the gathering and dissemination of information about the Agency's and Center's programs to the mass communications media, the general public, and the educational community at the elementary and secondary levels.

3. Shop and Support Services	**3,389**	**3,844**	0	**0**

Shop and Support Services funds provided for a wide range of support efforts including photographic services in support of Public Affairs and other institutional activities such as, technical writing, graphics services, illustration support, and the ordering, storing, and issuing of forms and publications. These funds also provided for a comprehensive safety program which included the institutional part of the mishap reporting system, and the establishment and development of both short- and long-range work plans, emergency plans, and schedules in support of KSC base operations. The maintenance, lease, and purchase of the associated supplies and equipment for this function were also included.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
C. Management and Operations				
1. Administrative Communications	4,632	3,746	0	0

These funds provided for local telephone service, long distance tolls, and special communication services in support of all NASA civil service and contractor personnel located at KSC, the Eastern Space and Missile Center (ESMC), and VAFB. Special services were also included, such as, teletype, wire news services, and maintenance of various small electrical/electronic systems, such as, printers which support major communications systems. The base operations contractor performed liaison activities for administrative communications systems and equipment which are installed and maintained by others and used by various contractor and government organizations at KSC and ESMC. The contractor was responsible for performing operation and maintenance activities for other administrative communications systems and equipment and for operation of communications centers at KSC and ESMC. This function also included management of all administrative communication systems and supplies and equipment for outfitting new and existing KSC institutional facilities.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
2. Printing and Reproduction	8,566	9,528	0	0

Funds provided printing, reproduction and micrographics services which are provided by the support contractor, the Government Printing Office (GPO) and minor firms contracted by GPO. Major workload activities included continuous updating of Operations and Maintenance Instructions (OMI's); preparing viewgraphs, halftones, and offset plates; trimming, binding, collating, drilling, cutting, and stapling finished products; reducing documentation to micrographic products; producing the house organ, the telephone directory, and Public Affairs brochures and launch support material; and providing lease and maintenance services for office copiers at KSC, ESMC and VAFB. Funds were also included for supplies and equipment associated with this function.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
3. Transportation	7,459	7,339	0	0

Funds provided the transportation management function performed by the base operations contractor, which included coordination, inspection, and document control of all shipments, delivery of in-bound shipments, and the operation of heavy transportation equipment. Funding also included the maintenance of KSC's administrative aircraft, the cost of passenger and cargo type vehicles used by civil service personnel, and supplies, materials, and equipment used by the support contractor performing the function.

4. Installation Common Services	24,317	26,053	0	0

These funds provided for management and logistics services, mail and distribution services, medical services, environmental monitoring, administrative equipment, and a wide variety of minor procurements of special and one-time services.

The base operations contractor provided a broad range of procurement aqd logistics services including receipt, storage, and issuing of supplies, parts and equipment, as well as maintaining various supply management systems. Mail and distribution services provided by the support contractor include distribution of inter-office mail, classified document control, operation of the KSC branch post office. Two major types of medical services are provided, occupational medicine aqd environmental health. Occupational medicine included emergency and first-aid care for the workforce, guests, and tour visitors; health maintenance and counseling for civil service and contractor employees; and a variety of physical examinations and special programs for health maintenance, and job certification for civil service and contractor personnel. The occupational medical services are available on a three-shift basis to provide emergency and ambulance services and special standby service in support of launch operations including hazardous tests and operations. Environmental health consisted of industrial hygiene, radiological health, and environmental sanitation program elements. This included: monitoring hypergolic substances and other toxins; the maintenance of a center-wide toxic substances inventory; surveillance of the potable water supply and distribution; sewage management, sewage treatment and disposal; treatment and disposal of industrial wastes, solid wastes management: and disposal; selection and use of pesticides; and the surveillance of sanitation practices in all food services areas.

Funding also provided for environmental monitoring efforts which included the generation of data and documentation of impact assessments, analyses, and environmental impact statements; field surveillance for impacts due to launch and recovery activities, industrial operations, and specialized functions in support of space activities, including efforts to maintain and update ecological baseline data; data base management work, including development, operation, and maintenance of a Geographic Information System; and laboratory operations and equipment maintenance in support of the above activities.

This category also included leases of special purpose office equipment, maintenance of all government-owned administrative equipment, and procurements to replace office machines, such as, typewriters and calculators. Funding provided for office supplies and equipment to support all civil service and institutional contractor personnel and for furniture and partitions for outfitting new facilities and existing KSC institutional facilities.

NATIONAL AERONAUTICS A m SPACE ADMINISTRATION
JOHN F. KENNEDY SPACE CENTER

STAFFING SUMMARY

	FY92	FY93
SES	33	33
GM/GS-15	146	146
GM/GS-14	328	328
OTHER GM/GS	2022	2022
WG	6	6
TOTAL	2535	2535

CENTER DIRECTOR

	FY92	FY93
SES	3	3
GM/GS-15	1	1
GM/GS-14	1	1
OTHER GM/GS	3	3
TOTAL	8	8

OFFICE

DIRECTOR OF SHUTTLE MANAGEMENT & OPERATIONS

	FY92	FY93
SES	3	3
GM/GS-15	9	9
GM/GS-14	18	18
OTHER GM/GS	31	31
TOTAL	61	61

DIRECTOR, SHUTTLE OPERATIONS

	FY92	FY93
SES	1	1
GM/GS-15	9	9
GM/GS-14	18	18
OTHER GM/GS	94	94
TOTAL	122	122

DIRECTOR, SHUTTLE LOGISTICS PROJECT MANAGEMENT

	FY92	FY93
SES	1	1
GM/GS-15	6	6
GM/GS-14	7	7
OTHER GM/GS	51	51
TOTAL	65	65

DIRECTOR, VEHICLE ENGINEERING

	FY92	FY93
SES	1	1
GM/GS-15	16	16
GM/GS-14	37	37
OTHER GM/GS	319	316
TOTAL	373	370

DIRECTOR, GROUND ENGINEERING

	FY92	FY93
SES	1	1
GM/GS-15	6	6
GM/GS-14	15	15
OTHER GM/GS	143	143
TOTAL	165	165

DIRECTOR OF SAFETY RELIABILITY & QUALITY ASSURANCE

	FY92	FY93
PIS	1	1
GM/GS-15	2	2
GM/GS-14	2	2
OTHER GM/GS	9	9
TOTAL	14	14

DIRECTOR, SAFETY & RELIABILITY

	FY92	FY93
SES		
GM/GS-15	3	3
GM/GS-14	7	7
OTHER GM/GS	70	70
TOTAL	81	ai

DIRECTOR, QUALITY ASSURANCE

	FY92	FY93
SES	1	1
GM/GS-15	1	1
GM/GS-14	3	3
OTHER GM/GS	211	203
TOTAL	216	208

DIRECTOR, MISSION ASSURANCE

	FY92	FY93
SES	1	1
GM/GS-15	4	4
GM/GS-14	15	1s
OTHER GM/GS	SO	SO
TOTAL	70	70

DIRECTOR OF ENGINEERING DEVELOPMENT

	FY92	FY93
SES	2	2
GM/GS-15	6	6
GM/GS-14	14	14
OTHER GM/GS	23	23
TOTAL	45	45

DIRECTOR, FACILITIES ENGINEERING

	FY92	FY93
SES	1	1
GM/GS-15	5	5
GM/GS-14	7	7
OTHER GM/GS	sa	58
TOTAL	71	71

DIRECTOR, MECHANICAL ENGINEERING

	FY92	FY93
SES	1	1
woo-is	7	7
GM/GS-14	12	12
OTHER GM/GS	93	94
TOTAL	113	114

DIRECTOR, ELECTRONIC ENGINEERING

	FY92	FY93
SES	1	1
GM/GS-15	9	9
GM/GS-14	23	23
OTHER GM/GS	103	103
TOTAL	136	136

DIRECTOR OF CENTER SUPPORT OPERATIONS

	FY92	FY93
SES	1	1
GM/GS-15	8	8
GM/GS-14	16	16
OTHER GM/GS	145	150
TOTAL	170	175

DIRECTOR OF PAYLOAD MANAGEMENT & OPERATIONS

	FY92	FY93
SES	1	1
GM/GS-15	1	1
GM/GS-14	1	1
OTHER GM/GS	7	7
TOTAL	10	10

DIRECTOR, PAYLOAD PROJECTS MANAGEMENT

	FY92	FY93
SES	1	1
GM/GS-15	6	6
GM/GS-14	18	18
OTHER GM/GS	25	25
TOTAL	50	50

DIRECTOR, SHUTTLE PAYLOAD OPERATIONS

	FY92	FY93
SES	1	1
GM/GS-15	14	14
GM/GS-14	35	35
OTHER GM/GS	213	213
TOTAL	263	263

DIRECTOR, EXPENDABLE VEHICLES

	FY92	FY93
SES	1	1
GM/GS-15	2	2
GM/GS-14	5	5
OTHER GM/GS	22	22
TOTAL	30	30

MARSHALL
SPACE FLIGHT CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1993 ESTIMATES

GEORGE C. MARSHALL SPACE FLIGHT CENTER

DESCRIPTION

The Marshall Space Flight Center is located in Huntsville, Alabama, on 1,841 acres within the U.S. Army's Redstone Arsenal military reservation. The Marshall Center manages operations at three satellite installations in Mississippi and Louisiana.

The Michoud Assembly Facility is located 15 miles east of downtown New Orleans, Louisiana, on an 832 acre site. The facility provides 3,730,000 square feet of space, including a main assembly plant, for the manufacture of the Space Shuttle's External Tank. Tenant activities for other Federal agencies are also conducted at this facility. The facility is located on the Gulf Intercoastal Waterway and has deep water access via the Mississippi River.

The Slidell Computer Complex is located 20 miles northeast of the Michoud Assembly Facility, on 14 acres at Slidell, Louisiana. The complex provides centralized computer services for the Marshall Center, the Michoud Facility, the Stennis Space Center in Bay St. Louis, Mississippi, NASA contractors, as well as other government agencies.

A number of individual facilities at the Center and its component installations are unique within NASA, the Nation, and the free world. The combined capability of the science and engineering laboratories, special development facilities, and test facilities provide an important national resource for designing, developing, and testing large, complex space systems. The total capital investment (acquisition) of the Marshall Center and its satellite installations, including fixed assets in progress, and contractor-held facilities at various locations was $1,227,245,000 as of September 30, 1991.

CENTER ROLES AND MISSIONS

The Marshall Space Flight Center is a development and multi-project center with primary emphasis on development of space transportation and propulsion systems, large space systems (manned and unmanned), payload mission management, selected science disciplines, technology utilization and technology transfer programs, science and math education programs, and advanced studies as follows:

SPACE TRANSPORTATION AND PROPULSION SYSTEMS:

Launch Vehicles - Design, development, integration, and testing of launch vehicles and space transportation systems and system definition for future manned and unmanned launch systems. Current focus is on the Space Shuttle and its propulsion elements; development of the Space Transportation Main Engine for the New Launch System which is a joint NASA-DoD effort to provide the technologies and operating concepts for the next generation of responsive launch vehicles.

Propulsion Systems - Design, development, and procurement of propulsion elements of the Space Transportation System including the Space Shuttle Main Engine, Solid Rocket Booster, Redesigned Solid Rocket Motor, External Tank, and the development of the Space Transportation Main Engine for the New Launch System. Advancements in Shuttle main engine and solid rocket propulsion is achieved through ground testing of the main engine in the Marshall Center's Technology Test Bed and solid propulsion technology test facilities. Advanced program and new technology development effdrts are focused on analysis and definition of propulsion/transportation systems to meet national needs for the next 30 to 40 years, including liquid and solid rocket boosters, LOX/HC and LOX/H_2 engines, improved solids, space transfer vehicles, hybrids, and propulsion technologies.

Upper Staees - Design, development, procurement, and integration of upper stages such as the Inertial Upper Stage, and commercially-developed and produced Transfer Orbit Stage.

MANNED SPACE SYSTEMS - Design, development, procurement, management: of science operations of manned space systems, and science crew training.

Spacelab - Focus is on program management, systems engineering, development of related payload carriers, procurehent, and flight and ground operations support engineering.

Pavload Mission Management - Design, development, and testing of payload carriers; payload definition;

integration of microgravity flight experiments and science and applications flight experiments for Spacelab and Space Station Freedom; operation of the integrated payload carrier systems, and mission science operation training of mission and payload specialists.

Space Station Freedom - Design, development, manufacturing, integration and checkout of the habitation and laboratory modules, the pressurized and unpressurized logistics elements; the resources nodes pressurized structure and cupolas; the environmental control/life support system, the fluid management system, the internal audio/video system, the internal thermal control system, and the manned systems. The development and operation of the Payload Operations Integration Center and the Payload Training Facility.

SPACE SYSTEMS - Definition, design, development, and procurement of large, complex, and/or specialized unmanned space systems.

Advanced X-Rav Astrophvsics Facilitv (AXAF) - Spacecraft, science instruments, development, and operation of a unique spacecraft calibration facility, ground system and science center development, integration, and operation.

Tethered Satellite Svstem (TSS) - Joint U.S./Italian endeavor involving development and scientific use of a system allowing remote operations of a satellite from the Shuttle via a deployable/retrievable tether.

Earth Science Geostationarv Platform - Definition of this element of mission to planet Earth and identify and define concepts with associated attached payloads.

TECHNOLOGY:

Supporting Research and Technology - Conducts research and technology on the following disciplines and subdisciplines needed to carry out the Center's roles and missions: propulsion systems; structural systems and dynamic control of flexible structures; materials and manufacturing processes; software engineering; optical systems; environmental control/life support systems; physical, earth, and astronomical science systems; microgravity science systems; information and electronic systems; aerothermodynamics; power systems; automation (traditional and artificial intelligence); and guidance, navigation, and control systems.

Advanced Development - Development, to a point of recognized minimal development risk, of a selected technology into a specific implementation of a planned flight subsystems or system application. The focus is on the demonstration of a point design solution rather than a more general, generic model development associated with earlier technology development programs, and permitting the program office to demonstrate promising technologies at a level that meets the specific need. Capability to perform engine level validation testing of merging technologies applicable to large oxygen/hydrogen engines.

Advanced Studies - Study and definition of space systems to meet future Space Exploration Initiative needs including space transportation (to and from Earth, the Moon and Mars), space habitation systems including those for planetary surface habitation; space power and energy, space structures, microgravity processing, large astrophysical observatories, and solar terrestrial and space physics systems; identification of requirements for research and technology and advanced developments in support of the applicable space systems within the traditional Marshall Center roles and responsibilities.

TECHNOLOGY UTILIZATION - Conducts programs for the transfer of NASA-derived technologies to industry, academia, and economic development organizations; develops activities designed to involve the NASA scientist and engineer more actively in the technology transfer process; solicitation of problem statements from American industries; and develop projects involving the application of NASA-derived technology to the commercial sector or private individuals, including establishing Memorandum of Understanding with State governments to facilitate the rapid, state-supported movement of technology to private business.

SCIENCE - Definition and development of science and applications investigations and experiments and serve as a focal point for interaction with scientific community in programs of interest, such as the Spacelab, Space Station Freedom, Earth Science and Geostationary Platform, and large astronomical observatories:

Solar-terrestrial physics including solar, magnetospheric, and atmospheric physics.

Astrophysics including high energy and optical astronomy.

Microgravity Science and Application including development of the space-processing discipline base, enlistment of user interest in potential applications, and development and management of space processing experiments and facilities.

Atmospheric and Earth science including environmental effects and earth system phenomena.

EDUCATION - Development and management of a wide range of education programs as a leading national resource for all levels of related activities in the advancement of scientific and technical knowledge, such as: Project LASER (Learning About Science, Engineering and Research), an elementary/secondary outreach program; JOVE (JOINT VENTURE), a university level research program for students and educators; the Summer Teacher Enrichment Program for summer employment and hands-on educational experiences for selected math and science teachers.

DISTRIBUTION OF FULL TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

MARSHALL

	1991 ACTUAL	1992 BUDGET ESTIMATE	1992 CURRENT ESTIMATE	1993 BUDGET ESTIMATE
SPACE STATION	499	570	576	579
SPACE FLIGHT PROGRAMS	1,520	1,565	1,498	1,447
SPACE TRANSPORTATION CAPABILITY DEV	563	565	562	570
SPACE TRANSPORTATION OPERATIONS	957	1,000	936	877
SPACE SCIENCE AND APPLICATIONS	792	739	835	870
PHYSICS AND ASTRONOMY	584	548	605	623
LIFE SCIENCES	0	0	0	0
PLANETARY EXPLORATION	2		7	6
SPACE APPLICATIONS	206	191	223	241
AERONAUTICS AND SPACE TECHNOLOGY	216	251	221	234
AERONAUTICAL RESEARCH AND TECHNOLOGY	0	0	0	0
SPACE RESEARCH AND TECHNOLOGY	216	251	221	234
TRANSATMOSPHERIC RESEARCH AND TECH	0	0	0	0
SPACE EXPLORATION	58	0	0	0
COMMERCIAL PROGRAMS	17	18	22	22
SAFETY, RELIABILITY & QUALITY ASSURANCE	0	0	0	0
ACADEMIC PROGRAMS	0	0	0	0
TRACKING AND DATA PROGRAMS	17	16	17	17
SUBTOTAL - DIRECT FULL-TIME PERM FTEs	3,119	3,159	3,169	3,169
CENTER MANAGEMENT AND OPERATIONS	521	491	481	481
SUBTOTAL - FULL-TIME PERM FTEs	3,640	3,650	3,650	3,650
OTHER FTEs	16	11	11	11
SUBTOTAL - FULL-TIME EQUIVALENTS	3,656	3,661	3,661	3,661
PROJECT CORE	0	52	0	0
GRAND TOTAL - FULL-TIME EQUIVALENTS	3.656	3,713	3.661	3.661

PROGRAM DESCRIPTION

	Permanent Civil Service Workvears
R AND VELOPMENT	
SPACE STATION	*579*

The technical and programmatic management of Work Package 1 for the Space Station is the responsibility of MSFC. This package contains the habitation, logistics, laboratory modules, and resource node structures. Work Package 1 subsystem responsibilities include the internal thermal control, Environmental Control and Life Support System (ECLSS), and internal audio and video. The habitation module is a pressurized element where the crew lives. The laboratory module is a manufacturing and technology laboratory outfitted to accommodate materials processing and other related disciplines. The logistics module provides the ground-to-orbit logistics and on-orbit supply for extended periods. The resources nodes are large outfitted passageways connecting the laboratory and habitation modules.

In 1991, the overall system integration function of the Space Station Freedom program was strengthened by moving element integration responsibility to MSFC, the prime element developer.

SPACE FLIGHT PROGRAMS	*1.447*
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT.........	*570*

The 1993 activities include continuation of program management and Spacelab system sustaining engineering; integration of ESA and NASA-provided hardware and software; mission integration and preparation for Spacelab flights in 1993, plus other missions involving Spacelab hardware; and development of the capability to fly mixed cargoes to be completed using igloo pallet and Multiplexer De-Multiplexer (MDM) pallet configurations.

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Inertial Upper Stage (IUS)

Activities involve four remaining IUS/Tracking and Data Relay Satellite (TDRS) missions which will require: (1) a series of readiness reviews conducted to assure the flight readiness of the upper stage prior to launch; (2) the conduct of joint integrated flight simulations prior to launch; (3) launch and flight operations support; and (4) the post flight evaluation of the upper stage performance.

Transfer Orbit Stage (TOS)

Activities include technical direction and management of the production, integration, and launch support of the TOS vehicles for the Mars Observer and the Advanced Communications Technology Satellite (ACTS) which will require: (1) a series of readiness reviews conducted to assure the flight readiness of the upper stage prior to launch; (2) the conduct of the joint integrated flight simulations prior to launch; (3) launch and flight operations support; and (4) the past-flight analysis of the upper stage's performance.

Solid Propulsion Integrity Program (SPIP)

Activities and work performed are focused on directly improving the engineering technology base for SRM with the specific objective of improving the overall success rate of SRM's. Efforts in the areas of nozzles, bondlines, propellants, combustion dynamics, and verification testing are ongoing. These efforts include work to: (1) improve analytical capabilities; (2) validate models used for design; (3) further characterize and define the behavior of materials currently used for design; (4) improve understanding of the processes involved in manufacturing SRM's and their components, and of the influences of process and material variables on the final product; (5) develop criteria and techniques to enhance current capabilities and practices to nondestructively evaluate the acceptability of SRM elements; and (6) define and characterize some alternate design and construction approaches in selected areas.

Tethered Satellite System (TSS)

Activities include continued technical and programmatic management involving the U.S.-developed deployer and science instrument development, and overall system engineering activities for the cooperative effort between the U.S. and Italy. Specifically, the TSS will be delivered and launched in FY 1992.

Advanced Programs

The Advanced Programs effort at MSFC includes the definition and implementation of in-house and contracted system studies to establish the fundamental planning and decision making data needed prior to proposing future space programs. Major 1993 advanced study activities include: (1) Heavy Lift Launch Vehicle support; (2) evolutionary advanced upper stages in support of manned and unmanned missions including space transfer vehicle: (3) personnel launch system booster; (4) alternate propulsion systems studies for all space transportation system elements; (5) automated rendezvous and docking studies; (6) space transportation system analysis; (7) advanced development activities in the areas of materials, avionics, recovery systems and propulsion; (8) orbital platforms and facilities such as tethered satellite system and their applications; (9) orbital services such as satellite servicing applications and in-orbit assembly, maintenance and repair; (10) flight demonstration studies.

New Launch System (NLS)

NASA and the Air Force are jointly maturing the planning and definition for the NLS family of vehicles. Programmatic acquisition planning is in preparation for a National Space Council Program Review in FY 93 and the prerequisites thereto. The full scale development of the Space Transportation Main Engine (STME) implemented in FY 92 through a contract with the Space Transportation Propulsion Team, a legal general partnership consisting of Aeroject, Pratt & Whitney, and Rocketdyne, will result in a Preliminary Design Review in FY 93. Definition of the NLS vehicles has been initiated under the direction of the joint NASA and Department of Defense Program Office. Inhouse definition studies at the Marshall Space Flight Center, with the Air Force Systems Command Space Division, other NASA Centers, and support from a team of fourteen contractors are to be matured for major design reviews in FY 92 and completed to support the National Space Council Review in FY 93. In support of the on-going engine and vehicle studies, an Advanced Development Program is underway leading to characterization of component hardware designs and manufacturing processes through prototype testing in FY 92 and FY 93. This activity includes turbopumps, thrust chambers, injectors, nozzles, gas generators, engine controllers, engine valve/actuators, advanced manufacturing techniques, materials characterization, and operations technologies.

	Permanent Civil Service Workyears
SPACE TRANSPORTATION OPERATIONS	**877**

Activities include those necessary for the planned increase in flight rate including the continued proper emphasis on safety, reliability, maintainability and quality assurance. This includes the analysis of the flight hardware performance (including the SRM, SRB, SSME, and ET) as the Shuttle flights continue. This effort also provides main engines for a four Space Shuttle orbiter fleet and continues a logistics support capability to provide spares hardware. Activity will continue in the development of an alternate turbopump for the Shuttle main engine, as will certification testing of the engine design changes which will be incorporated in the SSME flight engine for margin improvements.

Included in this activity is the standard operational support services for the Space Shuttle in the operations phase. Other activities will include the production, overhaul, and acquisition of hardware for Shuttle flights. The flight hardware program element provides for the procurement of external tanks, solid rocket motors and propellants, booster hardware and replenishment spare components and overhaul for the main engine. Typical functions will be production engineering, manufacturing, sustaining engineering, anomaly resolution, logistics, configuration management, systems level analysis, test and integration tasks, ground operations, and contract management.

SPACE SCIENCE AND APPLICATIONS	**870**
PHYSICS AND ASTRONO....................	**623**

Hubble Space Telescope

The Hubble Space Telescope (HST), was placed in orbit in April 1990 via the Space Shuttle. HST is a high quality optical 2.4-meter telescope system for use by the astronomical community in conjunction with NASA, MSFC was the lead Center for the management of the Hubble Space Telescope project and had overall implementation responsibility under the Office of Space Science and Applications. Project responsibility has been transferred to the Goddard Space Flight Center (GSFC). MSFC continues to provide technical and system engineering support in cooperation with GSFC.

Gamma Rav Observatorv

The objective of the Gamma Ray Observatory (GRO) is to measure gamma radiation from the universe, and to explore the fundamental physical processes involved. MSFC was responsible for the design, development and operation of the Burst and Transient Source Experiment (BATSE) which is one of the four experiments developed to attain the GRO objectives. BATSE was launched as part of the GRO in FY 1991 and will remain on orbit in a mission operations, data gathering and data analysis mode for all of FY 1993.

Advanced X-Rav Astrophysics Facility (AXAF)

AXAF will be a Shuttle-launched observatory-class X-ray telescope system for studies of stellar structure and evolution, large scale galactic phenomena, and the nature of active galaxies. It will operate in a *28.5* degree, 300-nautical mile orbit. The observatory will weigh approximately 30,000 pounds and will be about *45* feet long and *14* feet in diameter, A 15-year operational lifetime is planned through use of orbital servicing from the Space Shuttle. MSFC is assigned management responsibility for the entire AXAF program, through development and *15* years of operation. This includes flight systems development, ground systems development, science operations, mission operations and servicing, including development of replacement science instruments.

Pavload Mission Management

In 1993, MSFC will continue its responsibilities for managing and planning activities of the Atlas, International Microgravity Laboratory, Spacelab-J, United States Microgravity Laboratory (USML), and other dedicated and partial payload missions as assigned. MSFC is also responsible for the definition and development of selected payloads, facilities, and instruments to be flown on these missions.

Mission management responsibility begins with the definition of the payload complement and ends with the dissemination and analysis of the experiment; data and materials resulting from the flight. During 1993, MSFC will continue to manage the assigned mission planning and definition activities, as well as development of the required instruments and supporting hardware and software,

Interfaces will continue to be maintained in 1993 with the cognizant NASA program offices, principal investigators, and other appropriate organizations to assure accomplishment of the scientific objectives of the assigned missions. MSFC will continue to participate in, and manage, the analysis of the requirements, objectives, and constraints of the STS systems and payload complements in order to develop requirements for all levels of integration to insure physical, functional, and operational compatibility for all assigned missions.

Supporting Research and Technology

The Space Science and Applications supporting research and technology activities at MSFC are oriented toward development of new technologies required for future science and applications missions, particularly in Astrophysics and Space Physics. The principal application area is in earth science and microgravity science research, which support definition efforts of future STS payloads.

	Permanent Civil Service Workyears
Planetary Exploration............................	6

Cometary Retarding Ion Mass Spectrometer (CRIMS) is being designed to measure ions surrounding a comet with the hope of determining various chemical and physical characteristics of the comet such as its composition and temperature. Additionally, the instrument is capable of helping with the investigation of plasma processes in the comet's atmosphere. Design and review will be initiated during FY 1992. The instrument consists of two parts: an Ion Mass Spectrometer (ISU) which is being developed by the University of Texas at Dallas (UTD) and a Central Electronics Unit (CEU) which is being developed by Southwest Research Institute (SWRI). CRIMS is managed by the MSFC through the Jet Propulsion Lab. It is scheduled for launch in FY 1997 and will reach the comet in FY 2003.

SPACE APPLICATIONS...............................	241

Materials Processing in Space

The Materials Processing program emphasizes the fundamental science and technology of processing materials under conditions that allow detailed examination of the constraints imposed by gravitational forces. These studies are directed towards selected materials and processes which will best identify the limitations due to gravity, as well as demonstrate the enhanced control that may be possible by the weightless environment of space. In 1993, MSFC will continue to perform research and development activities in such areas as: (1)

crystal growth; *(2)* chemistry and polymeric materials; *(3)* fluid physics; *(4)* biophysics; and *(5)* solidification mechanics. Continuing activities include: engineering and scientific analyses, advanced studies, definition, design, development, and operations of materials processing payloads.

Atmospheric Supporting Research

Theoretical, field, and laboratory experimental research will be conducted in the global weather, severe storms, and local weather areas. Efforts will be concentrated on improving understanding of severe storms, mesoscale and global scale weather systems, and in defining Shuttle free flyer and Space Station missions to obtain data required to understand and predict severe storms and atmospheric conditions.

	Permanent Civil Service Workyears
AERONAUTICS AND SPACE [illegible]LOGY .	234
SPACE RESEARCH AND TECHNOLOGY......................	234

The space research and technology activities are in propulsion, controls and guidance, systems analysis, in-space technology experiments, telerobotics, artificial intelligence, science technology, control of flexible structures, and flight experiments. The primary effort in 1993 will be on developing and extending technology in support of space transportation systems for human exploration and large space systems, and developing the technology for laser power beaming and its future applications.

The In-Space Flight Experiments Program (INSTEP) provides the technical direction and management of the design, fabrication, integration and launch support for experiments conducted in space. These experiments are designed to validate and verify advanced concepts and their accompanying analyses in the space environment that were conceived and developed in ground based laboratories.

COMMERCIAL PROGRAMS AND TECHNOLOGY UTILIZATION	22

The objectives of the Commercial Use of Space program are to establish close working relations with the private sector and academia to encourage investment in space technology and the use of such technology to facilitate private sector space activities. This is accomplished through access to government capabilities to encourage private sector investments which are independent of NASA funding and of joint industry NASA projects.

The Technology Utilization Office develops, implements, and administers programs for MSFC involving: applications projects; space benefits reporting; identification and evaluation of new technology derived from MSFC development programs both in-house and contractor-performed; and dissemination of technology to the Nation's industrial, governmental agencies and educational communities for the benefit of the Nation's economy.

	Permanent Civil Service Workyears
TRACKING AND DATA PROGRAMS........................	17

These activities involve the management and monitoring of the Program Support Communications Network which is the communications hardware and software and transmission medium that inter-connects NASA Headquarters, field installations, and major contractor locations for the transfer of programmatic and institutional data, voice, and video.

CENTER MANAGEMENT AND OPERATIONS SUPPORT............	481

Center Management and Operations Support is provided to all MSFC organizations and includes the following:

Director and Staff - The Center Director, Deputy Director, and immediate staff, e.g., Comptroller, Administrative Operations, Legal, Patent Counsel, Equal Opportunity, Public Affairs.

Management Support - Those who provide management and support services to all levels of Center management, both program and functional. Specific functions include contracting and procurement, property management, personnel management, and management systems and analysis.

Operations Support - Those who manage or provide for the operation and maintenance of institutional facilities, buildings, systems and equipment, including those who manage or provide technical services such as automatic data processing, reliability and quality assurance, safety, medical care, and photographic support.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
			(Thousands of Dollars)		
I.	PERSONNEL AND RELATED COSTS	205.705	219.474	220.455	230.002
II.	TRAVEL	6,282	7,615	6,592	7.135
III.	OPERATION OF INSTALLATION	74.168	97.393	0	0
	A. Facilities Services	28,121	31,973	0	0
	B. Technical Services	13,333	13,782	0	0
	C. Management and Operations	32,714	47,504	0	0
	D. Implementation of Project CORE	0	4,134	0	0
	Total, Fund Requirement	286,155	324,482	227,047	237,137

RESOURCES REQUIREMENTS BY FUNCTION

I.	PERSONNEL AND RELATED COSTS			205,705	219,474	220,455	230,002

Summary of Fund Requirements

A.	Compensation and Benefits						
	1.	Compensation					
		a.	Full-time permanent	165,349	174,816	177,354	182,529
		b.	Other than full-time permanent	2,581	2,498	2,603	2,836
		c.	Reimbursable detailees	0	0	0	0
		d.	Overtime and other compensation	2,141	2,292	1,910	2,069
			Subtotal, Compensation	170,071	179,606	181,867	187,434
	2.	Benefits		32,033	35,668	36,088	39,038
		Subtotal, Compensation and Benefits		202,104	215,274	217,955	226,472

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)			
B.	Supporting Costs				
1.	Transfer of personnel	1,190	1,200	200	738
2.	Investigative Svcs and CORE Conv	0	0	0	400
3.	Personnel training	2.411	3,000	2,300	2,392
	Subtotal, Supporting Costs	3.601	4.200	2.500	3.530
	Total, Personnel and Related Costs	205,705	219,474	220,455	230,002

Explanation of Fund Requirements

A. Compensation and Benefits

1. Compensation

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
a.	Full-time permanent	165,349	174,816	177,354	182,529

The increase in the 1992 Current Estimate from the 1992 Budget Estimate reflects the increase in the additional January pay raise from 4.0 to 4.2 percent. Also included in the increase is a re-estimate of costs due to fewer attritions achieved in 1991 and higher salaried new hires than previously planned. This contributes to a higher base at the beginning of 1992. The 1993 Estimate includes funding for a full year of the 1992 pay raise, the anticipated 1993 pay raise, and full year funding for promotions, within grade increases and other personnel actions. We plan to fund our approved ceiling FTE complement by maximizing our lapse savings, hiring more freshouts and reducing discretionary salary growth factors,

Basis of Cost for Permanent Workyears

In 1993, the cost of full-time workyears will be $182,529,000. The increase from 1992 is calculated as follows:

Cost of full-time permanent workyears in 1992.....		$177,354
Cost of increases in 1993.......................		11,950
Within grade and career advances:		
Full year effect of 1992 actions.............	3,414	
Partial year effect of 1993 actions...........	2,281	
Full year cost of 1992 pay raise.............	1,828	
Partial year cost of 1993 pay raise...........	4,427	
Cost Decreases in 1993.........................		- 6,775
Turnover Effects:		
Full year effect of 1992 actions.............	-4,533	
Partial year effect of 1993 actions...........	-1,603	
One less paid day in 1993...................	- 639	
Cost of full-time permanent workyears in 1993.....		$182,529

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
b. Other than full-time permanent				
(1) cost	2,581	2,498	2,603	2,836

This category includes funding for the Co-op program, although the FTE are no longer shown as part of our ceiling FTE. The increase from the 1992 Budget Estimate to the 1992 Current Estimate reflects the additional .2% percent pay raise for 1992 and higher salaried temporary positions than planned. The 1993 Budget Estimate reflects a return to our normal temporary program, with full year funding of the 1992 pay raise and the cost of the anticipated pay raise in January 1993.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
c. Reimbursable detailees	0	0	0	0
a. Overtime and other compensation	2,141	2,292	1,910	2,069

The overtime and other budget category consists of overtime, holiday pay, incentive awards, night differential, Sunday premium pay and overseas assignments. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate results from the decision to divert overtime funding to pay for the current approved FTE. The increase in the 1993 Budget Estimate reflects full year funding of the 1992 pay raise, and the anticipated 1993 pay raise.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
2. Benefits	32,033	35,668	36,088	39,038

The distribution of these costs by major categories is as follows:

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
Retirement Fund and Thrift Plan..........	16,286	16,761	17,411	18,927
Employee life insurance..................	335	354	366	392
Employee health insurance................	7,854	10,345	9,122	10,025
FICA....................................	3,985	4,819	4,563	5,072
Unemployment Compensation/Severance......	44	0	0	0
Workers' Compensation..................	1,824	2,044	2,043	1,963
Medicare...............................	1,705	1.345	2,583	2.659
Total..................................	32,033	35,668	36.088	39,038

The increase from the 1992 Budget Estimate to the 1992 Current Estimate is the result of repricing due to a higher 1991 base than anticipated, greater FERS participation for the 1991 hires, and the additional .2% percent pay raise in 1992, offset by a decrease in the health insurance estimate. The 1993 Budget Estimate increase reflects the full year effect of the 1992 pay raise, the anticipated 1993 pay raise and expected increases above the pay raise in health insurance, retirement programs and Medicare.

B. Supporting **Costs**

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Transfer of Personnel	1,190	1,200	200	738

This supporting costs category includes movement of household goods, subsistence and temporary expenses, real estate costs and miscellaneous moving expenses related to change of duty station. The decrease in the 1992

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			

Budget Estimate to the 1992 Current Estimate reflects a reduction in the number of planned new hires due to anticipated lower attrition. The increase in the 1993 Budget Estimate reflects an anticipated increase in the number of hires eligible for relocation benefits.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
2. Investigative Svcs and CORE Conv	0	0	0	400

The 1993 Budget Estimate reflects the transfer of the security investigation requirements from Headquarters.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
3. Personnel Training	2,411	3,000	2,300	2,392

The purpose of the MSFC training program is to continue to develop the skills and knowledge of civil service employees in order to more efficiently support center roles and missions. The benefits derived by NASA from training and educational programs are: enhancement of scientific and engineering leadership in the scientific community; maintenance of a high degree of professional competency with the administrative and clerical workforce; development of needed skills and knowledge required in center mission activities; extending our Center's workforce capability; increasing productivity; and emphasizing "Upward Mobility" training of women and minorities and Equal Opportunity Seminars. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate results in reducing training programs in order to adequately fund the current level of FTE's. The 1993 Budget Estimate reflects inflation over the 1992 level.

		1991 Actual	1992 Budget Estimate	1992 Currant Estimate	1993 Budget Estimate
			(Thousands of Dollars)		
II.	TRAVEL	6,282	7,615	6.592	7.135

Summary of Fund Requirements

		1991 Actual	1992 Budget Estimate	1992 Currant Estimate	1993 Budget Estimate
A.	Program Travel	4,998	6,448	5,688	6,195
B.	Scientific and Technical Development Travel	264	271	200	200
C.	Management and Operations Travel	1,020	896	704	740
	Total, Travel	6,282	7.615	6.592	7.135

Explanation of Fund Requirements

A.	Program Travel	4,998	6,448	5,688	6,195

Program travel is specifically required for and is directly related to the accomplishment of the Center's mission. The number of face-to-face program technical and management meetings at the point where work is being done varies directly with the program travel budget. Travel requirements include those for ongoing programs such as the Shuttle, Spacelab, Space Station, Upper Stages, Advanced X-Ray Astrophysics facility, Spacelab Payloads, Space Science and Applications payloads and basic supporting research and technology, as well as support to the planning and definition of potential new programs. The decreased 1992 Current Estimate is due to a constrained budget and the 1993 Budget Estimate increases allow for inflation and an increase in the number of trips.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
B. Scientific and Technical Development Travel	264	271	200	200

Scientific and technical related travel permits employees to participate in meetings and technical seminars with representatives of the aerospace community. This participation allows them to maintain and to grow in technical excellence, and benefit from exposure to technological advances outside MSFC, as well as to present both accomplishments and concerns to associates. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate is a result of a constrained budget.

C. Management and Operations Travel	1,020	896	704	740

Management and operations travel is required for the direction and coordination of general management matters. It includes travel by managers in such areas as personnel, financial management, and procurement activities, and travel of the Center's top management to NASA Headquarters and other NASA Centers. This category of travel includes local travel, passenger vehicle rental and non-NASA travel. Local travel includes travel in and around the official station of the employee and includes tolls, parking fees and taxis. The decrease in FY 1992 is due to a constrained budget. The FY 1993 Budget Estimate allows for inflation.

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)			
III.	OPERATION OF INSTALLATION	74,168	97.393	0	0

Summary of Fund Requirements

			1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A.	Facilities Services					
	1.	Rental of Real Property	99	110	0	0
	2.	Maintenance and Related Services	6,981	9,844	0	0
	3.	Custodial Services	5,546	5,805	0	0
	4.	Utility Services	15,495	16,214	0	0
		Total, Facilities Services	28,121	31,973	0	0
B.	Technical Services					
	1.	Automatic Data Processing	8,353	8,256	0	0
	2.	Scientific and Technical Information	1,989	2,366	0	0
	3.	Shop and Support Services	2,991	3,160	0	0
		Total, Technical Services	13,333	13,782	0	0

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
			(Thousands of Dollars)		
C.	Management and Operations				
	1. Administrative Communications	14,932	15,756	0	0
	2. Printing and Reproduction	785	964	0	0
	3. Transportation	4,740	17,884	0	0
	4. Installation Common Services	12,257	12.900	0	0
	Total, Management and Operations	32,714	47,504	0	0
D.	Project CORE	0	4,134	0	0
	Total, Operation of Installation	74,168	97,393	0	0

Explanation of Fund Requirements

Operation of Installation provided a broad range of services, supplies, and equipment in support of the Center's mission activities. These are divided into three major functional areas: Facilities Services, the cost of maintaining and repairing institutional facilities and equipment, and the cost of custodial services and utilities; Technical Services, the cost of automatic data processing for management activities, and the cost of educational and informational programs and technical shops supporting institutional activities; and Management and Operations, the cost of administrative communications, printing, transportation, medical, supply, administrative support, and related services. Additionally, in 1992 Operation of Installation included funding for the implementation of Project CORE, which will convert certain functions from contractors to civil servants.

The activities that had been budgeted in the Operation of Installation account are no longer included in the Research and Program Management (R&PM) budget. Project CORE funds are budgeted in the Salary and Related

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

Costs account and the remainder are included in the Research and Development and Space Flight, Control and Data Communications budgets.

A. Facilities Services

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Rental of Real Property	99	110	0	0

Funds provided for lease of off-site space for source evaluation boards (SEBs).

2. Maintenance and Related Services	6,981	9,844	0	0

Funds provided for maintenance and operation of a total of 234 facilities (buildings, structures, and trailers) many of which are aging.

3. Custodial Services	5,546	5,805	0	0

Funds provided for custodial services which included janitorial services, security services, fire protection, trash removal, sanitary landfill operations, and related supplies and materials. Janitorial services provided about 3.5 million square feet of facility space and trash removal for approximately 130 separate locations. Security and fire protection services included 24-hour coverage of MSFC property, law enforcement, and motor vehicle registration and control.

4. Utility Services	15,495	16,214	0	0

These funds provided for the cost of electricity, steam, natural gas, water, and sewage disposal services provided by RASA on a reimbursable basis. It also provided for the propane and burner fuel to

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			

generate steam for the heating of water in support of experiments/tests at the MSFC test area when RASA steam is off line.

B. Technical Services

1. Automatic Data Processing	2,353	2,256	0	0

These funded provided centralized computational systems analysis, systems and applications, operations, and related computational services to meet the management and administrative computing requirements. This category also included maintenance of ADP equipment such as central site computers and associated equipment. Activities supported include IBM 3090 center-wide management information systems, operating systems software, and data base management systems and administrative/institutional application software development. This activity directly supported program management in terms of response planning and tracking, including procurements, resources, and contract status.

2. Scientific and Technical Information	1,989	2,366	0	0

Funds provided for the cost sharing operation of the Redstone Scientific Information Center (RSIC) library on RASA and other scientific and technical information services. Scientific information and library services are provided to MSFC employees and associated NASA contractor personnel through RSIC operations. The RSIC contains a central collection of books and journals, periodicals, documents on microfilm, and technical papers, servicing over 3,000 civil service and contractor patrons per month. Operation of the RSIC by the Army is under direction of a joint MSFC/Army Redstone scientific information board, on a cost-sharing basis. Funding also provided for MSFC's share of the operation of the MSFC Visitor Information Center located at the Alabama Space and Rocket Center.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
3. Shop and Support Services	2,991	3,160	0	0

These funds provided the Center with support in the areas of graphics, photographic services, and related supplies, materials, and equipment.

C. Management and Operations

1. Administrative Communications	14,932	15,756	0	0

Funds provided the local administrative telephone service, local base/mobile/portable radio services to include radio paging, the MSFC Emergency Warning System, and the MSFC fire surveillance system. The MSFC Private Automated Branch Exchange (PABX) furnishes local telephone service. Long Distance Telephone (LDTS) is provided to all NASA Centers through the Program Support Communications Network (PSCN); commercial and long distance tolls by South Central Bell (SCB); and American Telephone and Telegraph Communications (AT&T COM). Automatic Digital Network (AUTODIN), furnished by the Air Force, is a secure digital message system that provides institutional support in sending classified and non-classified messages in a classified mode.

2. Printing and Reproduction	785	964	0	0

Funds provided for a contractor operated on-site reproduction plant and MSFC purchase of reproduction services from the Government Printing Office, RASA, and private firms. Off-site printing is an overflow requirement that cannot be handled within the on-site workload or capability.

3. Transportation	4,740	17,884	0	0

Funds provided operation and maintenance and repair of vehicles and aircraft, transportation of related supplies and materials, and purchases of transportation equipment. Included is the maintenance of general

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			

purpose vehicles, material handling equipment, special purpose trailers and vehicles, equipment such as cranes, mobile tractors, generators and welders. Freight charges for shipment of materials and equipment by both surface and air transportation are also included.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
4. Installation Common Services	12,257	12,900	0	0

Funds provided administrative support to Center management and staff activities, medical services, and various other installation support services. Installation support services include maintenance and repair of office equipment, equipment rental, acquisition of supplies and materials and other miscellaneous services such as: (1) receiving supplies, materials, and equipment; (2) distributing supplies, materials, equipment, and program-critical hardware; (3) preparing supplies, materials, and equipment for shipment; and (4) warehousing of raw materials.

Center management and staff functions included patent counsel services, tort claims, and equal opportunity activities. Medical services provided occupational medicine and environmental health services for the maintenance and improvement of employee health at MSFC, with emphasis on prevention, diagnosis, treatment and care of illness and injuries. Also provided are such services as the disposal of toxic waste; inspection of hazardous cargo prior to entry to RASA; receipt, storage and issuance services for hazardous substances and postage; and acquisition of supplies and materials.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
D. Implementation of Project CORE	0	4,134	0	0

The Marshall Space Flight Center had planned to convert 249 positions from contractors to civil servants. Because of Congressional action, these plans are under review. Until this review is completed, funds for such conversions are being held in the Salary and Related Costs account.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GEORGE C. MARSHALL SPACE FLIGHT CENTER

OFFICE OF DIRECTOR

	FY91	FY92
SES	4	4
GS-16		
GS-15	1	1
GS-14		
ALL OTHER GS	5	5
AD POS.		
TOTAL PERM.	10	10

MSFC SUMMARY

	FY91	FY92
SES	57	59
GS-16		
GS-15	229	200
GS-14	631	602
ALL OTHER GS	2868	2724
AD POS.	4	4
TOTAL PERM.	3789	3589

ASSOCIATE DIRECTOR FOR SCIENCE

	FY91	FY92
SES	1	1
GS-16		
	1	1
ALL OTHER GS	1	1
TOTAL PERM.	3	3

EXECUTIVE STAFF

	FY91	FY92
SES		
GS-16		
GS-15	1	1
GS-14	1	1
	12	12
TOTAL PERM.	14	14

SAFETY & MISSION ASSURANCE OFFICE

	FY91	FY92
SES	3	3
GS-16		
GS-15	9	9
GS-14	35	35
ALL OTHER GS	147	147
AD POS.		
TOTAL PERM.	194	194

PUBLIC AFFAIRS OFFICE

	FY91	FY92
SES		
GS-16		
GS-15	1	1
GS-14	2	2
ALL OTHER GS	19	19
AD POS.		
TOTAL PERM.	22	22

CHIEF COUNSEL

	FY91	FY92
SES	1	1
GS-16		
GS-15	1	1
GS-14	5	5
ALL OTHER GS	9	9
AD POS.		
TOTAL PERM.	16	16

CENTER COMPTROLLER

	FY91	FY92
SES	1	1
GS-16		
GS-15	6	6
GS-14	15	15
ALL OTHER GS	107	107
AD POS.		
TOTAL PERM.	129	129

ADMINISTRATIVE OPERATIONS OFFICE

	FY91	FY92
SES	1	1
GS-16		
GS-15	2	2
GS-14	13	13
ALL OTHER GS	167	167
AD POS.		
TOTAL PERM.	183	183

EQUAL OPPORTUNITY OFFICE

	FY91	FY92
SES		
GS-16		
GS-15	1	1
GS-14		
ALL OTHER GS	6	6
AD POS.		
TOTAL PERM.	7	7

SPACE SHUTTLE PROJECTS OFFICE

	FY91	FY92
SES	5	5
GS-16		
GS-15	21	16
GS-14	21	21
ALL OTHER GS	84	84
AD POS.		
TOTAL PERM.	131	126

SPACE SYSTEMS PROJECT OFFICE

	FY91	FY92
SES	1	1
GS-16		
GS-15	7	7
GS-14	9	9
ALL OTHER GS	16	16
AD POS.		
TOTAL PERM.	33	33

PROJECTS OFFICE

	FY91	FY92
SES		
GS-16		
GS-15	6	6
GS-14	14	14
ALL OTHER GS	22	22
AD POS.		
TOTAL PERM.	45	45

PROJECTS OFFICE

	FY91	FY92
SES	3	3
GS-16		
GS-15	14	12
GS-14	35	35
ALL OTHER GS	51	51
AD POS.		
TOTAL PERM.	103	101

PROJECTS OFFICE

	FY91	FY92
SES	2	2
GS-16		
GS-15	3	3
GS-14	17	17
ALL OTHER GS	32	32
AD POS.		
TOTAL PERM.	54	54

VEHICLE DEFINITION OFC

	FY91	FY92
SES	1	1
GS-16		
GS-15		
GS-14	7	7
ALL OTHER GS	10	10
AD POS.	3	3
TOTAL PERM.	21	21

SPC STATION FREEDOM PROG ELEM INTEG OFC

	FY91	FY92
SES		
GS-16		
GS-15	2	2
GS-14	4	4
ALL OTHER GS	2	2
AD POS.		
TOTAL PERM.	8	8

PROGRAM DEVELOPMENT

	FY91	FY92
SES	4	4
GS-16		
GS-15	19	16
GS-14	37	37
ALL OTHER GS	98	98
AD POS.		
TOTAL PERM.	158	155

SCIENCE AND ENGINEERING

	FY91	FY92
SES	21	23
GS-16		
GS-15	117	100
GS-14	373	344
ALL OTHER GS	1742	1598
AD POS.	1	1
TOTAL PERM.	2254	2066

INSTITUTIONAL AND PROGRAM SUPPORT

	FY91	FY92
SES	6	6
GS-16		
GS-15	17	15
GS-14	43	43
ALL OTHER GS	338	338
AD POS.		
TOTAL PERM.	404	402

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12-20-91

STENNIS
SPACECEMER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1993 ESTIMATES

JOHN C. STENNIS SPACE CENTER

DESCRIPTION

The John C. Stennis Space Center is located in southwest Mississippi, approximately 50 miles northeast of New Orleans, Louisiana. Total land area is 138,872 acres of which 13,800 acres make up the actual installation owned by NASA. The remaining 125,072 acres are held as a buffer zone. In the buffer zone, 6,788 acres are owned by NASA and 118,284 acres are under restrictive easements. The installation has deep water access via the Pearl River and the Intercoastal Waterway. Capital investment for the John C. Stennis Space Center, as of September 30, 1991, was $419,431,000.

CENTER ROLES AND MISSIONS

The John C. Stennis Space Center (SSC) is NASA's prime static test facility for large liquid propellant rocket engines and propulsion systems. The redesignation by NASA of the New Space Technology Laboratory (NSTL) as the Stennis Space Center in August 1988 recognized the emerging character of the installation.

SSC is presently engaged in development and acceptance testing of the Space Shuttle Main Engines, Main Propulsion System development testing, and forthcoming development testing of the New Launch Systems (NLS). SSC also conducts applied research and development in the fields of remote sensing, environmental sciences, commercial programs, and other selected applications programs. SSC manages the installation and, through interagency agreements, provides support and maintains full utilization of all facilities by NASA and collocated elements of other executive agencies. These agencies are engaged in compatible research, development, and operational activities. They include the Department of Defense, the Department of Interior, the Department of Commerce, the Environmental Protection Agency, the Department of Transportation, the State of Mississippi, and the State of Louisiana. The principal NASA roles of SSC are:

Space Shuttle - SSC provides, maintains and manages the facilities and the related capabilities required for the continued development and acceptance testing of the Space Shuttle Main Engines, and the capability to do system testing using the Shuttle's Main Propulsion Test Article, which consists of a cluster of three main engines, an external tank and an orbiter aft-fuselage structure.

New Launch System - SSC responsibilities include, but are not limited to, the following: Management oversight of NLS Propulsion Test Facility design modifications, and construction, and Test Operations at SSC. Design, construction, and activation of the SSC Component Test Facility (CTF) is underway for turbomachinery testing. SSC is also assigned project responsibility for implementing the test activities of the NLS propulsion project requirements. This activity includes testing of two turbomachinery assemblies (one liquid hydrogen and one liquid oxygen).

Space Applications - SSC conducts fundamental and applied research, develops advanced airborne sensors and data/information systems, and conducts test and evaluation activities of remote sensing technology in the areas of renewable and non-renewable resources.

Support to Tenant Agencies - Provides technical and institutional support to resident agencies.

DISTRIBUTION OF FULL TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

STENNIS	1991 ACTUAL	1992 BUDGET ESTIMATE	1992 CURRENT ESTIMATE	1993 BUDGET ESTIMATE
SPACE STATION	3	2	0	0
SPACE FLIGHT PROGRAMS	106	138	116	116
SPACE TRANSPORTATION CAPABILITY DEV	59	67	62	60
SPACE TRANSPORTATION OPERATIONS	47	71	54	56
SPACE SCIENCE AND APPLICATIONS	11	11	10	10
PHYSICS AND ASTRONOMY	0	0	0	0
LIFE SCIENCES	1	1	1	1
PLANETARY EXPLORATION	0	5	0	0
SPACE APPLICATIONS	10	5	9	9
AERONAUTICS AND SPACE TECHNOLOGY	0	0	0	0
AERONAUTICAL RESEARCH AND TECHNOLOGY	0	0	0	0
SPACE RESEARCH AND TECHNOLOGY	0	0	0	0
TRANSATMOSPHERIC RESEARCH AND TECH	0	0	0	0
SPACE EXPLORATION	0	0	0	0
COMMERCIAL PROGRAMS	13	12	15	15
SAFETY, RELIABILITY & QUALITY ASSURANCE	0	0	0	0
ACADEMIC PROGRAMS	0	0	0	0
TRACKING AND DATA PROGRAMS	0	0	0	0
SUBTOTAL - DIRECT FULL-TIME PERM FTEs	133	163	141	141
CENTER MANAGEMENT AND OPERATIONS	72	53	75	75
SUBTOTAL - FULL-TIME PERM FTEs	205	216	216	216
OTHER FTEs	8	6	6	6
SUBTOTAL - FULL-TIME EQUIVALENTS	213	222	222	222
PROJECT CORE	0	20	15	28
GRAND TOTAL - FULL-TIME EQUIVALENTS	213	242	237	250

PROGRAM DESCRIPTION

RESEARCH AND DEVEL

	Permanent Civil Service Workyears
SPACE FLIGHT PROGRAMS..............................	116
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT........	**60**

In 1993, the Stennis Space Center will continue to provide, maintain, and manage the facilities and the related capabilities required for development and acceptance testing of the NLS and will undertake special studies.

SPACE TRANSPORTATION (....................	*56*

In 1993, the SSC will continue to provide, maintain, and manage the facilities and the related capabilities required for the development and acceptance testing of the Space Shuttle main engines.

SPACE SCIENCE AND APPLICATIONS.....................	10

In 1993, the SSC's Science and Technology Laboratories program will continue to conduct research investigations in the application of remotely sensed data. The program will use existing aircraft and satellite programs as a basic source of remotely sensed data in conjunction with surface data to develop techniques and procedures for practical applications. This includes conducting applied research investigations for the application of new sensor data to prioritized information requirements of national concern in the areas of agricultural productivity, geological explorations, and land resources management. This work will include studies for aligning appropriate sensor technology with applicable disciplinary requirements. This will facilitate the promotion of the effective transfer of applications technology, as well as reduce systems costs and improve compatibility with other information sources and products. SSC will also conduct research and development into applications for non-remote sensing, primarily in such areas as environmental system development and closed ecosystems development.

	Permanent Civil Service Workyears
COMMERCIAL PROGRAMS................................	15

The objectives of the Commercial Use of Space program are to: increase private sector awareness of space opportunities; encourage increased investment and participation in high technology space-based research and development; and conduct joint applications research projects with industry. This program provides an organizational focus for commercial use and access to space. The SSC Technology Utilization Program is responsible for identifying and reporting new NASA/SSC technology, and promoting the transfer of NASA technology to the public and private sector. Applications engineering projects are conducted with non-NASA users to adapt NASA technology for solving problems of widespread public concern and for improving the competitiveness of U.S. industry. The States of Louisiana and Mississippi maintain active technology transfer offices that team with the NASA Technology Utilization Office to promote the transfer of technology to users within their states. Programs of national scope are conducted with other government agencies and industry to expedite the transfer of NASA technology.

CENTER MANAGEMENT AND OPERATIONS SUPPORT............	75

Center Management and Operations Support is defined as that support or services being provided to all SSC organizations which cannot be identified exclusively to a single program or project. The civil service personnel involved are:

Director and Staff · The Installation Director, Deputy Director, and immediate staff, e.g., Legal, Equal Opportunity, and Public Affairs.

Management Support · Those who provide information and management services supporting **all** levels of Center management, both program and functional. Specific functions include resources and financial management, program control, contracting and procurement, property management, personnel management, and management systems and analysis.

Operations Support · Those who manage or provide for the operation and maintenance of institutional facilities, buildings, systems and equipment, including those who manage or provide technical services such as automatic data processing, reliability and quality assurance, medical care, and photographic support.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
			(Thousands of Dollars)		
I.	PERSONNEL AND RELATED COSTS	12,206	13,351	14,215	15.641
II.	TRAVEL	599	674	630	681
III.	OPERATION OF INSTALLATION	15,731	16,608	0	0
	A. Facilities Services	6,209	6,384	0	0
	B. Technical Services	4,716	4,295	0	0
	C. Management and Operations	4,806	4,979	0	0
	D. Implementation of Project CORE	0	950	0	0
	Total, Fund Requirement	28,536	30.633	14,845	16.322

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

RESOURCES REQUIREMENTS BY FUNCTION

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
I. PERSONNEL AND RELATED COSTS	12,206	13,351	14,215	15,641

Summary of Fund Requirements

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A. Compensation and Benefits				
1. Compensation				
a. Full-time permanent	9,273	10,307	10,333	10,907
b. Other than full-time permanent	321	318	366	372
c. Reimbursable detailees	0	0	0	0
d. Overtime and other compensation	53	70	76	80
Subtotal, Compensation	9,647	10,695	10,775	11,359
2. Benefits	2,017	2,388	2,385	2,550
Subtotal, Compensation and Benefits	11,664	13,083	13,160	13,909

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)			
B.	Supporting Costs				
1.	Transfer of personnel	319	100	180	180
2.	Investigative Svcs and Core Conv	35	0	700	1,376
3.	Personnel training	188	168	175	176
	Subtotal, Supporting Costs	542	268	1,055	1,732
	Total, Personnel and Related Costs	12,206	13,351	14,215	15,641

Explanation of Fund Requirements

A. Compensation and Benefits

1. Compensation

a.	Full-time permanent	9,273	10,307	10,333	10,907

The increase in the 1992 Current Estimate from the 1992 Budget Estimate reflects the increase from 4% to 4.2% for the 1992 pay raise and higher salaried new hires than previously planned. The 1993 Estimate includes funding for a full year of the 1992 pay raise, the anticipated 1993 pay raise, and full year funding for promotions, within grade increases and other personnel actions. We plan to fund our approved ceiling FTE by maximizing our lapse savings, hiring more freshouts and reducing discretionary salary growth factors.

Basis af Cost for Permanent Positions

In 1993. the cost of full-time workyears will be $10,907,000. The increase from 1992 is calculated as follows:

Cost of full-time permanent workyears in 1992.....		$10.333
Cost of increases in 1993......................		769
Within grade and career advances:		
Full year effect of 1992 actions..............	159	
Partial year effect of 1993 actions...........	205	
Full year cost of 1992 pay raise..............	109	
Partial year cost of 1993 pay rafse...........	296	
Cost changes in 1993..........................		-195
Full year effect of 1992 actions..............	-31	
Partial year effect of 1993 actions...........	-126	
One less day in 1993..........................	-38	
Cost of full-time permanent workyears in 1993...		$10.907

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
b. Other than full-time permanent				
(1) cost	321	318	366	372

Other than full time permanent includes funding for the Co-op Program, although they are no longer part of the approved FTE ceiling. The increase from the 1992 Budget Estimate to the 1992 Current Estimates reflects one additional Co-op, the additional .2% pay raise and higher salaried part-time positions than planned. The 1993 increase reflects full year funding of the 1992 pay raise and the cost of the anticipated pay raise in January 1993.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
c. Reimbursable detailees	0	0	0	0
d. Overtime and other compensation	53	70	76	80

The overtime and other budget category consists of overtime, holiday pay, incentive awards, night differential, Sunday premium pay and overseas assignments. The increase from the 1992 Budget Estimate to the 1992 Current Estimate results from a slight increase in incentive awards and night differential, The increase in the 1993 Budget Estimate reflects full year funding of the 1992 pay raise and the anticipated 1993 pay raise.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
2. Benefits	**2,017**	**2,388**	**2,385**	**2,550**

Fallowing are the amounts of contribution by category:

Retirement Fund and Thrift Plan..................	**1,109**	**1,232**	**1,283**	**1,371**
Employee Life Insurance.........................	**18**	**25**	**22**	**23**
Employee Health Insurance.......................	**455**	**661**	**566**	**603**
FXCA..	**311**	**407**	**358**	**388**
Medicare..	**122**	**63**	**156**	**165**
Annuitant & Other Benefits......................	**2**	**0**	**0**	**0**
Total...	**2,017**	**2,388**	**2,385**	**2,550**

The 1993 increase reflects the full year effect of the **1992** pay raise, the anticipated **1993** pay raise and expected increases above the pay raise in health insurance, retirement programs and FICA.

B. Supporting Costs

1. Transfer of Personnel	**319**	100	**180**	**180**

This supporting **costs** category includes movement of household goods, subsistence and temporary expenses, real estate costs and miscellaneous moving expenses related to change of duty station. The increase in the **1992** Currant Estimate from the Budget Estimate reflects an increase in the number of hires eligible for relocation benefits. **The FY 1993** Budget is held at the FY **1992** level due to budget constraints to fully fund our approved FTE's.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
2. Investigative Svcs and Core Conv	35	0	700	1,376

The 1992 Current Estimate reflects the implementation of the approved Core conversions. The 1993 Estimate includes the full year funding of 1992 Core conversions and the transfer of the security investigation responsibility from Headquarters to the centers.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
3. Personnel Training	188	168	175	176

The purpose of the SSC training program is to continue to develop the skills and knowledge of civil service employees in order to more efficiently support center roles and missions. The benefits derived by NASA from training and educational programs are: enhancement of scientific and engineering and clerical force; development of needed skills and knowledge required in center mission activities; extending our center's workforce capability; increasing productivity; and emphasizing "Upward Mobility" training of women and minorities and Equal Opportunity Seminars. Changes between the 1992 Budget and the 1992 Current Estimates and the 1993 Budget Estimate reflect constant levels of effort.

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
			(Thousands of Dollars)		
II.	TRAVEL	599	674	630	681

Summary of Fund Requirements

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A.	Program Travel	240	254	252	284
B.	Scientific and Technical Development Travel	167	192	176	185
C.	Management and Operations Travel	192	228	202	212
	Total, Travel	599	674	630	681

Explanation of Fund Requirements

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A.	Program Travel	240	254	252	284

Program travel requirements are directly related to the accomplishments of the Center's mission, and will primarily be in support of the SSME Program and NLS/ASRM activities. The increase from the FY 1992 Current Estimate to the 1993 Budget Estimate includes an increase for inflation.

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
B.	Scientific and Technical Development Travel	167	192	176	185

Scientific and technical development travel will permit employees to participate in meetings and technical seminars with other representatives of the aerospace community. This participation allows them to maintain their technical competency and gain awareness of technological advances outside SSC as well as to present both accomplishments and problems to their associates. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate is due to overall reduction of travel funds. The increase from the 1992 Current Estimate to the 1993 Budget Estimate includes expected inflation.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
C. Management and Operations Travel	192	228	202	212

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities as well as travel of the Center's top management to NASA Headquarters and other NASA Centers. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate is due to overall reduction of travel funds. The increase from the 1992 Current Estimate to the 1993 Budget Estimate includes anticipated inflation.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
III. OPERATION OF INSTALLATION	15,731	16,608	0	0

Summary of Fund Requirements

A. Facilities Services				
1. Rental of Real Property	34	36	0	0
2. Maintenance and Related Services	2,173	1,815	0	0
3. Custodial Services	2,215	2,146	0	0
4. Utility Services	1.787	2.387	0	0
Total, Facilities Services	6,209	6,384	0	0
B. Technical Services				
1. Automatic Data Processing	1,022	2,216	0	0
2. Scientific and Technical Information	486	225	0	0
3. Shop and Support Services	3,208	1,854	0	0
Total, Technical Services	4,716	4,295	0	0

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
C. Management and Operations				
1. Administrative Communications	2,497	3,351	0	0
2. Printing and Reproduction	146	33	0	0
3. Transportation	676	966	0	0
4. Installation Common Services	1,487	629	0	0
Total, Management and Operations	4,806	4,979	0	0
D. Project CORE	0	950	0	0
Total, Operation of Installation	15,731	16,608	0	0

Explanation of Fund Requirements

Operation of Installation provided a broad range of services, supplies, and equipment in support of the Center's institutional activities. These are divided into three major functional areas: Facilities Services, the cost of maintaining and repairing institutional facilities and equipment, and the cost of custodial services and utilities; Technical Services, the cost of educational and informational programs and technical shops supporting institutional activities; and Management and Operations, the cost of administrative communications, printing, transportation, administrative support, and related services. Additionally, in 1992 Operation of Installation included funding for the implementation of Project CORE, which will convert certain functions from contractors to civil servants.

The activities that had been budgeted in the Operation of Installation account are no longer included in the Research and Program Management budget. Project CORE funds are budgeted in the Salary and Related Costs

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

account and the remainder are included in the Research and Development and Space Flight, Control and Data Communications budgets.

A. Facilities Services

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Rental of Real Property	34	36	0	0

Funds provided for lease of hangar space for the Science and Technology Laboratory.

2. Maintenance and Related Services	2,173	1,815	0	0

Funds provided for the management of modifications, alterations and operation and maintenance of installation facilities. They also provided various facility engineering activities, such as master planning and physical space management which involves movement of personnel and equipment.

3. Custodial Services	2,215	2,146	0	0

Funds provided for NASA's share of janitorial services and fire protection, provided by the SSC institutional support services contractor.

4. Utility Services	1,787	2,387	0	0

Funds provided for the purchase of the two utility commodities; electricity from the Mississippi Power Company and natural gas from the United Gas Pipe Line Company. Natural gas is the primary heating fuel used at SSC. Also funded was NASA's share of the operation and maintenance of the utility distribution and control systems, water wells, and sewage systems.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
B. Technical Services				
1. Automatic Data Processing	**1,022**	**2,216**	0	**0**

Automated data processing (ADP) funds provided for the lease, purchase, and maintenance of ADP equipment, as well as programming and operation's support. Support contractor activities include programming services for payroll, general accounting, resources and financial management, supply, procurement, preventive maintenance, contract surveillance, personal security, and other related institutional and management information.

2. Scientific and Technical Information	**486**	**225**	0	**0**

Scientific and Technical Information funds provided the contractor-operated library which includes technical and management books and periodicals as well as technical and administrative documentation services. This funding also contributes to NASA's share of upgrading and operating the SSC Visitor Information Center (VIC).

3. Shop and Support Services	**3,208**	**1,854**	0	**0**

Funds provided for a wide variety of support efforts including photographic services, technical writing, graphics services, and the issuing, stocking, and ordering of forms and publications. Additionally, there is a comprehensive safety program which includes the establishment and the development of short- and long-range work plans, schedules in support of SSC base operations, emergency plans, and the institutional portion of the mishap reporting system.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
D. Implementation of Project CORE	0	950	0	0

The Stennis Space Center had planned to convert 24 positions from contractors to civil servants. Because of Congressional action, these plans are under review. Until this review is completed funds for such conversions are being held in Salary and Related Costs account.

ORGANIZATION CHART

FY 1993 CONGRESSIONAL BUDGET
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN C. STENNIS SPACE CENTER

SSC SUMMARY STAFFING

	FY92	FY93
SES	6	6
GS/GM 15	11	11
GS/GM 14	30	30
All other GS/GM	175	175
TOTAL PERMANENT	222	222

OFFICE OF THE DIRECTOR

	FY92	FY93
SES	3	3
GS/GM 15	0	0
GS/GM 14	1	1
All other GS/GM	3	3
TOTAL PERMANENT	7	7

ASRM PROJECT OFFICE

	FY92	FY93
GS/GM 15	1	1
GS/GM 14	2	2
All other GS/GM	2	2
TOTAL PERMANENT	5	5

NLS PROJECT OFFICE

	FY92	FY93
GS/GM 15	1	1
GS/GM 14	1	1
All Other GS/GM	3	3
TOTAL PERMANENT	5	5

CHIEF COUNSEL

	FY92	FY93
GS/GM 15	1	1
GS/GM 14	0	0
ALL other GS/GM	3	3
TOTAL PERMANENT	4	4

PUBLIC AFFAIRS OFFICE

	FY92	FY93
GS/GM 14	1	1
All other GS/GM	2	2
TOTAL PERMANENT	3	3

HUMAN RESOURCES OFFICE

	FY92	FY93
GS/GM 14	1	1
All other GS/GM	6	6
TOTAL PERMANENT	7	7

SR AND QA OFFICE

	FY92	FY93
GS/GM 14	1	1
All other GS/GM	9	9
TOTAL PERMANENT	10	10

COMPTROLLER

	FY92	FY93
GS/GM 15	1	1
GS/GM 14	3	3
All other GS/GM	25	25
TOTAL PERMANENT	29	29

PROCUREMENT OFFICE

	FY92	FY93
GS/GM 15	1	1
GS/GM 14	3	3
All other GS/GM	14	14
TOTAL PERMANENT	18	18

PROPULSION TEST OPERATIONS

	FY92	FY93
SES	1	1
GS/GM 15	3	3
GS/GM 14	3	3
All other GS/GM	39	39
TOTAL PERMANENT	46	46

SCIENCE a TECHNOLOGY LABORATORY

	FY92	FY93
SES	1	1
GS/GM 15	2	2
GS/GM 14	8	8
All other GS/GM	32	32
TOTAL PERMANENT	43	43

CENTER OPERATIWS OFFICE

	FY92	FY93
SES	1	1
GS/GM 15	1	1
GS/GM 14	6	6
All other GS/GM	37	37
TOTAL PERMANENT	45	45

GODDARD
SPACE FLIGHT CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1993 ESTIMATES

GODDARD SPACE FLIGHT CENTER

DESCRIPTION

The Goddard Space Flight Center (GSFC), located 15 miles northeast of Washington, D.C., at Greenbelt, Maryland, is situated on a 552-acre main site. Three additional nearby plots of 554 acres comprise the remote site area and contain the Goddard Antenna Test Range, the Goddard Optical Facility, the Propulsion Research Facility, the Laser Facility, the Magnetic Fields Component Test Facility, the Attitude Control Test Facility, and the Network Training and Test Facility. The Center also utilizes an additional 6,176 acres at the Wallops Flight Facility located on the Atlantic Coast of Virginia's eastern shore. The Wallops facility consists of 1,833 acres on the main base, 3,095 acres on Wallops Island launching site, 108 acres on the mainland tracking site, and 1,140 acres of marshland. The total capital investment for the Goddard Space Flight Center, including tracking stations, work in progress, contractor-held facilities at various locations, and the Wallops facility, as of September 30, 1991, was approximately $912,175,000.

The majority of the Goddard Center's personnel are located at Greenbelt, Maryland; other personnel are located at the Wallops facility in Virginia, the Goddard Institute for Space Studies in New York City, and throughout the world, managing the operation of satellite tracking and communications network stations.

CENTER ROLES AND MISSIONS

Goddard, established in 1959 as the first major United States installation devoted to the investigation and exploration of space, conducts a wide-ranging program in earth and space sciences. The GSFC has developed many diverse capabilities: the management of complex projects; the development of wholly integrated spacecraft, ranging from systems engineering to development, integration, and testing; the development and operation of satellite tracking networks, and data acquisition and analysis; scientific research to include both theoretical studies and the development of many significant scientific experiments flown on satellites;

management of the NASA Sounding Rocket and Balloon Program and the operation of a research airport and launch range, located at Wallops, in support of NASA's aeronautics research and Scientific Sounding Rocket programs.

The principal and supporting roles are:

PRINCIPAL ROLES

EARTH ORBITING SPACECRAFT DEVELOPMENT. ON-ORBIT SERVICING AND FLIGHT OPERATIONS · includes spacecraft propulsion and supporting technology such as low cost structural evaluation and reliability demonstration, advanced guidance systems and space power systems. Major emphasis is on automated, standard spacecraft systems, free-flyers, experiment development and integration, on-orbit free-flyer and payload servicing, earth observing system platforms, and the conducting of associated flight operations.

SPACE SCIENCE AND APPLICATIONS · develops the basis for science and technology disciplines, develops and calibrates spaceborne sensors, and ground data processing and analysis systems, conducts scientific research and theoretical modeling studies, and implements science and applications experiments in astronomy, solar physics, high energy astrophysics, solar terrestrial studies, and atmospheric, oceanic, and land processes.

TRACKING AND DATA ACQUISITION SYSTEMS AND SUPPORT OPERATIONS · plans, develops, implements and operates tracking facilities and provides for the related data processing, communications, and mission control; plans and conducts support of earth orbital spacecraft, aeronautical balloon research and sounding rockets; and network planning and implementation support for the Shuttle. Also, this includes the operation of the Tracking and Data Relay Satellite System (TDRSS).

LAUNCH RANGE AND RESEARCH AIRPORT MANAGEMENT AND OPERATIONS · plans and operates the Wallops launch range, associated aircraft. and a research airport in support of NASA aerospace programs as well as other Government agencies, such as the Deparfment of Defense, and the academic and international community. Launch support and related services are provided for various sounding rockets and small expendable launch vehicles such as Scout.

EXPENDABLE LAUNCH VEHICLES · technical oversight and procurement management of the medium and small class expendable launch vehicle services procured commercially, includes the procurement and management of the launch services required to place a variety of spacecraft into earth orbit.

SOUNDING ROCKET DEVELOPMENT. PROCUREMENT AND OPERATIONS - management of the NASA sounding rocket program; provides the complete spectrum of support including mission planning and operation; launch vehicles; payload design and development including recovery systems, telemetry systems, power systems, separation systems, and attitude control systems; payload testing and evaluation; analytical studies; and launch range operations/coordination.

BALLOON PROGRAM - management of the NASA balloon program; provides technical oversight and direction to the balloon activities conducted for universities and other scientific groups; directs the research and development effort for balloon related technologies; provides management oversight of the National Scientific Balloon Facility in Palestine, Texas, and the launch site at Ft. Sumter, New Mexico.

SPACELAB PAYLOAD DEVELOPMENT - develops, analytically integrates and processes data for Spacelab payloads in astrophysics, solar terrestrial physics, astronomy, and applications.

ATTACHED PAYLOADS - manages and develops low-cost reusable carrier systems which accommodate a variety of payloads to be flown on Shuttle missions. Three basic carrier systems are currently on-line to support Spartan, GAS, and Hitchhiker payloads. These payloads will be integrated and tested with the carrier and then flown with compatible Shuttle missions. These activities involve development and operation of diverse mechanical, power, electrical, aerodynamic, propulsion, control, thermal and combined systems. In addition, Center personnel coordinate with an international array of experimenters (including private citizens, high schools, universities, industry and other government agencies) to facilitate the accommodation of their investigations with the carrier and Shuttle systems.

INFORMATION SYSTEMS - applies advanced computer and information systems technology in support of OSSA science programs, including data management, scientific computing, networking, and data archiving and distribution.

SUPPORTING ROLES

PLANETARY SCIENCE - develops and applies techniques for the investigation and analysis of planetary atmospheres.

AEROSPACE FLIGHT TEST SUPPORT - plans and conducts launches of scientific payloads and aeronautical tests and other research, development and related activities as requested by elements of NASA, the Department of Defense, other Government agencies, and the worldwide scientific community.

DISTRIBUTION OF FULL TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

GODDARD

	1991 ACTUAL	1992 BUDGET ESTIMATE	1992 CURRENT ESTIMATE	1993 BUDGET ESTIMATE
SPACE STATION	21	26	0	0
SPACE FLIGHT PROGRAMS	127	121	129	136
SPACE TRANSPORTATION CAPABILITY DEV	71	40	64	62
SPACE TRANSPORTATION OPERATIONS	56	81	65	74
SPACE SCIENCE AND APPLICATIONS	2,237	2,343	2,418	2,411
PHYSICS AND ASTRONOMY	1,230	1,259	1,332	1,304
LIFE SCIENCES	1	1	1	1
PLANETARY EXPLORATION	121	95	116	116
SPACE APPLICATIONS	885	988	969	990
AERONAUTICS AND SPACE TECHNOLOGY	149	137	94	99
AERONAUTICAL RESEARCH AND TECHNOLOGY	8	13	16	16
SPACE RESEARCH AND TECHNOLOGY	141	124	78	83
TRANSATMOSPHERIC RESEARCH AND TECH	0	0	0	0
SPACE EXPLORATION	0	0	0	0
COMMERCIAL PROGRAMS	12	13	11	13
SAFETY, RELIABILITY & QUALITY ASSURANCE	11	8	10	10
ACADEMIC PROGRAMS	0	0	0	0
TRACKING AND DATA PROGRAMS	606	610	595	592
SUBTOTAL - DIRECT FULL-TIME PERM FTEs	3.163	3,258	3,257	3,261
CENTER MANAGEMENT AND OPERATIONS	720	717	726	724
SUBTOTAL - FULL-TIME PERM FTES	3,883	3,975	3,983	3,985
OTHER FTEs	28	42	34	32
SUBTOTAL - FULL-TIME EQUIVALENTS	3,911	4,017	4,017	4,017
PROJECT CORE	0	125	44	87
GRAND TOTAL - FULL-TIME EQUIVALENTS	3,911	4,142	4,061	4,104

PROGRAM DESCRIPTION

	Permanent Civil Service Workyears
SPACE FLIGHT PROGRAMS..............................	**136**
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT.........	**62**

Goddard manages development of the Hitchhiker, a reusable carrier system which provides increased flight opportunities with reduced leadtime, maximizing Shuttle load factors and minimizing spaceflight costs.

SPACE TRANSPORTATION OPERATIONS......................	74

Goddard manages and coordinates the Agency's Get Away Special (GAS) program. Center personnel coordinate with an international array of experimenters (including private citizens, high schools, universities, and industry) who have procured, through Agency established procedures, payload space on the Shuttle. Tasks include ensuring that experiments meet flight and safety specifications and securing the experiments into containers for Space Shuttle flight. Individuals are responsible for the performance of their instruments/experiments. Goddard also manages operation of the Hitchhiker program.

Activities also include the management of a flight support system which is the electromechanical interface between the orbiter and Multimission Modular Spacecraft and other spacecraft with compatible interface parameters. It will be used for ascent, retrieval, repair, and descent phases of Space Shuttle flights carrying Multimission Modular Spacecraft and other compatible spacecraft.

Goddard has management responsibility for the medium class expendable launch vehicle services. This class vehicle is used to accurately put a wide variety of spacecraft into a broad spectrum of orbits, ranging from equatorial to polar inclinations. Under existing contracts, the Delta Launch Vehicle will be used to launch the EWE, GEOTAIL, WIND, POLAR and RADARSAT spacecraft. Additional requirements for medium class launch service, will be procured via the exercise of options under the existing contract.

	Permanent Civil Service Workyears
SPACE SCIENCE AND APPLICATIONS......................	2,411
PHYSICS AND ASTRONO.................................	1,304

Astrophysics and space physics activities at GSFC are responsible for laboratory and flight scientific research to increase human knowledge of the Earth's space environment, the stars, the sun, and other objects in space; and provide advanced technical development of experiments and spacecraft components for future missions. GSFC manages activities in the pursuit of scientific progress in all of the following discipline areas: gamma ray astronomy, X-ray astronomy, ultraviolet and optical astronomy, infrared and radio astronomy, particle astrophysics, solar physics, interplanetary physics, planetary magnetospheres, and astrochemistry.

The Hubble Space Telescope is operational and is providing a space observatory and dedicated ground system to extend the sensitivity, resolving power, and spectral range significantly beyond those achievable from ground-based observations. The first servicing mission is presently scheduled for late 1993. In addition, the Compton Observatory was launched in 1991. Gamma ray measurements returned from the Compton Observatory are providing unique information on phenomena occurring in quasars, active galaxies, black holes, neutron stars, supernova, and the mysterious gamma ray bursts.

Development activities continue on the Extreme Ultraviolet Explorer (EWE) leading to a launch in 1992. In addition, development work on the X-Ray Timing Explorer (XTE) will continue. Initial studies have begun on the next two explorer missions, the FAR Ultraviolet Spectroscopic Explorer (FUSE) and the Advanced Composition Explorer (ACE).

The International Ultraviolet Explorer spacecraft, with its unique satellite control and data management systems, will continue to afford guest observers the opportunity to point the satellite in real-time from the ground, make quick observations, and receive data in visual formats. The analysis of data from various scientific missions will continue. Among the more recent missions generating data for analysis are the: COBE, HST, ASTRO-1, which contains the Broad Band X-Ray Telescope (BBXRT) payload, Compton Observatory and ROSAT.

Goddard manages the U.S. participation in the international cooperative program between the United States, Japan's Institute of Space and Astronautical Science (ISAS), the Soviet Union and the European Space Agency (ESA) consisting of eight spacecraft; two (WIND & POLAR) provided by the U.S., one (GEOTAIL), by ISAS, and five **(SOHO** and CLUSTER/4 Spacecraft) by ESA. Mission objectives are to measure, model, and quantitatively assess the processes in the Sun-Earth interaction chain with emphasis on solar wind-magnetosphere- ionosphere interactions, global plasma storage, flow, and transformation, solar wind origin and three dimensional features, deposition of plasma energy into the atmosphere, solar seismology, solar coronal dynamics, and the basic physics of cosmic plasma. Activities in FY 1992 and FY 1993 include the development of 19 instruments on the WIND and POLAR spacecraft, development of 11 instruments to be flown on **SOHO** and CLUSTER, and development of the 4 instruments for the GEOTAIL mission.

Goddard will provide management of the design, development, test, integration, and launch of small explorers to support domestic and foreign science investigations from Earth orbit. Currently, three missions are being developed: Solar Anomalous Magnetospheric Particle Explorer (SAMPEX), scheduled for launch in mid-1992 to study Solar Energetic particles, Anomalous Cosmic Rays, Galactic Cosmic Rays, and Magnetospheric Electrons; Fast Auroral Snapshot Telescope (FAST), to be launched in late 1994 to conduct investigations of the processes operating within the Earth's Auroral Region; and Submillimeter Wave Astronomy Satellite (SWAS), scheduled for launch in mid-1995 to investigate how molecular clouds collapse to form stars and planetary systems.

Goddard will provide the management and support of the NASA domestic and international sounding rocket programs. The project involvement extends from conception through launch and analysis of the data obtained in the following areas: galactic astronomy, high energy astrophysics, solar physics, plasma physics, upper atmospheric and interdisciplinary research, and the space applications of materials processing science.

Goddard will continue development of sounding rocket-class payloads for flight on the Space Shuttle. This is a cost-effective approach which allows instruments to be flown for much longer periods of time than available with sounding rockets. Goddard will also continue to manage the scientific balloon program providing for launch and tracking support, flight hardware, and technical support including new systems development. Goddard has responsibility for operation of the National Scientific Balloon Facility at Palestine, Texas, and provides management and technical oversight.

ASTRO-D, an X-Ray Astronomy satellite designed to examine high energy astrophysical phenomena in the 1 to 12 Kev Band is an international cooperative project between the U.S. and Japan scheduled for launch from Japan in 1993.

SAC-B, a NASA/Argentine cooperative mission which will study solar flares is being developed for launch on a Pegasus vehicle in 1994.

	Permanent Civil Service Workyears
LIFE SCIENCES............................	1

The Goddard Life Sciences activities involve the utilization of data from remote sensing satellites to increase our understanding of global biological characteristics and processes.

PLANETARY EXPLORATION......................	116

The GSFC science activity emphasizes the physics of interplanetary and planetary space environments. GSFC maintains a strong and viable research group, including participation in Galileo, Mars Observer and CASSINI instrument development and mission operations and data analysis activity.

SPACE APPLICATIONS........................	990

The FY 1993 program activities will span GSFC's broad roles and missions mandate, including activities in the discipline areas of land, oceans, and atmospheric sciences. GSFC is engaged in three major types of activities in these areas: research and technology, flight projects, and data analysis.

The research and technology effort is directed toward solving major problems in the disciplines mentioned and involves conceptual instrument design and testing, mission payload studies, and conceptual flight missions. This is accomplished through the design and construction of mathematical models to study:

- The global circulation of the Earth's atmosphere for better weather and climate predictions, including extensive ozone studies;

- The geopotential fields (gravity and magnetic) of the Earth to provide a better understanding of the structure and evolution of the Earth;

- The processes of the oceans such as surface winds, waves, temperature, currents, and circulation to support the ongoing weather and climate studies and the ocean research program;

- The physical characteristics of the Earth's vegetation cover, water resources, and land use which can be remotely sensed; and

- The interaction between the Earth's atmosphere, hydrosphere, and cryosphere.

Some examples of instrumentation activities which GSFC is supporting include instrumentation for measuring temperature and pressure profiles in the atmosphere which are essential parameters for weather and climate models; user active and passive microwave systems for measuring sea surface temperatures and winds, and measurement of soil moisture essential for water resources modeling and agricultural yield predictions; new instruments for ocean color measurements; and high precision laser electronic ranging systems in support of the Earth and ocean dynamics activities.

At GSFC flight project responsibilities include:

- Operational weather satellite missions for the National Oceanic and Atmospheric Administration (NOAA), including launch of NOM-I in 1992 and GOES-I in 1993;

- Conducting correlation measurements from balloons, sounding rockets, aircraft, and ground installations;

- The Upper Atmospheric Research Satellite (UARS) was launched in September 1991. Mission operations and data analysis are in progress.

A continuing major thrust at GSFC is development of the Earth Observing System (EOS) initiated in FY 1991. All flight hardware contracts to support the first spacecraft launch have been awarded, and the ground system contract will be awarded early FY 1993.

EOS is a science mission whose goal is to advance the understanding of the entire Earth system on the global scale through developing a deeper understanding of the components of that system, the interactions among them, and how the Earth system is changing. The EOS mission will create an integrated scientific observing system that will enable multi-disciplinary study of the Earth including the atmosphere, oceans, land surface and polar region. In order to quantify changes in the Earth systems, EOS will be a long-term mission providing systematic, continuing observations from low-Earth orbit.

The program encompasses a series of U.S. and international space elements producing data sets for a 15-year period starting in the late 1990's. These are supported by a large data acquisition, data processing, and data distributive ground system to disseminate Earth science data to a world-wide community.

Another initiative, and a component of the Mission to Planet Earth concept, managed by GSFC is the Earth Probes program. Earth Probes are an extension of the Explorer concept, and are designed to provide a platform for investigations in Earth science requiring special orbital characteristics not attainable from the Space Station or EOS observatories. As part of the Earth Probe program, GSFC will manage the development of the Total Ozone Mapping Spectrometer (TOMS), scheduled for launch in 1993. Another Earth Probe is the Tropical Rainfall Mapping Mission (TRMM).

Earth Science data analysis activities involve the formulation, analysis, and distribution of data received from satellites for which GSFC has management responsibility and data from the Earth Radiation Budget Experiment will continue to be collected for study of geographical and seasonal variations of the Earth's radiation budget. Such demonstrations involve the use of data from the Nimbus-7 spacecraft for the solution of problems concerning pollution, ocean resources and dynamics, and weather and climate and the TOMS/Meteor-3 instruments for continuing the measurement of the long-term global ozone trends. Similar activities will be conducted by using the data from the non-NASA satellites, both domestic and foreign; this information will be of use to investigators in the disciplines of agriculture, forestry, geology, cartography, hydrology, ecology, and oceanography.

As part of its information systems functions, GSFC manages and operates the agency's premier scientific computing and archival facilities. The NASA Center for Computational Services (NCCS) serves the scientific community with its super-computing resources in support of modeling and simulation efforts. It supplies advanced capabilities for managing, distributing and analyzing data and information, thereby enhancing the science productivity derived from data acquired from space flight observations and experiments. The National

Space Science Data Center (NSSDC) serves the research community as the national archival and distribution facility for the wealth of space science data accumulated from past and present NASA missions.

	Permanent Civil Service Workvears
AERONAUTICS AND SPACE TECHNOLOGY....................	99
AERONAUTICAL RESEARCH AND TECHNOLOGY..................	16

The Wallops airport will be used to conduct research tests of various aircraft in their terminal area operating environment. Flight studies will be made of new approach and landing procedures utilizing the latest in guidance equipment and techniques, pilot information displays, human factors, terminal area navigation, and tests of other systems leading to increased landing rates and all weather automatic landing of aircraft. Flight tests of wind shear detection systems will also be supported.

One runway is being used to study aircraft hydroplaning, water ingestion, foreign object damage, braking studies and tire design on wet or slush-covered surfaces. The data acquired from this research testing will ultimately assist in the development of safer, more flexible transportation systems. Wallops will continue to support aircraft noise and safety research for general aviation.

SPACE RESEARCH AND TECHNOLOGY...................... ..	83

Goddard's Space Research and Technology program activities are directed at providing advanced technology for future NASA missions while progressing the state-of-the-art in many science and engineering disciplines. The broad technology development program encompasses technologies targeted at improved space borne instruments, on-board spacecraft systems and subsystems, and end-to-end systems including ground segments, networking and overall supporting infrastructure. The GSFC program is structured to provide not only discrete technologies for specific applications, but also test bed environments in which new technologies can be fully evaluated as advanced elements in an integrated system. In addition, the GSFC is strongly involved in flight test and demonstration of new technologies integrated with space systems as well as integrating new technology payloads on a variety of the GSFC managed STS and ELV carrier systems.

Goddard will continue to place emphasis in scientific sensors, optics, robotics, cryogenics, thermal management, contamination control, high rate communication systems--including laser communication, information systems technology, and the OAST space-flight experiments program.

	Permanent Civil Service Workyears
COMMERCIAL PROGRAMS	13

Technology Utilization activities at Goddard are directed toward the application of space technology to public and private sector needs. Foremost among the technology applications projects in 1992 and 1993 are the Lidar topographical mapping system, the biomedical implantable devices systems, and the functional electrical system. Other activities include: (1) new technology identification, evaluation, and publication; (2) dissemination methods and techniques; (3) public section technology applications projects; (4) outreach activities to encourage industrial participation in the program, and (5) technology transfer activities with state and local governments.

The objective of Goddard's Commercial Use of Space program is to increase private sector awareness of space opportunities and encourage increased industry investment and participation in high technology space based research and development.

SAFETY. RELIABILITY AND QUALITY ASSURANCE	**10**

Goddard has responsibility for the Agency's electronic parts standards activity, including preparing and maintaining the NASA Standard Parts List (NSPL); evaluating new parts technology for potential additions to the NSPL; and for preparing qualification criteria to be used by vendors who wish to be listed as certified suppliers for electronic parts on the NSPL. Other efforts include the development of design guidelines,

TRACKING AND DATA PROGRAMS	592

Goddard's Research and Technology activity in this area involves the investigation and development of advanced systems and techniques for spacecraft communications and tracking, command and control, and data acquisition and processing. The primary objectives are to: (1) apply technology and develop advanced capabilities to meet the tracking and data processing performance requirements of approved new missions; and (2) to improve the cost effectiveness and reliability of overall space flight mission support. Primary technologies include RF systems, modulation and coding, orbit/attitude determination, data system architectures, Very Large Scale Integration (VLSI), software engineering, automation and expert systems, and human factors.

The operational part of the Space Tracking and Data Systems program at GSFC involves five main areas: operation of the Tracking and Data Relay Satellite System (TDRSS); mission control, data processing, and orbit/attitude computation support for flight projects; the Space Tracking and Data Network (STDN); the NASA Communications (NASCOM) Network, and the Aeronautics, Balloons and Sounding Rocket Program.

The Space Network System, through the White Sands Ground Terminal (WSGT), is operational with four TDRS spacecraft which provide routine telemetry, tracking, and command support. The System employs both S-band and workmanship standards, and appropriate training for electronic packaging and related processes. Ku-band frequencies, and greatly increases coverage capabilities available to Earth orbiting spacecraft. The Space Network provides the communications interface between the user's spacecraft and the project control centers and science data processing facility.

TDRS-5 was launched in 1991. TDRS-6 is in storage until March 1992, and then its built to launch configuration will continue for a scheduled launch in FY 1993. Developmental activity continues on TDRS-7, which is expected to be launched in 1995. Phase B studies have been completed on the next generation of TDRS satellites (TDRS 11), and the development contract for TDRS II is expected to be awarded in early FY 1993.

Work will continue on the Second TDRS Ground Terminal (STGT). The STGT will augment the WSGT to provide a back-up to the expanded WSGT, and provide the capability for the increased mission loading anticipated in the mid 1990's.

With the demonstration of a successful Space Network, a number of Spaceflight Tracking and Data Network ground systems were closed. The remaining stations provide launch, landing, range safety, and STS contingency support.

The NASA Communications Network provides all operational communications required by NASA. Facilities of this network link the stations of the STDN, the TDRSS, the Deep Space Network (DSN), and other tracking and data acquisition support elements with control centers and the data processing and computation centers, thereby, making it possible for all participants to operate as a network.

GSFC provides tracking, data acquisition, communication, and control in support of the aeronautics sounding rocket, and balloon programs. This includes support of balloons, sounding rockets and satellites launched from Wallops Island and other locations.

In the area of mission control, the operations control centers for the Extreme Ultraviolet Explorer (EWE) and the Small Explorer SAMPEX will be completed to support launch and early spacecraft operations in 1992. In FY 1992, development of operations control centers for TOMS, Small Explorer FAST, Small Explorer SWAS, TRMM, and ISTP/SOHO will start and development of the operations control centers for ISTP/WIND and ISTP/POLAR will continue. In FY 1993, the operations control center for ISTP/WIND will be completed to support spacecraft launch and early operations and development of the operations control center for XTE will begin,

Flight dynamics development and testing will continue in support of ISTP/WIND, POLAR, and SOHO, and Small Explorer SAMPEX. Mission readiness has been achieved for EUVE and will be achieved for SAMPEX and launch and early operations support will be provided. Flight dynamics development will begin in support of XTE and TRMM. Replacement of the Flight Dynamics Facility mainframe central processing units will be initiated.

In data processing, emphasis will continue to be placed on the operation of data processing facilities. Development activity has been completed for the EWE; spacecraft launch and operations will be supported. Development for Small Explorer SAMPEX will be completed and launch and operations will be supported. Science data processing development for Small Explorers FAST and SWAS will continue and development for XTE and TRMM will begin. Development and testing for ISTP WIND and GEOTAIL will be completed and spacecraft launch and operations will be supported. Development will continue on later ISTP missions.

	Permanent Civil Service Workyears
CENTER MANAGEMENT AND OPERATIONS SUPPORT......................	724

Center Management and Operations Support is support of services being provided to all GSFC organizations which cannot be identified exclusively to a single program or project. The civil service personnel involved are:

Director and Staff - The Center Director, Deputy Director and the immediate staff, staff organizations, e.g., Comptroller, Chief Counsel, Personnel, Equal Opportunity, and Public Affairs.

Management Support - Those who provide information and control services supporting all levels of Center management, both program and functional. Specific functions include resources and financial management, contracting and procurement, property management, and management systems and analysis.

Operations Support - Those who provide for the operation and maintenance of institutional facilities, buildings, systems and equipment, including those who manage or provide technical services such as automated data processing, health and safety, and medical care.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
			(Thousands of Dollars)		
I.	PERSONNEL AND RELATED COSTS	222,415	240,638	243,575	256,800
II.	TRAVEL	6,684	7,100	7,100	7,780
III.	OPERATION OF INSTALLATION	73,907	90.473	0	0
	A. Facilities Services	29,653	32,253	0	0
	B. Technical Services	18,428	20,847	0	0
	C. Management and Operations	25,826	28,473	0	0
	D. Implementation of Project CORE	0	8,900	0	0
	Total, Fund Requirement	303,006	338.211	250.675	264.580

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)			

RESOURCES REQUIREMENTS BY FUNCTION

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
I.	PERSONNEL AND RELATED COSTS	222.415	240.638	243.575	256.800

Summary of Fund Requirements

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A.	Compensation and Benefits				
1.	Compensation				
a.	Full-time permanent	180,487	194,691	194,880	201,744
b.	Other than full-time permanent	2,834	3,202	3,063	3,017
C.	Reimbursable detailees	0	0	0	0
d.	Overtime and other compensation	2,924	3,111	3,073	4,187
	Subtotal, Compensation	186,245	201,004	201,016	208,948
2.	Benefits	31,684	35,667	35,711	38,117
	Subtotal, Compensation and Benefits	217,929	236,671	236,727	247,065

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
B. Supporting Costs				
1. Transfer of personnel	1,051	641	900	1,030
2. Investigative Services and Core Conv	0	0	2,300	4,725
3. Personnel training	3,435	3,326	3,648	3,980
Subtotal, Supporting Costs	4,486	3,967	6,848	9,735
Total, Personnel and Related Costs	222,415	240,638	243,575	256,800

Explanation of Fund Requirements

A. Compensation and Benefits

1. Compensation

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
a. Full-time permanent	180,487	194,691	194,880	201,744

The 1993 Estimate includes funding for a full year of the 1992 pay raise, the anticipated 1993 pay raise, full year funding for promotions, within grade increases and other personnel actions. In 1993, we plan to fund our approved ceiling FTE by maximizing our lapse savings, hiring more freshouts, and reducing discretionary growth factors.

BASIS OF COST FOR PERMANENT WORKYEARS

In 1993. the cost of full-time workyears will be $201.744.000. The increase from 1992 is calculated as follows:

Cost of full-time permanent workyears in 1992.....		$194.880
Cost of increases in 1993.........................		14.488
Within-grade and career advances:		
Full year cost of 1992 actions................	3.010	
Part year cost of 1993 actions................	3.672	
Full year effect of 1992 pay raise............	2,301	
Part year effect of 1993 pay naise............	5.505	
Cost change in 1992............................		-7,624
Turnover Effects:		
Full year 1992 effect........................	.3. 768	
Partial year 1993 effect.....................	-3.041	
One less day..................................	-815	
Cost of full-time permanent workyears in 1993.....		$201.744

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
b. Other than full-time permanent				
(1) cost	2,a34	3,202	3,063	3,017

The decrease from the 1992 Budget Estimate to the 1992 Current Estimate reflects the movement of PMIs to the Full-Time Permanent category offset by an increase in the Part-Time Permanent FTE. The 1993 increase reflects full year funding of the 1992 pay raise and the cost of the anticipated pay raise in January 1993, offset by a reduction in use of temporaries.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
c. Reimbursable detailees	0	0	0	0
d. Overtime and other compensation	2,924	3,111	3,073	4,187

The overtime and other budget category consists of overtime, holiday pay, incentive awards, night differential, Sunday premium pay and overseas assignments. The use of overtime is primarily to support: shuttle launches and for operations that cannot be accomplished during regular work hours. The increaoe in the 1993 Budget Estimate is due to overtime requirements for in-house projects; TRFMM (Tropical Rain Fall Measuring Mission), TOMS (Total Ozone Mapping Spectrometer) XTE (X-Ray Timing Explorer) and SMGX (Small Explorers).

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
2. Benefits	31,684	35,667	35,711	38,117

The following are the amounts of contribution by category:

Retirement Fund and Thrift Plan.............	17,297	18,743	19,209	19,566
Employee Life Insurance....................	321	372	346	383
Employee Health Insurance..................	7,596	9,321	8,634	9,869
Workers' Compensation.....................	279	302	302	473
FICA......................................	4,330	5,151	4,307	4,777
Medicare..................................	1,855	1,778	2,913	3,049
Other.....................................	6	-0-	-0-	-0-
Total.....................................	31,684	35,667	35,711	38,117

The 1993 Budget Estimate includes full year funding of the 1992 pay raise, the January 1993 pay raise, anticipated increases in the FERS retirement program and increased health benefits rates.

B. Supporting Costs

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Transfer of Personnel	1,051	641	900	1,030

This supporting costs category includes movement of household goods, subsistence and temporary expenses, real estate costs and miscellaneous moving expenses related to change of duty station. The 1992 and 1993 increased Estimates result from a revised plan to hire more personnel eligible for relocation benefits.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
2. Investigative Services and Core Conv	0	0	2,300	4,725

The 1992 Current Estimate reflects the implementation of the approved Core conversions. The 1993 Estimate includes the full year funding of 1992 Core conversions, the 1993 conversions and the transfer of the security investigation responsibility from Headquarters to the centers.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
3. Personnel Training	3,435	3,326	3,648	3,980

The purpose of the GSFC's training program is to continue to develop the skills and knowledge of civil service employees in order to more efficiently support center roles and missions. The benefits derived by NASA from training and educational programs are: enhancement of scientific and engineering leadership in the scientific community; maintenance of a high degree of professional competency with the administrative and clerical workforce; development of needed skills and knowledge required in center mission activities; extending our minorities and Equal Opportunity seminars. The increase in the Current 1992 Estimate includes training for freshouts hired in 1991 and 1992. The 1993 Budget Estimate reflects an increase to provide essential training to planned new freshout college graduate hire in 1992 and 1993.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
II. TRAVEL	6,684	7,100	7,100	7,780

Summary of Fund Requirements

A. Program Travel	5,480	5,775	5,826	6,447
B. Scientific and Technical Development Travel	670	705	712	748
C. Management and Operations Travel	534	620	562	585
Total, Travel	6,684	7,100	7,100	7,780

Explanation of Fund Requirements

A. Program Travel	5,480	5,775	5,826	6,447

Program travel is essential to the accomplishment of the Center's mission, particularly with regard to the Space Science and Applications, Tracking and Data Programs, Space Transportation System, and Aeronautics and Space Technology. In thdse areas, efforts will be devoted to performing applications research, developing complex satellites and launch systems, managing data processing systems, and creating scientific instruments for further research. Program travel includes travel to industry contractors to monitor and evaluate the contractor's effort, and to other Centers for integration meetings, design, technical and safety reviews, and pre- and post-launch mission activities. The increase in the 1992 current Estimate and 1993 Budget Estimate is due to increased requirements for the major on-going flight programs.

B. Scientific and Technical Development Travel	670	705	712	748

Scientific and technical development travel permits employees to participate in meetings and technical

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

seminars with other representatives and the aerospace community. This participation allows them to benefit from exposure to technological advances outside GSFC, as well as to present both accomplishments and problems to their associates. The 1992 Current Estimate and 1993 Budget Estimate reflects an increase due to the number of anticipated trips.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
C. Management and Operations Travel	534	620	562	585

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities, travel of the Center's top management to other NASA Centers and local travel in and around the Washington Metropolitan area, and to and from the Wallops Flight Facility. The decrease from the 1992 Budget Estimate to the 1992 current Estimate is a result of the re-evaluation of Center funds to meet priorities. The increase in the 1993 Budget Estimate is due to requirements to improve management oversight over selected support areas associated with program and institutional planning.

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)			
III.	OPERATION OF INSTALLATION	73,907	90,473	0	0

Summary of Fund Requirements

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A.	Facilities Services				
1.	Rental of Real Property	1,579	1,574	0	0
2.	Maintenance and Related Services	9,a77	10,703	0	0
3.	Custodial Services	7,103	7,593	0	0
4.	Utility Services	11,094	12,383	0	0
	Total, Facilities Services	29,653	32,253	0	0
B.	Technical Services				
1.	Automatic Data Processing	13,719	15,210	0	0
2.	Scientific and Technical Information	2,776	2,995	0	0
3.	Shop and Support Services	1,933	2,642	0	0
	Total, Technical Services	18,428	20,a47	0	0

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
C. Management and Operations				
1. Administrative Communications	4,191	5,203	0	0
2. Printing and Reproduction	1,098	1,282	0	0
3. Transportation	1,552	2,354	0	0
4. Installation Common Services	18.985	19,634	0	0
Total, Management and Operations	25,826	28,473	0	0
D. Project CORE	0	8,900	0	0
Total, Operation of Installation	73,907	90,473	0	0

Explanation of Fund Requirements

Operation of Installation provided a broad range of services, supplies, and equipment in support of the Center's institutional activities. These are divided into three major functional areas: (1) Facilities Services--the cost of renting real property, maintaining and repairing institutional facilities and equipment, the cost of custodial services and utilities; (2) Technical Services--the cost of automatic data processing for management activities, and the cost of library services, educational and informational programs; and, (3) Management and Operations--the cost of administrative communications, transportation, printing, medical, supply, administrative support and related services. Additionally, in 1992 Operation of Installation included funding for the implementation of Project CORE, which will convert certain functions from contractors to civil servants.

The activities that had been budgeted in the Operation of Installation account are no longer included in the Research and Program Management (R&PM) budget. Project CORE funds are budgeted in the Salary and Related

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			

Costs account and the remainder are included in the Research and Development and Space Flight, Control and Data Communications budgets.

A. Facilities Services

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Rental of Real Property	1,579	1,574	0	0

Funds provided space for personnel at tracking stations and the Goddard Institute for Space Studies (GISS) in New York. Funding also provided. for the lease of trailers to be used on-site and lease of off-site facilities for the housing of employees and to provide a meeting place for Source Evaluation Boards, both required because of the shortage of on-site space.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
2. Maintenance and Related Services	9,877	10,703	0	0

Funds provided for general building maintenance such as painting, inspection, mechanical and electrical maintenance, rehabilitation and modification projects in office buildings with estimated project costs of less than $200,000, and road and grounds maintenance. Funding also provided supplies, materials, and equipment associated with maintenance and related services.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
3. Custodial Services	7,103	7,593	0	0

Funds provided for janitorial, plant security, fire fighting, and ambulance services. These services included washing and relamping of light fixtures, office cleaning, minor laundry services, trash removal, badging of all on-site personnel and visitors, vehicle identification, and fire fighting.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
4. Utility Services	**11,094**	**12,383**	0	**0**

Funds provided for maintenance of the utility plant and distribution systems and provided the purchase of utility services as well as supplies, materials, and equipment required for the maintenance of these systems. At the Greenbelt facility, electricity is purchased from the Potomac Electric and Power Company, natural gas from the Washington Gas Light Company, and fuel oil from a local supplier. Water and sewage service is provided by the Washington Suburban Sanitary Commission. Electricity at Wallops is purchased from the Delmarva Power Company and fuel oil is purchased from a local supplier.

B. Technical Services

1. Automatic Data Processing	**13,719**	**15,210**	**0**	**0**

This funding provided for the mainframe, micro- and mini-computer hardware, system software, and maintenance as well as programming and operations support, necessary to supply management with accurate and timely information to support Center operations and missions. This information is also needed for responding to external budget, administrative, and operational requirements. All administrative and management: systems are supported including: finance and accounting, payroll, budget, procurement, personnel management, and supply management.

2. Scientific and Technical Information	**2,776**	2,995	0	**0**

Funded the cost of maintaining the GSFC library, including operations support, information systems, as well as book and subscription purchases. These funds also provided €or a public affairs educational and information program and also supported the Center by providing various scientific and technical information services. Costs included exhibit management and refurbishment, demonstration models, workshops and symposia, and education and information materials.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
3. Shop and Support Services	1,933	2,642	0	0

Funds provided support to safety, fire protection, fire protection system maintenance, and related supplies and equipment. Also included was funding for nontechnical photographic and chart and art support for all Center organizations.

C. Management and Operations

1. Administrative Communications	4,191	5,203	0	0

These funds supported local telephone service, long distance service, and other administrative communications.

2. Printing and Reproduction	1,098	1,282	0	0

These funds covered costs associated with maintenance of administrative copiers across the Center and all administrative printing costs, including in-house operations, supplies, materials and equipment, as well as contracted printing tasks.

3. Transportation	1,552	2,354	0	0

This funding supported the operation and maintenance of the GSFC Administrative Aircraft; the purchase, maintenance, and repair of the installation's vehicle fleet; fuel and supplies associated with the operation of the aircraft and vehicles; special vehicle rental; and packing, crating and shipping costs for the transportation of materials.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
4. Installation Common Services	18,985	19,634	0	0

These funds supported Center management and staff activities, provided medical services, and covered various installation support services, including operation of the transportation system. Funding supported: patent searches and applications; mailroom services and all associated costs; administrative equipment purchases, lease, and maintenance; office supplies and materials; operation of the GSFC on-site health unit as well as medical services for the Qoddard Institute for Space Studies employees in New York (including emergency care, annual physical exams, fitness programs, immunizations, and counseling). Annual physical exams are provided for approximately 4,000 employees at the Center. The necessary supplies, materials, and equipment for operation of the Health Unit were also included. This category also provided funding for institutional supply management activities including storage and warehousing.

D. Implementation of Project CORE	0	a,900	0	0

The Goddard Space Flight Center had planned to convert 240 positions form contractors to civil servants. Because of Congressional action, these plans are under review. Until this review is completed, funds for such conversions are being held in the Salary and Related Costs account.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GODDARD SPACE FLIGHT CENTER
Greenbelt. Maryland

DIRECTOR / ASSOCIATE DIRECTORS

	91	92	93
SES	3	3	3
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	0	0	0
GS/GM 14	0	0	0
OTHER GS/GM	6	6	6
WAGE GRADE	0	0	0
TOTAL	9	9	9

TOTAL

	91	92	93
SES	56	58	58
EXCEPTED/ST	3	10	12
GS/GM 16	0	0	0
GS/GM 15	478	477	480
GS/GM 14	717	724	729
OTHER GS/GM	2675	2647	2639
WAGE GRADE	68	64	62
TOTAL	3997	3980	3980

NASA OFFICE OF INSPECTOR GENERAL GSFC FIELD OFFICE

CHIEF COUNSEL

	91	92	93
SES	1	1	1
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	1	1	1
GS/GM 14	2	3	3
OTHER GS/GM	5	4	4
WAGE GRADE	0	0	0
TOTAL	9	9	9

EQUAL OPPORTUNITY PROGRAMS OFFICE

	91	92	93
SES	0	0	0
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	1	1	1
GS/GM 14	0	0	0
OTHER GS/GM	5	5	5
WAGE GRADE	0	0	0
TOTAL	6	6	6

OFFICE OF PUBLIC AFFAIRS

	91	92	93
SES	0	0	0
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	1	1	1
GS/GM 14	3	3	3
OTHER GS/GM	16	16	16
TOTAL	20	20	20

OFFICE OF UNIVERSITY PROGRAMS

	91	92	93
SES	1	1	1
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	0	0	0
GS/GM 14	1	1	1
OTHER GS/GM	1	1	1
WAGE GRADE	8	8	8

DIRECTOR OF FLIGHT PROJECTS

	91	92	93
SES	12	13	13
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	141	140	138
GS/GM 14	142	141	142
OTHER GS/GM	189	180	175
WAGE GRADE	0	0	0
TOTAL	484	474	468

COMPTROLLER

	91	92	93
SES	1	1	1
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	2	2	2
GS/GM 14	1	2	2
OTHER GS/GM	17	16	16
WAGE GRADE	0	0	0
TOTAL	21	21	21

DIRECTOR OF FLIGHT ASSURANCE

	91	92	93
SES	2	2	2
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	23	24	25
GS/GM 14	39	40	41
OTHER GS/GM	86	84	83
WAGE GRADE	0	0	0
TOTAL	150	150	151

OFFICE OF HUMAN RESOURCES

	91	92	93
SES	1	1	1
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	0	0	0
GS/GM 14	3	3	3
OTHER GS/GM	72	72	73
WAGE GRADE	0	0	0
TOTAL	76	76	77

DIRECTOR OF MANAGEMENT OPERATIONS

	91	92	93
SES	3	3	3
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	18	19	20
GS/GM 14	49	49	50
OTHER GS/GM	546	549	552
WAGE GRADE	68	64	62
TOTAL	684	684	687

DIRECTOR OF MISSION OPERATIONS AND DATA SYSTEMS

	91	92	93
SES	7	7	7
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	[illegible]	[illegible]	[illegible]
GS/GM 14	108	106	105
OTHER GS/GM	480	477	477
WAGE GRADE	0	0	0
TOTAL	660	654	652

DIRECTOR OF SPACE SCIENCES

	91	92	93
SES	5	5	5
EXCEPTED/ST	2	6	7
GS/GM 16	0	0	0
GS/GM 15	59	58	58
GS/GM 14	73	73	74
OTHER GS/GM	156	153	151
WAGE GRADE	0	0	0
TOTAL	295	295	295

DIRECTOR OF ENGINEERING

	91	92	93
SES			
EXCEPTED/ST	0	1	1
GS/GM 16	0	0	0
GS/GM 15	73	74	77
GS/GM 14	[redacted]		
OTHER GS/GM	[redacted]		
WAGE GRADE			
TOTAL	[illegible]	[illegible]	[illegible]

DIRECTOR OF SUBORBITAL PROJECTS AND OPERATIONS

	91	92	93
SES	4	4	4
EXCEPTED/ST	0	0	0
GS/GM 16	D	0	0
GS/GM 15	14	15	16
GS/GM 14	[redacted]		
OTHER GS/GM	198	195	194
WAGE GRADE			0
TOTAL	[illegible]	[illegible]	[illegible]52

DIRECTOR OF EARTH SCIENCES

	91	92	93
SES	9	9	9
EXCEPTED/ST	1	3	4
GS/GM 16	0	0	0
GS/GM 15	80	78	78
GS/GM 14	112	114	115
OTHER GS/GM	245	243	242
	0	0	0
TOTAL	447	447	448

AMES
RESEARCHCENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1993 ESTIMATES

I RESEARCH CE

DESCRIPTION

Established in 1939, Ames Research Center operates in two locations. The Ames Moffett location is on 429.9 acres at the southern end of San Francisco Bay on land contiguous to the U.S. Naval Air Station, Moffett Field, California. Certain facilities, such as the utilities and airfield runways, are used jointly by NASA and the Department of the Navy. Also housed at this location is the U.S. Army Aeroflightdynamics Directorate. The capital investment at Ames Moffett, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1991, was $1,146,588,000.

The Ames Dryden Flight Research Facility is 65 air miles northeast of Los Angeles. Ames Dryden is located at the north end of Edwards Air Force Base on 838 acres of land under a permit from the Air Force. The total capital investment at Dryden, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1991, was $1,146,588,000.

CENTER ROLES AND MISSIONS

The programs at Ames involve research and development in the fields of Aerosciences, Intelligent Systems and Human Integration, Flight Research, space and Earth sciences and applications, and space technology. Specifically, the Center's major program responsibilities are concentrated in: computational and experimental fluid dynamics, high speed aerodynamics, full scale aerodynamics research, transatmospheric research and technology, numerical aerodynamic simulation, high performance computing and communications, computer systems and research, automation sciences, aerospace human factors, flight systems and simulation research, rotorcraft technology, powered lift technology, vehicle conceptual analysis, flight test techniques and instrumentation, high-performance aircraft flight research, IR astronomy and astrophysics, Earth system science, planetary research, airborne research and applications, gravitational biology and biomedical research, advanced life support, exobiology, and space and life sciences flight projects. In addition to these major program responsibilities, the Center provides major support for military programs. Center principal and supporting roles are:

PRINCIPAL

Fundamental Aerodvnamics - advance the general state-of-the-art, both theoretical and experimental.

Rotorcraft Technology - advance the tools of rotorcraft performance analysis and design, and develop a technology base for improving efficiency, safety, performance and environmental acceptability.

Low-Speed Vehicle Systems - conduct research, test and evaluate new concepts, and develop new technology for the low speed, take-off and landing operations of all aerospace vehicles. Computational Fluid Dynamics - advance the state of the art through the definition of new systems, both hardware and software, and apply these advances to aeronautical and other related areas.

Aeronautical Flight Research - conduct flight research using aircraft as flight test facilities and conduct flight research programs of advanced aerospace vehicle concepts, including demonstrator vehicles, when appropriate.

Flight Test Techniques - investigate and develop new flight test techniques to improve the capability of conducting flight research.

Flight Instrumentation Development - direct the development of new methods and equipment for flight measurements.

Guidance and Control - conduct theoretical investigation, simulation and flight research evaluation of new and innovative concepts for aerospace vehicle flight control to validate design methods and verify system performance in the flight environment.

Human-Vehicle Interactions - advance the state of the art through the study of machine and other human factor interactions and considerations involved in aircraft and space operations.

High-Performance Aircraft - conduct flight research on advanced military configurations and demonstrate the potential for improved aircraft performance through the integration of aircraft systems.

Aircraft Automation - develop a technology base for automated aircraft by conducting research in the integration of artificial intelligence, controls, and human factors.

Short Takeoff and Vertical Landing (STOVL) Technology - develop a technology base for military STOVL systems in support of Department of Defense missions.

Materials and Structures - conduct tests to increase the understanding of structural responses to aerodynamic heating, with particular emphasis on high-temperature space or hypersonic vehicle structures.

Flight Simulation - improve the state of the art to permit more effective use of simulators in aircraft design and validation-of-flight simulation; provide support to NASA and other government agencies' development and flight programs.

Military and FAA Aeronautics - provide facilities and technical support to military and civil aviation in areas consistent with other Ames aeronautics roles and unique capabilities.

Transatmospheric Research and Technology - combine aeronautics and space disciplines to provide the technology for a future class of vehicles capable of flight to orbit and/or hypersonic cruise.

High Performance Computing and Communications - conduct research to accelerate the development and application of high performance computing technologies to meet NASA's science and engineering requirements.

Information Sciences - advance the Nation's automation capabilities by focusing research efforts on the technology development of intelligent, autonomous systems for support of space station, planetary, astrophysical and aeronautical missions, and commercial use of space.

Fluid and Thermal Physics - develop thermal analysis methods and thermal protection systems required far aerospace planes and orbital transfer vehicles.

Gravitational Biology and Biomedical Research - conduct research to understand the mechanisms by which gravity affects the function and development of living systems from single cells to humans, and develop options for preventing health and psychophysiological problems experienced by humans during and following extended spaceflight, including assessment of the requirements for artificial gravity.

Advanced Life Support - develop the physical/chemical and regenerative life support technologies and extravehicular activity systems essential to exploration, and extended presence in space.

Exobiology - conduct research on the origin, evolution, and distribution of life and life-related molecules on Earth and throughout the universe, and manage the Search for Extraterrestrial Intelligence (SETI) Microwave Observing Project.

SUPPORTING:

Space Transportation System - provide prime and contingency landing support to the Space Transportation System.

Airborne Research and Applications - conduct airborne research and applications experiments by operating instrumented aircraft as airborne laboratories for world wide science investigations.

Earth Svstem Science - conduct research, develop airborne and spaceborne instruments, and manage projects in the science of Earth's atmosphere, ecosystems, and other components with emphasis on how these components interact as a system.

Physics and Astronomy - conduct research in infrared astronomy, laboratory astrophysics, theoretical studies, and planetary science to advance our knowledge of the origin and evolution of stars, planets, and the universe.

Planetarv Exploration - develop instruments and systems and participate in investigation teams for planetary exploration studies. conduct mission operations and data analysis support for the Pioneer program and the Galileo atmospheric probe.

DISTRIBUTION OF FULL TIME EQUIVALENT **(FTE)** WORKYEARS BY PROGRAM

AMES	1991 ACTUAL	1992 BUDGET ESTIMATE	1992 CURRENT ESTIMATE	1993 BUDGET ESTIMATE
SPACE STATION	13	18	10	10
SPACE FLIGHT PROGRAMS	41	36	36	26
SPACE TRANSPORTATION CAPABILITY DEV	0	0	0	0
SPACE TRANSPORTATION OPERATIONS	41	36	36	26
SPACE SCIENCE AND APPLICATIONS	374	373	384	384
PHYSICS AND ASTRONOMY	82	98	81	81
LIFE SCIENCES	169	147	177	175
PLANETARY EXPLORATION	35	37	37	39
SPACE APPLICATIONS	88	91	89	89
AERONAUTICS AND SPACE TECHNOLOGY	1,188	1,191	1,192	1,202
AERONAUTICAL RESEARCH AND TECHNOLOGY	970	987	987	1,000
SPACE RESEARCH AND TECHNOLOGY	197	189	194	192
TRANSATMOSPHERIC RESEARCH AND TECH	21	15	11	10
SPACE EXPLORATION	2	0	2	2
COMMERCIAL PROGRAMS	6	4	5	5
SAFETY, RELIABILITY & QUALITY ASSURANCE	24	18	26	26
ACADEMIC PROGRAMS	0	0	0	0
TRACKING AND DATA PROGRAMS	28	26	28	28
SUBTOTAL - DIRECT FULL-TIME PERM FTEs	1,676	1,666	1,683	1,683
CENTER MANAGEMENT AND OPERATIONS	543	561	542	542
SUBTOTAL - FULL-TIME PERM FTEs	2,219	2,227	2,225	2,225
OTHER FTEs	36	38	40	40
SUBTOTAL - FULL-TIME EQUIVALENTS	2,255	2.265	2.265	2.265
PROJECT CORE	0	137	83	134
GRAND TOTAL - FULL-TIME EQUIVALENTS	2.255	2,402	2,348	2.399

DISTRIBUTION OF PERMANENT WORKYEARS BY PROGRAM

PROGRAM DESCRIPTION

	Permanent Civil service Workyears
SPACE STATION	10

Space Station Freedom activities will focus on developing user payload designs and outfitting equipment requirements for incorporation into the current and evolutionary station configuration. These definition activities will support life sciences, and various space science activities, such as cosmic dust collection and gas grain simulation facilities. Research and development of expert systems will focus on automation of both on board and ground control functions of the Station.

SPACE FLIGHT PROGRAMS	26
SPACE TRANSPORTATION OPERATIONS..................	26

Dryden Flight Research Facility is one of two primary recovery sites for the Space Shuttle missions. Upon landing, Dryden provides orbiter convoy operations support, support in deservicing the orbiter, and in mating the obiter to the Shuttle Carrier Aircraft for transporting the orbiter to Kennedy Space Center. Dryden is also responsible for maintaining the on-site Space Shuttle servicing facilities and is conducting several efforts in support of continued Shuttle development.

SPACE SCIENCE AND APPLICATIONS PROGRAMS	384
PHYSICS AND ASTRONO...............................	81

In 1993, civil service personnel will provide support for the airborne astronomy program, with the C-141 Kuiper Airborne Observatory Aircraft (KAO). This aircraft is operated by Ames as a flying astronomical observatory with the bulk of the observing accomplished by various university research teams. This facility is supported through in-house research in astronomy and astrophysics and with in-house capability to operate research aircraft. The Center controls a variety of other operational aircraft, including a TR-1, two ER-2's, a DC-8, a C-130, and a Lear Jet, some of which serve as unique national and international facilities for research in astronomy, geophysics, meteorology, and Earth resources; others acquire data for remote sensing projects and provide a mechanism for integration of spaceborne, airborne and ground-based data acquisition and processing systems. Support for the astronomy program is also provided by a sophisticated laboratory effort in spectroscopy and dust physics.

Ames has an active program of laboratory, theoretical, and computational studies to develop the basic astrophysical modeling concepts, to obtain the necessary physical data, to interpret the infrared astronomical observations, and to support the development of improved scientific instruments for future air and spaceborne platforms. This program has as its objective to utilize the unique capabilities of infrared astronomy to investigate the nature and evolution of astronomical systems, including planets, stars, and galaxies.

Ames has an active program in airborne and spaceborne infrared technology. Definition activity will continue in FY 1993 for the Stratospheric Observatory for Infrared Astronomy (SOFIA). SOFIA is a future new start candidate to provide a 2.5 meter telescope which would fly at 41,000 feet escaping 99 percent of water vapor, enabling vastly improved imaging and spectroscopy.

	Permanent Civil Service Workyears
LIFE SCIENCES.....................................	**175**

In 1993, civil service personnel will continue to be involved in research, hardware development, and program management related to understanding the effects of space flight on living systems, including humans and other life forms, managing non-human biological experiments in space, and understanding the origin, evolution, and distribution of life and life-related chemicals on Earth and elsewhere in the universe.

Research on the effects of gravity on living systems from simple cells to humans will be conducted using spaceflight experiments, ground simulation and by hypergravity facilities. Potential countermeasure options for neurophysiological, psychophysiological, behavioral, musculoskelatal, metabolic, and cardiovascular changes observed during and immediately following spaceflight will be developed based on understanding of the mechanisms involved. Particular emphasis will be placed on addressing the effects of extended missions and different gravitational fields. Long-duration bed rest studies and other space related ground-based research will be done to identify psycophysiological causes affecting human performance and behavior during extended duration missions. Computationally-based reconstructions and modeling of biosystems will be employed to increase understanding of their functioning on Earth and under conditions of short and long-term weightlessness. Research and technology programs will also emphasize preparing for experimentation on various Life Science Missions, SL-J, SLS-2, COSMOS, SLS-3 as well as secondary payloads.

International Microgravity Lab (IML-1) is scheduled for launch in 1992. The ARC portion of the IML-1 payload consists of a general purpose plan facility to study growth of various plant specimens in microgravity. The remaining ARC developed experiments involve cell growth and are flown in as part of the ESA developed Biorack Facility. Work will continue on final integration of experiment payloads for Spacelab-J (SL-J). Planning continues for support of SLS-2 and SLS-3 as well as secondary payloads.

Ames is developing the Life Sciences Centrifuge Facility for Space Station Freedom. This orbital laboratory will provide the capability for long duration biological research in space, to improve our understanding of the effects of the space environment on living organisms. The facility consists of a centrifuge, modular habitats to house a variety of plants and animals, microgravity habitat holding units, a life sciences glovebox, and racks for servicing habitats and holding the laboratory test equipment required for each experiment. The centrifuge will provide the controlled conditions for research to determine the effects of long term exposure to microgravity, as well as radiation and other space phenomena, and to test specific countermeasures to improve living and working conditions for extended manned spaceflight.

Research into the origin, evolution, and distribution of life and life-related molecules on Earth and throughout the cosmos will include several key thrusts: origin of essential biological'functions and structures, distribution of prebiological chemicals in extraterrestrial samples and environments, examination of natural or simulated extraterrestrial environments for their potential to support chemical evolution and the origin of life, and development of advanced analytical techniques to support these studies. Research programs will also emphasize preparing for experimentation on solar system missions of critical importance to exobiology, including Mars Observer, and Cassini. Support is also provided for development of both science and planetary protection requirements for future Mars missions.

The SETI Microwave Observing Project is divided into the Targeted Search (ARC), and the Sky Survey (JPL). Pre-production SETI systems, now under construction will be emplaced at the Arecibo Observatory in Puerto Rico and at Goldstone to formally begin observations in 1992. The production systems will then be constructed, tested, and transported to various large radio telescopes around the world, and an extensive search for signals of extraterrestrial intelligent origin conducted through the rest of the decade by scientists. A parallel effort in SETI research and development, focussing mainly on new technology for SETI systems of the future, will be carried out.

The Ames Life Support Program integrates work in physical/chemical and regenerative life support systems with the objective of closing some of the life support systems so as to reduce dependency on resupply. The Controlled Ecological Life Support System (CELSS) activities will focus on conducting laboratory-scale experiments in a completed closed crop growth facility, investigating subsystems of a flight experiments facility intended for use on Space Station, continuing the development of four precursor flights to be flown on STS/Spacelab missions as technology development tests for the flight experiment facility, developing a CELSS Science Laboratory that will provide the capabilities for chemical and biological analysis necessary to support the consortium of CELSS investigators, continuing investigations of various aspects of waste processing for use in space, and initiating development of several essential CELSS subsystems, including those for cellulose recovery, ammonia extraction from urine, gas separation, nutrient composition maintenance and delivery, and water vapor condensation and recovery.

Biospherics research will continue to enhance the understanding of the biological aspects of global conditions and biogeochemical processes on Earth. In particular, NASA-derived technologies will be employed to study and model the environmental parameters which influence the distribution and prevalence of vector borne disease.

	Permanent Civil Service Workvears
PLANETARY EXPLORATION.............................	39

Ames carries out both basic research and project management activities in support of solar system exploration. In 1993, civil service personnel will continue to provide project management and scientific support for: Pioneers 6 through 9, a series of spacecraft exploring the physics of the interplanetary medium; Pioneers 10 and 11, the two spacecraft that made the initial exploratory close approaches to Jupiter and Saturn Pioneer 10 continues as the most distant man-made object in the solar system, exploring new regions beyond the known planets; the Pioneer Venus Orbiter which is still gathering data from Venus after more than 10 years; and the Galileo Probe, which was successfully launched toward Jupiter in October 1989.

In addition, Ames scientists serve as investigators and science team members on the following planetary missions: Pioneers 10 and 11; Voyager; the Pioneer Venus Orbiter; Galileo (both Jupiter Orbiter and Probe); Mars Observer (to be launched in 1992); and Cassini.

Ames maintains an active program of laboratory, computational, and theoretical studies to develop basic atmospheric planetary modeling concepts and obtain the necessary physical data to interpret spacecraft observations of planetary atmospheres and relate these data to the atmosphere of the Earth. The program in atmospheric modeling has been particularly active in combining radiative transfer concepts with aerosol physics to derive comprehensive cloud models, and it has recently led to a series of general circulation models for the atmospheres of Mars and other planets.

Advanced studies of instrumentation are carried out for potential deployment on the Space Station Freedom and on future planetary missions to Saturn, Mars, Titan, and comets. Astronomical and laboratory studies contribute fundamental data on solar system chemistry and the chemical evolution of planetary atmospheres.

	Permanent Civil Service Workyears
SPACE APPLICATIONS................................	89

In 1993, a highly diversified group of scientists, engineers, and technicians will support observations of both Earth and its environment through spaceborne, airborne, and ground-based programs. This group interprets and processes both directly and remotely-sensed data. This group also manages projects that provide research opportunities to Ames and outside scientists using Ames' unique aircraft and other resources.

The Ames atmospheric research program is an integrated activity that combines the expertise of the Center personnel and university scientists in the development of computer models for the atmosphere and in the measurement of atmospheric constituents and properties from aircraft platforms. Computer modeling of the atmosphere is being performed to understand the atmosphere and predict the effects of various pollutants, such as aircraft emissions and fluorocarbons, and of natural events such as the solar cycle, solar storms and volcanic eruptions. These modeling efforts make effective use of the unique computational resources at the Center. A similar program which focuses on the climatic effects of aerosol and cloud particles in the Earth's atmosphere through models of aerosols and their radiative effects and through measurements of aerosol and cloud properties from aircraft is also underway at Ames.

The Ames biogeochemical cycling and dynamics research program uses remote observation to derive biochemical, biophysical, polarimetric and climate information from leaf and plant canopy spectra. This information is then related to ecosystem productivity, evapotranspiration, nutrient cycling, and trace gas fluxes through computer modeling. These modeling efforts make use of Ames' unique computational and visualization resources in scaling understanding up to global circulation models. Research is conducted on theoretical modeling and understanding of radiative interaction with plant optical properties and atmosphere effects including polarization. Trace gas fluxes from natural and disturbed ecosystems are measured and related to remotely-sensed ecosystem variables. Remote estimates of fire extent and severity are conducted and are used to estimate gas and particulate emissions from biomass burning.

Ames also conducts a continuing program of applied research and development to enhance the use of remote and in situ sensing technology for various Earth resources applications. Applications and development programs expand the utility of remote sensing technology into areas such as vector borne disease modeling and predictions. Applications programs assist in expanding the commercial remote sensing markets, defining, developing, and evaluating potential future satellite sensors, data acquisition and processing techniques, and associated communications technology. Ames also functions as a node for terrestrial data in NASA-wide information systems.

	Permanent Civil Service Workyears
AERONAUTICS AND SPACE TECHNOLOGY PROGRAMS.......	**1.202**
AERONAUTICAL RESEARCH AND TECHNOLOGY,............	**1,000**

In 1993, the program in aeronautics will be characterized in terms of three elements: generic research and technology, vehicle specific technology, and aeronautical support to other government; agencies and to industry. These three elements form a coherent and interdependent program to meet the objectives of providing a technology base for the development of subsonic and high speed transport aircraft, hypersonic aircraft, advanced rotocraft and powered lift configurations and the improvement of the operational performance and efficiency of high performance aircraft.

The generic research and technology program is principally focused in the disciplines of fluid and thermal physics, propulsion, structures, aeromechanics, flight dynamics, high performance computing technology, guidance and control, and human factors. The program provides the fundamental disciplinary advances, both theoretical and experimental, that extend the state of the art. Substantial progress is anticipated in Ames' ability to compute the theoretical behavior of flows about aerodynamic components and full configurations and to measure experimental aircraft configuration parameters. Continued efforts will be directed toward providing advances in computational capability supporting aeronautical research, computational chemistry, and other complex analytical problems. Numerical Aerodynamic Simulation (NAS) will continue augmentation of the Nation's program in computational fluid dynamics and other areas of computational physics by continuing to develop an advanced capability that will provide modern and efficient access to users such as industry and academia nationwide. During FY 1993, the Cray 2 (High Speed Processor 1) will be replaced, by a competitive procurement, with a new state of the art supercomputer. This will allow the NAS to maintain its role of being the pre-eminent aeronautional computational facility.

Also, fundamental aerodynamic research will be continued using large- and small-scale research facilities and flight research vehicles to develop design methodologies for advanced aircraft. Flight research will continue for the development and validation of laminar flow control technology, aircraft systems integration technology, including flight, propulsion, and aerodynamic controls. In controls and guidance, advanced control technology will focus on developing the methodology to design highly coupled, highly nonlinear control systems; evaluating and improving digital flight control system prediction tools, techniques, methodology and criteria; and applying optimal control theory in conjunction with artificial intelligence to provide new concepts for automation.

In 1993, the human factors program will continue basic and applied research in human performance, computational models for human machine visual perception, development of advanced pilot-vehicle interface concepts for rotorcraft, transport, and high-performance aircraft, aviation safety and other crew factors affecting the safety and efficiency of aircraft operations.

The High-speed Research program will conduct a program of theoretical and experimental research to assess the atmospheric effects of a fleet of high-speed civil transport aircraft. Issues to be addressed include depletion of stratospheric ozone, perturbations to atmospheric chemistry on a global scale, and the potential for long term climate change.

The vehicle-specific technology is focused on high speed transport aircraft, rotorcraft, and high-performance aircraft. The vehicle technology emphasis at Ames relates to, and depends on, the basic capabilities and the aeronautical research disciplines described previously. The 1993 research program will include small-scale and large-scale wind tunnel testing, ground-based simulation, and flight research. The high speed research program is directed towards the critical environmental compatibility issues and the establishment of a foundation for subsequent decisions on future high speed civil transports. Near term efforts will focus on the development of fundamental understanding of the basic phenomena associated with atmospheric pollution, airport noise, sonic boom, and air frame propulsion system integration. Advanced fighter aircraft performance is highly dependent on high-lift technology (both propulsive and aerodynamic lift) and advanced guidance and control systems, both of which are part of the ongoing program at Ames. Current research is directed towards, methods to predict the complex flow surrounding a hovering vehicle, especially near the ground, and investigation of flight dynamics of transition between hover and forward flight. High-performance aircraft research requirements include the areas of high angle-of-attack performance and control, sophisticated flight and aerodynamic controls, structural, aerodynamic, flight control and propulsive system interactions, and superaugmented aircraft.

As part of the Federal High Performance Computing and Communications Program, ARC will lead the computational aeroscience project to develop the necessary computational technalogy for the numerical simulation of complete aerospace vehicles for both design optimization and analysis throughout the flight envelope. In 1993, ARC will procure and evaluate high performance computer testbeds, and develop algorithms and software applications in support of the computational aeroscience Grand Challenges.

In rotorcraft aeromechanics, research will be conducted to improve the understanding and prediction of rotor aerodynamics, rotor/fuselage interaction and tilting prop-rotor hover and forward flight performance. In guidance, work will be pursued to improve rotorcraft capability adverse weather for terminal area operations. In the controls area, flying qualities design criteria will be developed to improve control system concepts for better performance and mission capabilities for rotorcraft. In addition, efforts will be continued to investigate the requirements for flying night, adverse weather, nap-of-the-earth missions with a single pilot. Research to provide major improvements in aircraft automation will be conducted through the use of artificial intelligence. Studies have been completed to determine the most promising concepts for next-generation rotorcraft, and investigations will be pursued for further understanding and evaluation of high speed rotorcraft technology needs.

Ames has traditionally received requests from other agencies and industry, as well as from other NASA Centers, for test support of their aircraft and systems development programs. Typically, Ames provides 8,000 to 9,000 hours per year of wind tunnel occupancy time in support of both commercial and military aircraft development, as well as support for large NASA projects, such as the Space Shuttle. The U.S. Army Aeroflightdynamics Directorate of the U.S. Army Aviation Systems Command is located at Ames. This Directorate is the primary investigator of Army rotorcraft flight dynamics and controls, and aeromechanics, is working both on independent research and development projects and with a staff integrated into the NASA organization on projects of joint interest. Extensive use is made of Ames aeronautical research facilities in these efforts.

There are also a large number of joint programs with the Air Force Systems Command, the Naval Air Systems Command, and the Defense Advanced Research Projects Agency (DARPA). Examples of these joint efforts include: (1) V/STOL and STOVL fighter studies, V-22 support, LHX support and an AV-8B flight test program with DOD; (2) the Navy/DARPA/NASA/Republic of Germany, X-31 high angle of attack aircraft; (3) continued participation in the joint NASA/USAF Advanced Fighter Technology Integration program for research demonstration of the benefits of integration of the flight and free control systems on the F-16; participation in the NASA Natural laminar flow and laminar flow control program utilizing the F-16XL testbed aircraft; and (4) work on digital flight control system verification and validation with the FAA. Advanced structural, aerodynamic, propulsion, and control concepts are also investigated in conjunction with DOD and FAA.

	Permanent Civil Service Workvears
SPACE RESEARCH AND TECHNOLOGY.....................	192

In 1993, civil service personnel will provide support to a space research and technology program which encompasses both basic and support. The basic research focuses on entry technology materials research, aerothermodynamics research, and intelligent systems technology. The focused research supports future space transportation and space science missions, and the definition of advanced technology for space platforms. The ARC Space R&T program includes activities of the Civil Space Technology Initiative (CSTI) in the areas of spaceborne processors and science sensor technology, development of technologies for humans in space, and robotics and artificial intelligence.

The entry technology research will provide aerothermodynamic data required for the design, development, and verification of planetary entry vehicles, and for computational fluid dynamic codes to predict space vehicle flow fields and performance. Work is proceeding to apply laser physics and nonintrusive laser techniques to the development of flow diagnostic tools that will be used to probe gas dynamic flows which will in turn be used to define and verify turbulence models. Research efforts in the materials area will provide advanced thermal protection systems concepts and materials for heat shields to protect Earth and planetary entry vehicles (probes), and AOTV's and will develop computational chemistry codes to calculate basic properties of matter and expand the understanding of surface environment interactions (corrosion).

Research is also being conducted in the advanced electronics and materials areas to determine atomic structure and properties of absorbed surface layers and to advance the state-of-the-art of computing wave functions for molecules and atomic clusters. Research in artificial intelligence (AI) will focus on data analysis and theory formation, scheduling, machine learning, real time reactive planning, and design of and reasoning about complex physical systems. Investigations also include spaceborne symbolic processing architecture, information understanding and extraction and validation methodologies.

Starting in 1991, the Space Shuttle program was supported with ground-based facilities to study a variety of aerodynamic and thermodydamic problems. Ground-based facilities will also simulate aero-assisted orbital transfer vehicles heating environments and debris impact on Space Station components. Ames is supporting Space Shuttle orbiter experiments to study advanced materials and evaluate possible cost and weight reduction for the thermal protection system for Shuttle and advanced space transportation systems.

Ames work will be directed primarily toward developing and conducting selected Space Shuttle experiments and performing disciplinary research in the high temperature space structures technology area. The Shuttle experiments include: continuation of simulation studies to assist in analysis and solution of various problems that exist in certain flight profile areas between entry and landing, and evaluation of the performance of the Shuttle Entry Air Data System; in-flight evaluation of the effects of rain on thermal protection system tiles; studies to evaluate adequacy and provide a basis for improving Shuttle handling qualities criteria; and application of modified maximum likelihood parameter estimation methods for determination of digital flight control systems, stability and control, performance, and structural and atmospheric turbulence characteristics in the Shuttle reentry environment.

High temperature space structures disciplinary research will involve analyses and laboratory tests of medium-sized specimens to evaluate predictive techniques for thermal structures. Airloads data will be obtained from calibrated strain gauges on the orbiter and compared with wind tunnel and theoretical predictions to evaluate flight measurement techniques and analytical methods.

The infrared astronomy program is technologically supported in two primary areas: IR detector research and cryogenics technology. This program is developing technology for improving infrared sensitivity and spectral coverage to provide significantly enhanced data for scientific research. Specific work consists of developing detector arrays and electronics and space-worthy cryogenic systems.

In the area of orbiting astronomical instruments, work will continue to develop infrared detectors, define systems for precision pointing and control of telescopes, and advance the technology required to cool detectors to very low temperatures.

The Space human factors program will continue applied research in space human factors to ensure high levels of productivity and operational safety for future space missions. Applications of understanding and specific results arising from these research activities will be focused on human-system problems in space missions. The Ames advanced life support program integrates work in physical/chemical, regenerative and (extravehicular activity) EVA technologies and systems. The work consists of both modeling of processes and testing directed toward development of improved hardware and the tuning of models for integrated systems analysis. A major focus of the physical/chemical effort will be in the development of water recycling systems with other activities in atmosphere regeneration. The regenerative program will continue to support the scientific experiments, technological investigations and potential flight experiments necessary for the development of regenerative life support systems. In the extra vehicular activity (EVA) systems arena, the Ames mission will continue to conduct the research, develop the technologies, and validate the concepts and systems necessary to perform EVAs safely and efficiently during long-duration manned space missions (both in space and on planetary surfaces).

	Permanent Civil Service Workyears
TRANSATMOSPHERIC RESEARCH AND TECHNOLOGY...........	**10**

Transatmospheric Research and Technology activities at ARC focus on two major areas. The first area emphasizes the special capabilities and expertise in hypersonic and computational facilities at Ames Research Center for the conduct of extremely high Mach number tests and analysis of both wind tunnel and flight data. The strength of the computational methods using the Central Computing Facility and the Numerical Aerodynamic Simulation computers, combined with the advanced materials activities, provides unique capabilities to design and tailor lightweight, high-temperature structures, instrumentation, data acquisition systems, and a range of capabilities necessary for future potential flight testing of a hypersonic/transatmospheric research vehicle over the required range of speed, altitude and envelope conditions will be developed at Ames. These capabilities are being applied to the maturation of specific technologies required for the National Aero-Space Plane Program.

	Permanent Civil
SPACE EXPLORATION	**2**

Research is being conducted into how to utilize systems engineering concepts to design and develop advanced life support systems for planetary exploration. This approach is expected to result in more efficient life support systems that are easier to control and to maintain, thus freeing the crew to perform more exploration tasks.

COMMERCIAL PROGRAMS	**5**

The objective of the Commercial Use of Space program is to increase private sector awareness of space opportunities and encourage increased industry investment and participation in high technology space-based research applications and development. This effort establishes an organizational focal point specifically intended to foster commercial use of and access to space.

The technology utilization program serves to transfer knowledge developed through the NASA programs into industry for effective use in the marketplace.

SAFETY, RELIABILITY, AND QUALITY ASSURANCE	**26**

The Safety, Reliability, and Quality Assurance (SR&QA) function provides support to all Center projects and operating organizations. The Safety and Health Office provides institutional safety support to the entire Center and insures that the Center activities are conducted in a manner which is consistent with the Center risk management criteria. It advises and consults in the fields of industrial safety, occupational safety and health, radiation safety, environmental compliance and toxic waste management. The system Safety Office provides systems safety analyses to projects and operating organizations, The Reliability and Quality Assurance Office provides assistance to projects in developing reliability models and analyses and quality assurance plans. Techniques used include failure mode effects and analyses, inspection planning and monitoring, quantitative risk modeling and test plan verification. This organization also conducts internal surveys and surveys of contractor plants and their quality assurance programs. In addition, a training program in quality workmanship (welding and soldering) are conducted by this office.

	Permanent Civil Service Workyears
CENTER MANAGEMENT AND TIONS SUPPORT.............	542

Center Management and Operations provides support or services to all Ames organizations which cannot be identified exclusively to a single program or project. The civil service personnel involved are as follows:

Director and Staff - The Center Director, Deputy Director, Associate Director, and the immediate staff; e.g., Chief Counsel, Patent Counsel, and Directors for Equal Opportunity, Public Affairs, and the Chief Engineer.

Management Support - Provides information and control services supporting all areas of the Center, both program and functional. Specific functions, Comptroller, contracting and procurement, property management, and personnel management.

Operations Support - Provides for the operation and maintenance of institutional facilities, buildings, systems, and equipment, and technical services such as administrative automatic data processing, library and information services.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)			
I.	PERSONNEL AND RELATED COSTS	140,616	144,506	157,195	166,900
II.	TRAVEL	4,578	5,278	4,870	5,328
III.	OPERATION OF INSTALLATION	65,961	87.066	0	0
	A. Facilities Services	29,356	38,747	0	0
	B. Technical Services	17,591	16,101	0	0
	C. Management and Operations	19,014	23,152	0	0
	D. Implementation of Project CORE	0	9,066	0	0
	Total, Fund Requirement	211,155	236,850	162,065	172,228

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

RESOURCES REQUIREMENTS BY FUNCTION

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
I. PERSONNEL AND RELATED COSTS	140,616	144.506	157.195	166.900

Summary of Fund Requirements

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A. Compensation and Benefits				
1. Compensation				
a. Full-time permanent	110,638	113,975	120,708	126,318
b. Other than full-time permanent	2,635	2,413	2,619	2,584
c. Reimbursable detailees	420	427	445	462
d. Overtime and other compensation	2,415	2,336	2,733	2,855
Subtotal, Compensation	116,108	119,151	126,505	132,219
2. Benefits	20,918	21,859	23,761	24,529
Subtotal, Compensation and Benefits	137,026	141,010	150,266	156,748

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
B. Supporting Costs				
1. Transfer of personnel	1,179	949	404	240
2. Investigative Services and Core Conv	0	0	4,000	7,416
3. Personnel training	2,411	2,547	2,525	2,496
Subtotal, Supporting Costs	3,590	3,496	6,929	10,152
Total, Personnel and Related Costs	140,616	144,506	157,195	166,900

Explanation of Fund Requirements

A. Compensation and Benefits

1. Compensation

a. Full-time permanent	110,638	113,975	120,708	126,318

The increase in the 1992 Current Estimate over the 1992 Budget Estimate reflects the full-year effect of locality pay and the additional January pay raise from 4.0 percent to 4.2 percent which was not included in the 1992 Budget Estimate. The 1993 Estimate includes funding for a full year of the 1992 pay raise, the anticipated 1993 pay raise, and full year funding for promotions, within grade increases and other personnel actions. We plan to fund our approved ceiling FTE by maximizing our lapse savings, hiring more freshouts and reducing discretionary salary growth factors.

<u>Basis of Cost for Permanent Workyears</u>

In 1993. the cost of permanent workyears will be $126.318.000. The increase from 1992 is calculated as follows:

Cost of full-time permanent workyears in 1992......		**$120,708**
Cost Increases in 1993...........................		8.091
Within grade and career development advances:		
Full year effect of 1992 actions.................	1.588	
Partial year effect of 1993 actions..............	1.855	
Full year cost of the 1992 pay raise.............	1.402	
Partial year cost of the 1992 pay raise..........	3.246	
Cost Decreases in 1993...........................		-2,481
Turnover Savings:		
Full year effect of 1992 actions...............	-1.559	
Partial year effect of 1993 actions............	- 502	
Fewer pay days in 1993...........................	- 420	
Cost of full-time permanent workyears in 1993......		$126.318

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
b. Other than full-time permanent				
(1) cost	2,635	2,413	2,619	2,584

The other than full-time permanent category includes funding for the Co-op program, although the workyears are not in the above ceiling FTE. The increase from the 1992 Budget Estimate to the 1992 Current Estimate results from more workyears and higher salaried positions than planned. The 1993 decrease includes full year funding of the 1992 pay raise and the cost of the anticipated pay raise in January 1993 offset by lower salaried positions.

C. Reimbursable detailees	420	427	445	462

Military personnel detailed to Ames on a reimbursable basis are experienced in aeronautics, rotorcraft technology, veterinary medicine, and related fields. The increase from the 1992 Budget Estimate to the 1992 Current Estimate reflects the additional .2% pay raise and higher salaried detailees than planned. The 1993 Estimate maintains the same level of effort as 1992, but includes the full year funding of the 1992 pay raise and the anticipated January 1993 pay raise.

d. Overtime and other compensation	2,415	2,336	2,733	2,855

The overtime and other compensation budget category consists of overtime, holiday pay, incentive awards, night differential, Sunday premium pay, overseas assignments, and pay reform. Use of overtime and other compensation is primarily for off-peak operation of major facilities such as the Unitary Plan Wind Tunnel system, 40 x 80 x 120 foot Wind Tunnel, and the 6 x 6 foot Supersonic Wind Tunnel, Shuttle Landings, and preparation for test flights. The increase from the 1992 Budget Estimate to the 1992 Current Estimate is due to anticipated increases in wind tunnel usage. The increase in the 1993 Budget reflects the full year effect of the 1992 pay raise, the anticipated 1993 pay raise, pay reform, and overtime due to an expected increase in wind tunnel activity.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
2. Benefits	20,918	21,859	23,761	24,529

The following are the amounts of contributions by category:

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
Retirement Fund and Thrift Plan......	11,457	11,663	13,055	13,349
Employee Life Insurance..............	198	195	220	236
Employee Health Insurance............	4,477	4,924	4,947	5,314
Workers' Compensation................	682	639	639	642
FICA.................................	2,607	3,415	3,098	3,106
Medicare.............................	1.497	1.023	1.802	1.882
Total............................	20,918	21,859	23,761	24,529

The increase from the 1992 Budget Estimate to the 1992 Current Estimate reflects a revised estimate of benefits to include the additional .2 percent pay raise for 1992, the full year funding of locality pay and increases in retirement programs, thrift, FICA, and health insurance. The 1993 increase reflects the full year effect of the 1992 pay raise, the anticipated 1993 pay raise and expected increases above the pay raise in health insurance, retirement programs, and FICA.

B. Supporting Costs

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Transfer of Personnel	1,179	949	404	240

This supporting costs category includes movement of household goods, subsistence and temporary expenses, real estate costs and miscellaneous moving expenses related to change of duty station. The decrease in the 1992 Current Estimate from the 1992 Budget Estimate is due to efforts to control relocation costs and reduced hires due to lower attrition than planned. The decrease in the 1993 Budget results from a projected decrease in the number of hires.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
2. Investigative Services and Core Conv	0	0	4,000	7,416

The 1992 Current Estimate reflects the implementation of the approved Core conversions. The 1993 Estimate includes the full year funding of the 1992 core conversions and the transfer of the security investigation responsibility from Headquarters to the centers.

3. Personnel Training	2,411	2,547	2,525	2,496

The purpose of the ARC's training program is to continue to develop the skills and knowledge of civil service employees in order to more efficiently support center roles and missions. The benefits derived by NASA from training and educational programs are: enhancement of scientific and engineering leadership in the scientific community; maintenance of a high degree of professional competency with the administration and clerical force; development of needed skills and knowledge required in center mission activities; extending our center's work force capability; increasing productivity; and emphasizing "Upward Mobility" training of women and minorities and Equal Opportunity Seminars. The 1993 Budget Estimate reduces these programs to divert funds to compensation and benefits in an effort to maintain our current approved FTE.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
II. TRAVEL	4.578	5,278	4,870	5,328

Summary of Fund Requirements

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A. Program Travel	2,699	3,359	2,915	3,322
B. Scientific and Technical Development Travel	752	758	782	802
C. Management and Operations Travel	1,127	1,161	1,173	1,204
Total, Travel	4,578	5,278	4,870	5,328

Explanation of Fund Requirements

A. Program Travel	2,699	3,359	2,915	3,322

Travel for program purposes is required for the continual monitoring and management efforts in space research, aeronautical research and technology, flight simulation, fluid mechanics, airborne research and applications, space life sciences, Space Station, flight test techniques, flight measurements, guidance and flight control, and flight measurement development activities. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate is due to a reduction in the number of trips because of budget reductions, and reallocation of available funds to meet center priorities. The increase from the 1992 Current Estimate to the 1993 Budget Estimate is a result of anticipated inflation.

B. Scientific and Technical Development Travel	752	758	782	802

Scientific and technical development travel permits employees to participate in meetings and technical seminars with other representatives of the scientific and aerospace community. This participation allows personnel to benefit from exposure to technological advances outside Ames, as well as to present both

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

accomplishments and problems to associates. The travel costs in the 1992 Current Estimate reflect a continuation of the 1991 level plus an increase in the number of trips due to increased requirements. The 1993 Budget Estimate increase is primarily inflation driven.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
C. Management and Operations Travel	1,127	1,161	1,173	1,204

Management and operations travel provides for the direction and coordination of general management matters. It includes travel in such areas as personnel, budget, financial management and procurement; travel of the Center's top management to NASA Headquarters, other NASA Centers, and contractor plants; and local transportation. The changes in the 1992 Current Estimate are increases in the number of trips. The 1993 Budget Estimate maintains funding at approximately the 1992 level.

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)			
III.	OPERATION OF INSTALLATION	65,961	87,066	0	0

Summary of Fund Requirements

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A.	Facilities Services				
1.	Rental of Real Property	50	52	0	0
2.	Maintenance and Related Services	6,457	12,174	0	0
3.	Custodial Services	7,136	6,846	0	0
4.	Utility Services	15,713	19,675	0	0
	Total, Facilities Services	29,356	38,747	0	0
B.	Technical Services				
1.	Automatic Data Processing	10,101	7,722	0	0
2.	Scientific and Technical Information	3,929	4,649	0	0
3.	Shop and Support Services	3,561	3,730	0	0
	Total, Technical Services	17,591	16,101	0	0

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)			
C.	Management and Operations				
	1. Administrative Communications	3,416	3,398	0	0
	2. Printing and Reproduction	1,651	1,766	0	0
	3. Transportation	1,705	1,744	0	0
	4. Installation Common Services	12,242	16,244	0	0
	Total, Management and Operations	19,014	23,152	0	0
D.	Project CORE	0	9.066	0	0
	Total, Operation of Installation	65,961	87,066	0	0

Explanation of Fund Requirements

Operation of Installation provided a broad range of services, supplies, and equipment in support of the Center's institutional activities. These are divided into three major functional areas: Facilities Services, the cost of maintaining and repairing institutional facilities and equipment, and the cost of custodial services and utilities; Technical Services, the cost of automatic data processing for management activities, and the cost of educational and informational programs and technical shops supporting institutional activities; and Management and Operations, the cost of administrative communications, printing, transportation, medical, administrative supplies and support, and related services. Additionally, in 1992 Operation of Installation included funding for the implementation of Project CORE, which will convert certain functions from contractors to civil servants.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

The activities that had been budgeted in the Operation of Installation account are no longer included in the Research and Program Management (R&PM) budget. Project CORE funds are budgeted in the Salary and Related Costs account and the remainder are included in the Research and Development and Space Flight, Control and Data Communications budgets.

A. Facilities Services

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Rental of Real Property	50	52	0	0

These funds primarily provided for temporary rental of trailers for office space due to the overcrowding of personnel on site.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
2. Maintenance and Related Services	6,457	12,174	0	0

Funds provided for the maintenance of grounds and repairs of heating, ventilating, and lighting equipment in institutional buildings and offices. Maintenance of grounds included maintenance of approximately 50 acres of improved planted areas and associated pest control; maintenance of approximately 65 acres of unimproved areas such as substations, aircraft taxiways, drainage ditches, large fields and roadway shoulders within these areas; and vacuum sweeping approximately 85 acres of streets, parking lots, and aircraft ramp, taxiway and V/STOL areas.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
3. Custodial Services	7,136	6,846	0	0

Funds provided for janitorial and building cleaning services for approximately three million square feet of various types of space located in 231 buildings and structures, and in trailers which provided temporary office and shop space. Security services were funded for buildings and property, including research aircraft and computer facilities, and "round-the-clock" staffing of a duty office which monitors and coordinates fire

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			

protection, security, and safety functions at the Center. Funding also covered pest control, refuse collection, laundry and custodial supplies. These services are provided by support contractors.

4. Utility Services	**15,713**	**19,675**	0	**0**

The major utility service funded was electricity; the balance was natural gas, fuel oil, water, and sewage services. At Ames-Moffett, electricity is provided by the U.S. Bureau of Reclamation's Central Valley Project, marketed by the Western Area Power Administration (WAPA) of the Department of Energy, and the Pacific Gas and Electric Company (PG&E); natural gas is provided by PG&E; water by the U.S. Naval Air Station Moffett Field; and sewage by the City of Mountain View.

Research facilities are the largest consumers of electric power at Ames-Moffett. High users include the Unitary Plan Wind Tunnel system, the NFAC Wind Tunnel, the 14-foot Transonic Wind Tunnel, and the operation of simulators and smaller wind tunnels. Approximately **55** percent of the natural gas is used in research facilities; the other part is used for heating and ventilation of institutional buildings. Ames-Moffett accounts for ***92*** percent of the overall utility energy usage. At Dryden, electricity is purchased through Air Force contracts with regional utility companies and estimates are based on Air Force projections. Natural gas is purchased from Pacific Gas and Electric. Other commodities include fuel oil, water, and sewage services.

B. Technical Services

1. Automatic Data Processing	10,101	**7,722**	0	**0**

Funds supported the central administrative ADP facility equipment and operating costs.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
2. Scientific and Technical Information	3,929	4,649	0	0

Funds provided for the purchase of books, supplies, and materials for the operation of the Ames libraries. Also funded was a support contract to perform public information services, media development, and education programs.

3. Shop and Support Services	3,561	3,730	0	0

Funds supported institutional safety support, photo, graphics, and audio-visual services which primarily support the Center's public affairs activity.

C. Management and Operations

1. Administrative Communications	3,416	3,398	0	0

Funding provided communications services by the Pacific Telephone and Telegraph Company and the General Telephone and Telegraph Company for local services at Ames-Moffett and Dryden, respectively. Other communications consist of teletype equipment and services provided by Western Union, the lease of switchboard equipment, and support contracts for communications services.

2. Printing and Reproduction	1,651	1,766	0	0

Funding supported the operating costs of the printing and reproduction facility as well as supplies, materials, and equipment. All common processes of duplication, including photostating, blueprinting and microfilming are included.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
3. Transportation	1,705	1,744	0	0

Funds covered motor pool operation costs for NASA-owned and GSA-owned vehicles, Government bills of lading, and air freight costs.

4. Installation Common Services	12,242	16,244	0	0

Funding provided support to center management and staff activities, medical services, and installation support activities. For example, this category includes those supplies, materials and services in support of Center management functions such as personnel, procurement, and financial management. Medical services include the staffing of the health units, laboratory service fees, clinic supplies, and maintenance of clinic equipment. Installation support services provide contractor support for supply and property management, mail, pickup and delivery services, and postage.

D. Implementation of Project CORE	0	9,066	0	0

The Ames Research Center had planned to convert 200 positions from contractors to civil servants. Because of Congressional action, these plans are under review. Until this review is completed, funds for such conversions are being held in the Salary and Related Costs account.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AYES RESEARCH CENTER

ORGANIZATION AND STAFFING CHART

STAFFING SUMMARY

	92	93
SES	46	46
GS/GM 16	0	0
GS/GM 15	221	222
GS/GM 14	380	388
OTHER GS/GM	1237	1272
WAGE	316	316
TOTAL	2200	2244

OFFICE OF THE DIRECTOR

	92	93
SES	8	8
GS/GM 16	0	0
GS/GM 15	15	16
GS/GM 14	17	17
OTHER GS/GM	55	57
WAGE	0	0
TOTAL	95	97

OFFICE OF THE COMPTROLLER

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	1	1
GS/GM 14	[illegible]	4
OTHER GS/GM	[illegible]	82
WAGE	[illegible]	0
TOTAL	[illegible]	88

DIRECTOR OF ADMINISTRATION

	92	93
SES	2	2
GS/GM 16	0	0
GS/GM 15	0	0
GS/GM 14	0	0
OTHER GS/GM	3	3
WAGE	0	0
TOTAL	5	5

LOGISTICS AND SECURITY DIVISION

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	0	0
GS/GM 14	0	0
OTHER GS/GM	14	14
WAGE	6	6
TOTAL	20	20

HUMAN RESOURCES DIVISION

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	2	2
GS/GM 14	3	3
OTHER GS/GM	41	42
WAGE	0	0
TOTAL	46	47

ACQUISITION DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	4	4
GS/GM 14	9	9
OTHER GS/GM	94	96
WAGE	0	0
TOTAL	108	110

TECHNICAL INFORMATION DIVISION

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	0	0
GS/GM 14	1	1
OTHER GS/GM	23	23
WAGE	3	3
TOTAL	27	27

MANAGEMENT PROGRAMS OFFICE

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	0	0
GS/GM 14	1	1
OTHER GS/GM	5	5
WAGE	0	0
TOTAL	6	6

DIRECTOR OF ENGINEERING AND TECHNICAL SERVICES

	92	93
SES	2	2
GS/GM 16	0	0
GS/GM 15	1	1
GS/GM 14	1	1
OTHER GS/GM	2	2
WAGE	0	0
TOTAL	6	6

FACILITIES PLANNING OFFICE

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	0	0
GS/GM 14	2	2
OTHER GS/GM	1	1
WAGE	0	0
TOTAL	3	3

INFORMATION AND COMMUNICATIONS SYSTEMS DIVISION

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	5	5
GS/GM 14	8	8
OTHER GS/GM	54	54
WAGE	0	0
TOTAL	67	67

SYSTEMS ENGINEERING DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	7	7
GS/GM 14	19	19
OTHER GS/GM	97	97
WAGE	0	0
TOTAL	124	124

TECHNICAL SERVICES DIVISION

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	1	1
GS/GM 14	2	2
OTHER GS/GM	21	21
WAGE	113	113
TOTAL	137	137

MAINTENANCE MANAGEMENT OFFICE

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	0	0
GS/GM 14	1	1
OTHER GS/GM	2	2
WAGE	0	0
TOTAL	3	3

12-FOOT WIND TUNNEL OFFICE

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	1	1
GS/GM 14	4	4
OTHER GS/GM	5	5
WAGE	0	0
TOTAL	10	10

DIRECTOR OF AEROSPACE SYSTEMS

	92	93
SES	2	2
GS/GM 16	0	0
GS/GM 15	0	0
GS/GM 14	1	1
OTHER GS/GM	3	3
WAGE	0	0
TOTAL	6	6

AIRCRAFT TECHNOLOGY DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	9	9
GS/GM 14	17	17
OTHER GS/GM	33	33
WAGE	0	0
TOTAL	60	60

FULL-SCALE AERODYNAMICS RESEARCH DIVISION

	91	92
SES	1	1
GS/GM 16	0	0
GS/GM 15	7	7
GS/GM 14	10	10
OTHER GS/GM	49	49
WAGE	21	21
TOTAL	88	88

AEROSPACE HUMAN FACTORS RESEARCH DIVISON

	92	93
SES	2	2
GS/GM 16	0	0
GS/GM 15	10	10
GS/GM 14	13	13
OTHER GS/GM	24	24
WAGE	0	0
TOTAL	49	49

FLIGHT SYSTEMS AND SIMULATION RESEARCH DIVISION

	92	93
SES	1	1
GS/GM 16	1	1
GS/GM 15	15	15
GS/GM 14	17	17
OTHER GS/GM	61	61
WAGE	1	1
TOTAL	96	96

INFORMATION SCIENCES DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	8	8
GS/GM 14	13	13
OTHER GS/GM	25	25
WAGE	0	0
TOTAL	47	47

DIRECTOR OF FLIGHT OPERATIONS AND RESEARCH

	92	93
SES	2	2
GS/GM 16	0	0
GS/GM 15	2	2
GS/GM 14	3	3
OTHER GS/GM	10	10
WAGE	0	0
TOTAL	17	17

SCIENCE AND APPLICATIONS AIRCRAFT DIVISION

	92	93
SES	1	0
GS/GM 16	0	0
GS/GM 15	3	3
GS/GM 14	14	14
OTHER GS/GM	25	25
WAGE	1	1
TOTAL	44	43

AMES RESEARCH AIRCRAFT OPERATIONS DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	4	4
GS/GM 14	5	5
OTHER GS/GM	15	15
WAGE	45	45
TOTAL	70	70

DIRECTOR OF AEROPHYSICS

	92	93
SES	2	2
GS/GM 16	0	0
GS/GM 15	1	1
GS/GM 14	1	1
OTHER GS/GM	4	4
WAGE	0	0
TOTAL	8	8

NUMERICAL AERODYN. SIMULATION SYSTEMS DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	8	13
GS/GM 14	12	23
OTHER GS/GM	27	32
WAGE	0	0
TOTAL	48	69

AERODYNAMICS DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	5	5
GS/GM 14	21	21
OTHER GS/GM	50	50
WAGE	24	24
TOTAL	101	101

COMPUTER SYSTEMS & RESEARCH DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	4	4
GS/GM 14	3	3
OTHER GS/GM	26	26
WAGE	0	0
TOTAL	34	34

FLUID DYNAMICS DIVISION

	92	93
SES	2	2
GS/GM 16	0	0
GS/GM 15	16	16
GS/GM 14	27	27
OTHER GS/GM	33	33
WAGE	0	0
TOTAL	78	78

THERMOSCIENCES DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	11	11
GS/GM 14	18	18
OTHER GS/GM	35	35
WAGE	15	15
TOTAL	80	80

DIRECTOR OF SPACE RESEARCH

	92	93
SES	2	2
GS/GM 16	0	0
GS/GM 15	1	1
GS/GM 14	2	2
OTHER GS/GM	2	2
WAGE	0	0
TOTAL	7	7

SETI OFFICE

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	1	1
GS/GM 14	2	2
OTHER GS/GM	2	2
WAGE	0	0
TOTAL	5	5

ADVANCED LIFE SUPPORT DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	8	8
GS/GM 14	5	5
OTHER GS/GM	17	17
WAGE	0	0
TOTAL	31	31

SPACE SCIENCE DIVISION

	92	93
SES	2	2
GS/GM 16	0	0
GS/GM 15	15	15
GS/GM 14	13	13
OTHER GS/GM	28	28
WAGE	0	0
TOTAL	58	58

SPACE PROJECTS DIVISION

	92	93
SES	0	1
GS/GM 16	0	0
GS/GM 15	5	5
GS/GM 14	25	25
OTHER GS/GM	44	44
WAGE	0	0
TOTAL	74	75

SPACE LIFE SCIENCES PAYLOADS OFFICE

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	4	4
GS/GM 14	14	14
OTHER GS/GM	21	21
WAGE	0	0
TOTAL	39	39

LIFE SCIENCE DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	6	6
GS/GM 14	10	10
OTHER GS/GM	14	14
WAGE	0	0
TOTAL	31	31

EARTH SYSTEMS SCIENCE DIVISION

	92	93
SES	2	2
GS/GM 16	0	0
GS/GM 15	6	5
GS/GM 14	13	13
OTHER GS/GM	25	25
WAGE	0	0
TOTAL	46	45

DIRECTOR OF DRYDEN FLIGHT RESEARCH FACILITY

	92	93
SES	3	3
GS/GM 16	0	0
GS/GM 15	0	0
GS/GM 14	3	3
OTHER GS/GM	12	12
WAGE	0	0
TOTAL	18	18

CHIEF ENGINEER'S OFFICE

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	0	0
GS/GM 14	0	0
OTHER GS/GM	0	0
WAGE	0	0
TOTAL	1	1

DRYDEN AEROSPACE PROJECTS OFFICE

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 16	4	4
GS/GM 14	6	6
OTHER GS/GM	5	5
WAGE	0	0
TOTAL	15	15

DRYDEN ADMIN.& TECH. SERVICES DIVISION

	92	93
SES	0	0
GS/GM 16	0	0
	1	1
	4	4
OTHER GS/GM	65	65
WAGE	0	0
TOTAL	70	70

DRYDEN RESEARCH AIRCRAFT OPERATIONS DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	8	8
GS/GM 14	4	4
OTHER GS/GM	75	75
WAGE	99	99
TOTAL	187	187

DRYDEN RESEARCH ENGINEERING DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 16	14	14
GS/GM 14	33	33
OTHER GS/GM	92	92
WAGE	0	0
TOTAL	140	140

LANGLEY
RESEARCH CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1993 ESTIMATE

LANGLEY RESEARCH CENTER

DESCRIPTION

The Langley Research Center (LaRC), located at Hampton, Virginia, was established in 1917. It is situated between Norfolk and Williamsburg, Virginia, in the Tidewater area of Hampton Roads. The Center utilizes 807 acres of Government-owned land, divided into two areas by the runway facilities of Langley Air Force Base. Runways, some utilities, and certain other facilities are used jointly by NASA and the Air Force. Under a permit from the Department of Interior, Langley has access to 3,276 acres. The total capital investment of the Langley Research Center, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1991, was $927,531,000.

CENTER ROLES AND MISSIONS

Langley continues to play a leading role in the development of aeronautics and space technology. Technical excellence in specified research areas is attributed to the quality and capability of the civil service staff and to the availability of unique aeronautical and space facilities. The principal and supporting roles are:

PRINCIPAL:

Transport Aircraft Technology - develop a technology base for improving transport aircraft as a cost effective, safe, and environmentally compatible transportation mode.

General Aviation and Commuter Aircraft Technology - develop and maintain an engineering technology base related to improving general aviation and commuter aircraft.

Aero-Space Plane Technology - combine aeronautics and space disciplines to provide the technology for design of vehicles capable of airbreathing flight from Earth to orbit.

High-speed. Highly Maneuverable Aircraft Technology - conduct advanced disciplinary research applicable to military aircraft and missiles.

Fundamental Aerodvnamics · advance the general state-of-the-art, both theoretical and experimental, and improve the capability to compute the flow about vehicles to permit accurate assessment of aerodynamics performance.

Acoustics - conduct research and develop a technology base related to reducing interior and exterior aircraft noise and acoustic structural loads.

Structures and Materials · develop new and improved structural materials and structural design technology with emphasis on advanced composite materials and advanced metallic materials, and in the prediction and control of dynamic stability of aeroelastic vehicles.

Guidance and Control- conduct guidance, navigation, and controls research to improve existing aircraft and spacecraft control and guidance systems and enable development of new systems for advanced aerospace vehicles/systems.

Space Transportation Configurations- develop technology for future space transportation systems, including Earth-to-orbit vehicles, space transfer vehicles, transatmospheric vehicles, and maneuvering entry vehicles.

Space Svstems Technolonv · develop a technology base and systems analysis capability for advanced spacecraft, large space systems, Space Platforms, and manned Mars and lunar base missions.

Sensors and Data Acquisition- develop a technology base for sensors and data acquisition devices, including new nondestructive evaluation (NDE) techniques for assuring integrity of aerospace materials and structures.

Information Svstems- develop the technology for highly reliable, fault-tolerant software and data systems for flight critical aerospace vehicle applications, and for high Performance spaceflight storage systems.

Flight Management - conduct research to develop technology for efficient, safe crew/vehicle interface and for improved aerospace vehicle operations.

Technoloay Experiments - define and develop space technology experiments relevant to materials, structures, aerothermodynamics, automated assembly, control and dynamics of large space structures; large space antenna assemblies, advanced space transportation systems, Space Station Freedom and on-orbit assembly and servicing facilities.

Hypersonic Propulsion - contribute to the technology base of airbreathing propulsion systems by advancing the state-of-the-art of hypersonic propulsion.

SUPPORTING:

Rotorcraft Technology - contribute to the development of the technology base to advance rotorcraft performance with emphasis on structures, aeroelasticity, acoustics, and avionics components.

Atmospheric Sciences - develop, apply and manage improved techniques for atmospheric sensing, including development of Shuttle and Earth Observation System (EOS) payloads, and instruments related to atmospheric sensing and specialized ground/aircraft investigations.

Upper Atmosphere Research - conduct mission analyses, develop sensors, and utilize remote sensing data contributing to model development. This also includes development and management of Shuttle and Earth Observation System (EOS) payloads and instruments for free fliers related to atmospheric sensing.

Automation and Robotics - develop technology for telerobotic and autonomous robotic systems and evaluate application of resulting systems to future space mission needs.

Computational Fluid Dynamics - contribute to the software technology base; improve the capability to compute the flow about aircraft and vehicles at entry velocities to permit accurate assessments of aerodynamic performance and heat transfer characteristics.

Space Radiation Exposure and Protection - conduct research on the interaction of solar and galactic cosmic radiation with matter for estimating human exposure and for developing radiation protection technology.

DISTRIBUTION OF FULL TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

LANGLEY	1991 ACTUAL	1992 BUDGET ESTIMATE	1992 CURRENT ESTIMATE	1993 BUDGET ESTIMATE
SPACE STATION	33	22	38	37
SPACE FLIGHT PROGRAMS	40	22	18	15
SPACE TRANSPORTATION CAPABILITY DEV	26	22	18	15
SPACE TRANSPORTATION OPERATIONS	14	0	0	0
SPACE SCIENCE AND APPLICATIONS	229	217	271	275
PHYSICS AND ASTRONOMY	0	0	0	0
LIFE SCIENCES	8	5	9	9
PLANETARY EXPLORATION	2	0	2	2
SPACE APPLICATIONS	219	212	260	264
AERONAUTICS AND SPACE TECHNOLOGY	1,886	1,941	1,852	1,852
AERONAUTICAL RESEARCH AND TECHNOLOGY	1,259	1,294	1.259	1,271
SPACE RESEARCH AND TECHNOLOGY	559	540	516	521
TRANSATMOSPHERIC RESEARCH AND TECH	68	107	77	60
SPACE EXPLORATION	17	0	9	3
COMMERCIAL PROGRAMS	10	10	15	15
SAFETY, RELIABILITY & QUALITY ASSURANCE	6	11	12	13
ACADEMIC PROGRAMS	0	0	0	0
TRACKING AND DATA PROGRAMS	0	0	0	0
SUBTOTAL - DIRECT FULL-TIME PERM FTES	2,221	2,223	2.215	2,210
CENTER MANAGEMENT AND OPERATIONS	710	702	710	715
SUBTOTAL - FULL-TIME PERM FTEs	2,931	2,925	2,925	2,925
OTHER FTEs	18	19	19	19
SUBTOTAL - FULL-TIME EQUIVALENTS	2,949	2,944	2,944	2,944
PROJECT CORE	0	73	32	43
GRAND TOTAL - FULL-TIME EQUIVALENTS	2,949	3,017	2,976	2,987

PROGRAM I

	Permanent Civil Service Workyears
SPACE STATION....................................	37

Langley is responsible for systems engineering and analysis in direct support of the Space Station Freedom program and for the definition of the evolutionary station.

SPACE FLIGHT PROGRAMS............................	15
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT........	15

Langley will perform research on the Advanced Manned Launch System studies which provide the Agency long-range planning for a second generation Space Shuttle anticipated after the year 2000. A predefinition phase concept study, is scheduled to continue in 1993, utilizing in-house Langley efforts which will focus on configurations, technology levels and mission requirements and will be coordinated with complementary studies at Johnson Space Center, Marshall Space Flight Center, and Kennedy Space Center.

Langley is continuing research on the HL-20 Lifting Body Configuration for application to a near-term Personnel Launch System and a Space Station Assured Crew Return Vehicle that will minimize entry loads and land horizontally. Conceptual design studies will be conducted and experimental aerodynamics and heating data will be obtained and analyzed to further optimize the HL-20 concept.

SPACE SCIENCE AND APPLICATIONS....................	275
LIFE SCIENCES....................................	9

The space radiation exposure program at Langley supports existing and future manned space efforts including Space Station Freedom, lunar bases, and planetary exploration. Theoretical studies of the physical interactions and transport of space radiation (proton, electrons, and galactic heavy ions) with tissue-like matter will result in generating models that will be used to assess more accurately astronaut radiation exposures and body shielding factors. The ultimate objective of this work is to develop a space radiation exposure handbook for future manned spaceflight. This activity has a significant importance to current and future human exploration initiatives.

	Permanent Civil Service Workyears
PLANETARY EXPLORATION............................	2

The planetary exploration activity at Langley is directed at the identification of the major functional requirements for future Mars rover and lander imaging systems, including panoramic quasi-microscopic and telescopic imaging and the conduct of design and performance tradeoff studies for conceptual imaging system designs.

SPACE APPLICATIONS................................	264

The space applications program at Langley provides a national research capability €or understanding the environment and for developing related atmospheric sensing systems and techniques. The Center's technical expertise is widely recognized in the areas of remote sensing of the Earth's atmosphere, radiation budget, and in theoretical and empirical atmospheric modeling. Langley plays a particularly important role in the Agency's Mission to Planet Earth--the Earth Observing System (EOS). Four Langley experiments were selected and three are still candidates for final EOS definition: Clouds and the Earth's Radiant Energy System (CERES), Stratospheric Aerosol and Gas Experiment (SAGE 111), and Spectroscopy of the Atmosphere Using Far Infrared Emission (SAFIRE). Two major EOS interdisciplinary studies in the upper atmosphere, and clouds and radiation were also selected. A Langley scientist has been invited to be a member of the Canadian Experiment, Measurement of Pollution in the Troposphere (MOPITT), science team. Based on Langley's expertise and participation in EOS, the Center has been designated a Primary Data and Archival Center for Earth Radiation and Atmospheric Chemistry for the EOS. In the area of upper atmospheric research, Langley civil service personnel will continue to study the Earth's atmosphere to assess any changes caused by man and to determine whether or not there is any associated change in the chemical composition of the stratosphere that would change the transmission of solar ultra violet radiation to the Earth's surface. Langley scientists have used satellite and airborne remote sensors to probe the Antarctic and Arctic ozone holes in the 1987 and 1989 international campaigns and focused their capabilities on the Arctic mission in 1991 and 1992. Efforts will continue in defining and developing satellite experiments that will provide measurements of atmospheric constituents, radiation budget and other characteristics.

A significant improvement in the understanding of man's impact on the atmosphere and climate will be obtained from the combination of Langley developed statistical/theoretical models and the comprehensive global data set provided by present spaceborne sensors such as Stratospheric Aerosol Measurements 11, and Stratospheric Aerosol and Gas Experiments, Measurements of Air Pollution from Satellites, and Earth Radiation Budget Experiments. The Halogen Occultation Experiment (HalOE) is operating on the Upper Atmospheric Research Satellite to measure trace stratospheric constituents.

The Lidar Atmospheric Sensing Experiment (LASE) will fly on the NASA ER-2 aircraft to profile trace gases and aerosols in the lower atmosphere, and the Lidar In-Space Technology Experiment (LITE) will fly on the Shuttle to demonstrate active laser remote sensing from space. The Center's sensor development program encompasses the broadest possible range of advanced remote sensing techniques, including gas filter radiometry and interferometry, lidar, and active and passive microwave techniques.

Langley is managing the Global Tropospheric Experiment which is a coordinated program of theoretical modeling, field measurements, data analysis, and technology development to contribute to the enhanced understanding of the chemical and dynamic processes of the global troposphere.

Studies of the Earth's radiation budget are fundamental to the understanding of climate phenomena. Langley has the responsibility for data processing and analysis of the Earth Radiation Budget Experiment, a prime element in NASA's support of the National Climate Program. Major studies include analysis of other satellite data and theoretical models to examine the relationship of the radiation budget to such climatological parameters as cloudiness, snow and ice cover, and sea surface temperature. Langley researchers are developing the experimental and theoretical capability to extend the Earth Radiation Budget top-of-the atmosphere measurements to the surface of the Earth.

Langley is currently managing the Second Phase of the First International Satellite Cloud Climatology Project (ISCCP) Regional Experiment (FIRE) which concentrates on improving the basic knowledge of clouds which are one of the least understood, yet highly influential, components of the climate system.

Langley is responsible for conducting basic research activities to establish scientific and engineering bases to evaluate the potential of crystal growth in space for advanced electronic and electro-optical devices. Laboratory results will be verified in planned Shuttle flight tests. The Center also has a key role in cooperation with other Centers in developing microgravity science facilities for use on the Space Station Freedom.

	Permanent Civil Service Workyears
AERONAUTICS AND SPACE TECHNOLOGY.................	1,852
AERONAUTICAL RESEARCH AND TECHNOLOGY................	1,271

The aeronautical research and technology program at Langley is characterized by the application of discipline research to specific technology requirements, demonstrations of particular technology applications, and the examination of future technology requirements. The unique wind tunnels, computing facilities, and flight operations capabilities at Langley complement the expertise of the technical staff to produce a broad cohesive program in aeronautical research.

The aerodynamics activity at Langley encompasses extensive theoretical and experimental activities. Basic work in fluid and flight mechanics involves theoretical and experimental determination of aerodynamic flows and complex aircraft motions. The program utilizes the many unique Langley capabilities and facilities, including the CRAY-2 and Cray YMP supercomputers and wind tunnel testing capability of the National Transonic Facility (NTF), which provides improved simulation of full flight scale conditions.

Research areas include airfoil and wing design, flowfield analysis, configuration design processes, aircraft noise prediction, control analysis, aircraft drag reduction, propulsion system integration, flight dynamics, and fighter and missile aerodynamics. The Cray-2 supercomputer is in use in the areas of far-field noise, three-dimensional (3-D) potential flow programs, and the solution of 2-D and 3-D Navier-Stokes equations. Basic research on the conception and development of methods for reducing turbulent skin-friction drag and both passive and active laminar flow retention will be pursued. A goal of viscous drag reduction activities is to validate the various concepts to the level required for aircraft manufacturers to consider their use in future production aircraft. Application of advanced transonic theories to the design of improved 3-D wings will be continued and evaluated by wind tunnel tests. The development of design methodology for high-performance aircraft at high angles of attack in the areas of aerodynamics, controls, and handling qualities will be continued. Critical environmental compatibility issues are being studied to establish a foundation for subsequent decisions on future high speed civil transport technology and development programs. Technology options for realization of practical hypersonic and transatmospheric flight are being examined.

Activities in acoustics and noise reduction include research on jet noise, propeller noise, interior noise, rotor blade noise, atmospheric propagation, structure-borne noise, and system noise prediction.

The materials and structures effort is directed at the development of new and improved structural materials, fabrication processes, and structural design technology to improve the structural efficiency, reliability, and durability as well as reduce design costs of airframes and components. This activity is directed toward research on advanced composite materials, advanced metallic materials, computer-aided analysis and structural design technology, and development of life prediction methodology. Research in aeroelasticity emphasizes prediction and control of the dynamic stability of both fixed-wing aircraft and rotorcraft with theoretical studies and wind tunnel tests for validation. Aircraft safety research includes handling qualities, runway friction, aircraft tire mechanics, and crash worthiness of airframe structures.

Emerging technological advances in computer systems are being used to significantly increase engineering computational capability and reduce the cost of engineering computations. The Langley research program in computer science is directed at systems for distributed computer networks, methods for concurrent systems design, software engineering, fault-tolerant software techniques for improved system reliability, and software development management. In addition, studies to develop methods for validation and verification of knowledge-based software/systems have been initiated. Investigations of advanced computer hardware applications will be continued with finite-element structural analysis.

Controls and guidance work at Langley includes research programs to advance technology development in aircraft guidance and navigation, aircraft control systems, cockpit systems integration and interfacing techniques, and performance validation and verification methods for fully integrated, highly reliable flight control systems. Also, major efforts in aircraft flight management, operating procedures technology and controls technology for advanced transport aircraft are being conducted. The work includes requirement analyses, design studies, ground simulations, and experimental flight research in Langley's Boeing 737 research aircraft. The Langley expertise in the controls and guidance area is being applied to a range of problems, including intersystems communications networks for enhanced interfacing and integration of functions within an aircraft, flight path definitions, and advanced technology for pilot-system interfaces for aircraft. Investigations continue on the integration of aircraft with enhanced capabilities into the evolving air traffic control system in order to achieve benefits in capacity and efficiency while maintaining safety. Other efforts include the definition of technology for enhanced functional integration to increase aircraft systems reliability and reduce operating cost, and the investigation of concepts and technology which will result in greatly improved aircraft displays and input/output capabilities. Other technology applications are found in research on advanced flight control systems, design procedures, handling and flying qualities criteria for advanced aircraft, and modeling and assessment of pilot performance and workload using advanced human performance measurement tools. Research efforts in developing and applying artificial intelligence technology to aircraft cockpits are underway. The avionics integration research laboratory continues to be used for both NASA and industry research on fault-tolerant systems and software. This year, a new research program, directed at developing the technology base for confident application of integrated Fly-by-Light (FBL)/Power-by-Wire (PBW) systems to transport aircraft has been initiated. Langley is responsible for overall program management and the FBL research activity. A major element in Langley's FBL program is the investigation of High Intensity Radiated Fields (HIRE) and their impact on digital aircraft systems. A major joint FAA/NASA research effort is underway to develop the technology required to model, detect, and either avoid or safely fly through low altitude wind shear environments.

Langley has traditionally received requests from other agencies and industry for test support of their aircraft, missiles, and systems development programs. The Aerostructures Directorate of the U.S. Army Aviation Research and Technology Activity, and the Avionics Technology Directorate, both under Aviation Systems Command, are located at Langley. These directorates, the primary investigators of Army rotorcraft structures and avionics, work on independent research and development projects and on projects of mutual interest with a staff integrated into the NASA organization. Langley facilities are used extensively for these research activities. There are also a large number of joint programs with the Air Force Systems Command, the Naval Air Systems Command, other DOD components, and the Federal Aviation Administration.

	Permanent Civil Service Workyears
SPACE RESEARCH AND TECHNOLOGY.....................	521

The space research and technology program at Langley is characterized by levels of effort in several discipline areas and the application of expertise to current and future technology requirements. Longer range studies are directed at defining the technology requirements for future space systems and missions including technology development for a second-generation Space Shuttle, Space Transfer Vehicles (STV), Space Station Freedom, lunar bases, and Mars exploration. In the Civil Space Technology Initiative (CSTI), LaRC supports the Space Transportation, Operations, Space Platforms and Science thrust. Mission and system analysis are directed toward the establishment of requirements for future space systems and their supporting infrastructure.

The objective in the materials area is to establish and demonstrate the required technology for application of advanced materials to a wide variety of space applications. Materials systems and applications include: high-temperature composites with long-life capability for use as structural materials in future space transportation systems; high-temperature metallic materials for thermal protection systems; high-stiffness, low-weight, low-thermal expansion composites for large, long-life space structures; and deep space radiation shielding materials for the protection of life and equipment in advanced structures and spacecraft. Environmental effects on the mechanical and physical properties of materials are being studied utilizing specialized facilities and laboratories. These studies include dimensional and radiation stability of composites and thermal control coating. An integral part of the research activity is the definition of new experimental testing, nondestructive evaluation, and research facility requirements which will assure that the reliability and durability of future space structures can be adequately predicted and assessed.

The goal of the activities in the area of structures is to provide validated analysis and design methodology, design concepts, and dynamics and control methodology required for efficient long-life space transportation and payload structures. High-temperature metallic heat shield concepts and actively cooled structural and propulsion concepts for advanced space transportation systems are being developed and evaluated using specialized laboratories and wind tunnels. Analysis, design, and loads determination methodology for deployable and erectable large space platforms, antennas, and booms are being studied as part of a multi-Center, multi-disciplinary program for advanced technology. An integrated structural-thermal analysis methodology is being developed and verified for spacecraft structures. Work will be initiated on integrated controls software that will require application of advanced numerical techniques and computer hardware.

Extensive research in electronic component technology, spacecraft guidance and control, large space antenna systems, automation and robotics, and information systems technology is being conducted at Langley. Sensor research includes continuously tunable infrared laser techniques and high power/high pressure tunable gas lasers for the measurement of low concentration atmospheric constituents and transport phenomena (e.g., winds). Research related to onboard data management system concepts will be continued. This work supports a broad objective of developing candidate architectures and associated systems technology for manned spacecraft onboard data management, with potential application to the Space Station. The demonstration of wavelength division multiplexed fiber optic technology is underway at Langley. The objective of this research is to provide the component technology base for advanced local area networks used in the Space Station or other complex aerospace systems. The evaluation of solid-state and optical disk data storage technology for Space Station, Lunar/Mars missions and EOS applications has been initiated. The overall objective is to identify candidate technologies, evaluate their potential, and perform research necessary to demonstrate viability in a projected Space Station environment. Langley is evaluating advanced optical data processing techniques which take advantage of the parallelism of optics to perform complex mathematical operations such as a matrix arithmetic at high speed for potential application to complex aerospace systems. Automation/robotic technology efforts will focus on conducting systems level research on teleoperated and robotic systems, developing and demonstrating automated construction concepts and application of artificial intelligence technology. Other space technology efforts are focused on spacecraft guidance and control, software development, verification and validation techniques. Research continues on technology development for large space antennas, particularly on advanced microwave and millimeter systems for future space applications. A multi-center, multi-disciplinary technology program is underway to investigate, demonstrate, and validate the control-structures interaction of large flexible space structures through analysis, ground, and flight research experiments.

The Langley Aerothermodynamics Research Program focuses on future space transportation vehicles, developing experimental and theoretical data bases to support: Space Shuttle enhancements, reduction and interpretation of Shuttle flight data, development of aerobraking technology, future space transportation vehicles for the 1990's and beyond that employ advanced technologies other than those used for the Space Shuttle or lunar and planetary exploration concepts. The objectives are met through the development and application of experimental and theoretical techniques employing Langley computers and wind tunnel facilities, and through comparative analyses with available flight data. Disciplines include aerodynamic and aerothermodynamic performance, configuration optimization, hypersonic computational fluid flow techniques which include the continuum and rarefied regimes, experimental fluid dynamic research primarily in the Langley Hypersonic Facilities Complex, flight control systems assessment, mission analysis, trajectory performance analyses, and conceptual design studies.

The Langley program in space energy conversion is focused on radiant energy conversion concepts which transform solar and laser radiation efficiently into electricity and propulsion. One objective is to develop the technology of solar-pumped lasers for power generation, transmission, and storage for future space missions. Another objective is to develop the concepts and technology for an augmented-thrust advanced propulsion system.

Langley leads a space radiation protection program which develops the technology for shielding astronauts on extended missions, by developing the physics and computer codes which model the passage of solar and galactic cosmic rays and trapped radiations through matter, by experimentally validating the codes in the laboratory, by developing and assessing shielding concepts and by fabricating and laboratory testing the properties of candidate shielding.

	Permanent Civil Service Workyears
TRANSATMOSPHERIC RESEARCH AND TECHNOLOGY..........	60

The activities at Langley include development of fundamental processes and engineering feasibility of supersonic combustion of both ramjets and other advanced airbreathing propulsion systems; characterization of advanced materials for high-temperature applications and the development of large, hot, reusable structures for aerospace vehicles, efforts in high-speed aerodynamics, configurations, and advanced computational methods for a variety of vehicle applications, and studies to define and understand the integration of advanced technologies into a future class of horizontal takeoff and landing vehicles capable of operating to orbit and/or hypersonic cruise within the atmosphere.

SPACE EXPLORATION...............................	3

These activities include modification of state-of-the-art computer codes for modeling of the transport of galactic cosmic radiation (GCR) through engineered materials. In-house efforts will provide for preparation of multi-layered materials for shielding against GCR, including development of Boron-containing polymers for neutron absorption. Long range plans are to expose the materials to radiation and evaluate the effects of exposure on the shielding effectiveness and on the structural integrity and durability of the shielding material.

COMMERCIAL PROGRAMS.............................	15

The objective of the Commercial Use of Space Program is to increase private sector awareness of space opportunities and encourage industry investment and participation in high technology space based research, application and development. This effort establishes an organizational focal point specifically intended to foster commercial access, use and development of space.

The NASA technology utilization program will contribute to the enhancement of economic growth and support state and local governments solutions to public problems through the transfer of new technology, from aeronautical and space research and development efforts, to the non-aerospace segments of the economy.

Civil service personnel will provide support to define methods to expedite the application of new technology by compressing the time between the generation of technology and its application, and encourage the use of aerospace technology in non-aerospace segments of the economy.

	Permanent Civil Service Workyears
SAFETY. RELIABILITY, MAINTAINABILITY AND QUALITY ASSURANCE..	13

The Safety, Reliability, Maintainability and Quality Assurance program is to provide independent assessment activities which reduce program risk. Langley's multidiscipline research and development laboratory will house research which will provide detailed understanding of fundamental physical phenomena important to quantitative measurement science focused on nondestructive material characterization in support of LaRC, NASA, and the broader aerospace community through technology transfer.

CENTER MANAGEMENT AND OPERATIONS..................	715

Center Management and Operations provides services or support to all Langley organizations. The civil service personnel involved are:

Director and Staff - The Center Director, Deputy Director, Associate Director, and immediate staff; e.g., Chief Scientist, Chief Engineer, Equal Opportunity, and External Affairs.

Management Support - Provide information and control services supporting all levels of Center management, both program and functional. Specific functions include resources and financial management, program control, contracting and procurement, property management, personnel management, and management systems and analysis.

Operations Support - Provide for the operation and maintenance of institutional facilities, buildings, systems, and equipment, including those who manage or provide technical services such as automatic data processing, reliability and quality assurance, medical care, and photographic support.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

			1992		1993
		1991 Actual	Budget Estimate	Current Estimate	Budget Estimate
		(Thousands of Dollars)			
I.	PERSONNEL AND RELATED COSTS	156,117	166,138	167,412	174,500
II.	TRAVEL	4.516	4.799	4.703	5.165
111.	OPERATION OF INSTALLATION	53,898	60,252	0	0
A.	Facilities Services	22,503	26,208	0	0
B.	Technical Services	12,803	14,728	0	0
C.	Management and Operations	18,592	16,174	0	0
D.	Implementation of Project CORE	0	3.142	0	0
	Total, Fund Requirement	214.531	231,189	172,115	179,665

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

RESOURCES REQUIREMENTS BY FUNCTION

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
I. PERSONNEL AND RELATED COSTS	156,117	166,138	167,412	174,500

Summary of Fund Requirements

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A. Compensation and Benefits				
1. Compensation				
a. Full-time permanent	127,038	134,940	134,958	139,742
b. Other than full-time permanent	2,286	2,355	2,498	2,205
C. Reimbursable detailees	0	0	0	0
d. Overtime and other compensation	1,626	1,622	1,568	1,486
Subtotal, Compensation	130,950	138,917	139,024	143,433
2. Benefits	22,683	24,575	24,829	26,536
Subtotal, Compensation and Benefits	153,633	163,492	163,853	169,969

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
B. Supporting Costs				
1. Transfer of personnel	377	588	184	131
2. Investigative Services and Core Conv	0	0	1,400	2,350
3. Personnel training	2,107	2,058	1,975	2,050
Subtotal, Supporting Costs	2,484	2,646	3,559	4,531
Total, Personnel and Related Costs	156,117	166,138	167,412	174,500

Explanation of Fund Requirements

A. Compensation and Benefits

1. Compensation

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
a. Full-time permanent	127,038	134,940	134,958	139,742

The 1992 Current Estimate includes the increase for the additional pay raise from 4.0% to 4.2%, offset by a decrease due to repricing of the current FTE. The 1993 Estimate includes funding for a full year of the 1992 pay raise, the anticipated 1993 pay raise, and full year funding for promotions, within grade increases and other personnel actions. The plan in 1993 is to fund our approved ceiling FTE by maximizing lapse savings, hiring more freshouts and reducing discretionary salary growth factors.

Basis of Cost for Permanent Workyears

In 1993, the cost of permanent workyears will be $139,742,000.

Cost of permanent workyears in 1992..................		$134,958
Cost increases in 1992................................		8,493
Within grade and career development advances:		
Full year effect of 1992 actions..................	2,019	
Partial year effect of 1993 actions...............	1,308	
Full year cost of 1992 pay raise..................	1,552	
Partial year cost of 1993 pay raise...............	3,614	
Cost decreases in 1993................................		- 3,709
Savings due to personnel turnover:		
Full year effect of 1992 actions..................	- 1,495	
Partial year effect of 1993 actions...............	- 1,716	
Fewer paid days in 1993..........................	- 498	
Cost of full-time permanent workyears in 1993..........		$139,742

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
b. Other than full-time permanent				
(1) cost	2,286	2,355	2,498	2,205

The increase from the 1992 Budget Estimate to the 1992 Current Estimate reflects additional costs for increased Cooperative Education Program employes, which no longer are reflected in the FTE ceiling. In 1993 the funding decreases as Langley reduces its Co-op program to divert funds to maintain the approved FTE ceiling.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
c. Reimbursable detailees	0	0	0	0
d. Overtime and other compensation	1,626	1,622	1,568	1,486

The overtime and other budget category consists of overtime, holiday pay, incentive awards, night differential, Sunday premium pay and overseas assignments. Use of overtime and other compensation is primarily used for emergency repairs and work that cannot be accomplished during normal duty hours. This includes the monitoring of contracts during off-duty hours and wind tunnel operations required at night to take advantage of off-peak electrical rates. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate and the 1993 Estimate is driven by constraints to divert these funds to maintain our current FTE program.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
2. Benefits	22,683	24,575	24,829	26,536

The following are the amounts of contribution by category:

Retirement Fund and Thrift Plan..............	11,750	11,749	12,622	13,425
Federal Group Life Insurance.................	240	256	256	272
Employee Health Insurance...................	6,397	7,579	6,788	7,551
Workers' Compensation......................	595	590	773	603
FICA.......................................	2,068	2,885	2,382	2,519
Medicare...................................	1,622	1,501	1,949	2,107
Benefits for Former Personnel................	11	0	59	59
Total......................................	22,683	24.575	24.829	26.536

The increase from the 1992 Budget Estimate to the 1992 Current Estimate reflects a revised estimate of benefits to include the January 1992 increased pay raise of .2%, medicare increases due to the new cap and more FERS hires, offset by decreases in FICA and health insurance estimates. The 1993 increase reflects the full year effect of the 1992 pay raise, the 1993 pay raise, anticipated health insurance increases and expected increases for retirement and FICA costs based on most of the new hires participating in the more expensive FERS program.

B. Supporting Costs

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Transfer of Personnel	377	588	184	131

This supporting costs category includes movement of household goods, subsistence and temporary expenses, real estate costs and miscellaneous moving expenses related to change of duty station. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate and the 1993 Budget is based on a plan which calls for specific curtailment in relocation costs in order to divert funds to maintain our current approved FTE ceiling.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
2. Investigative Services and Core Conv	0	0	1,400	2,350

The 1992 Current Estimate reflects the implementation of the approved Core conversions. The 1993 Estimate includes the full year funding of 1992 and the transfer of the security investigation responsibility from Headquarters to the centers.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
3. Personnel Training	2,107	2,058	1,975	2,050

The purpose of the LaRC training program is to continue to develop the skills and knowledge of civil service employees in order to more efficiently support center roles and missions. The benefits derived by NASA from training and educational programs are: enhancement of scientific and engineering leadership in the scientific community; maintenance of a high degree of professional competency with the administrative and clerical workforce; development of needed skills and knowledge required in center mission activities; extending our Center's workforce capability; increasing productivity; and emphasizing "Upward Mobility" training of women and minorities and Equal Opportunity Seminars. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate reflects reduced funding in order to divert funds to maintain our approved FTE ceiling. The increase in 1993 continues the same level with inflation.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
II. TRAVEL	4.516	4.799	4.703	5.165

Summary of Fund Requirements

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A. Program Travel	2,977	3,147	3,165	3,562
B. Scientific and Technical Development Travel	1,032	1,131	1,068	1,113
C. Management and Operations Travel	507	521	470	490
Total, Travel	4,516	4,799	4,703	5,165

Explanation of Fund Requirements

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A. Program Travel	2,977	3,147	3,165	3,562

Program travel is directly related to the accomplishment of the Center's mission. Travel for program purposes reflects the continuing effort in space research, aircraft technology, flight simulation, fluid mechanics, airborne science and applications, space applications, Space Station Freedom and Shuttle support. Increases in the **1993** Budget Estimate are primarily due to inflation.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
B. Scientific and Technical Development Travel	1,032	1,131	1,068	1,113

Scientific and technical development travel permits employees to participate in meetings and technical seminars with other representatives of the aerospace community. Participation allows staff to benefit from exposure to technological advances outside Langley, as well as to present both accomplishments and problems to their associates. The decrease from the **1992** Budget Estimate to the **1992** Current Estimate is due to a reduction in the anticipated number of trips as a result of reallocation of funds to meet Center priorities. The increase from the **1992** Current Estimate to the **1993** Budget Estimate provides the same level with inflation.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
C. Management and Operations Travel	507	521	470	490

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters and other NASA Centers; peer group reviews; and local transportation. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate is due to a reallocation of available resources to meet Center priorities. The increase to the 1993 Budget Estimate reflects essentially the same level of operation as anticipated in 1992.

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)			
III.	OPERATION OF INSTALLATION	53,898	60,252	0	0

Summary of Fund Requirements

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A.	Facilities Services				
1.	Rental of Real Property	1	10	0	0
2.	Maintenance and Related Services	5,092	5,636	0	0
3.	Custodial Services	4,416	4,685	0	0
4.	Utility Services	12,994	15,877	0	0
	Total, Facilities Services	22,503	26,208	0	0
B.	Technical Services				
1.	Automatic Data Processing	6,697	8,457	0	0
2.	Scientific and Technical Information	6,106	6,271	0	0
3.	Shop and Support Services	0	0	0	0
	Total, Technical Services	12,803	14,728	0	0

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)			
C.	Management and Operations				
	1. Administrative Communications	4,543	1,595	0	0
	2. Printing and Reproduction	1,555	1,620	0	0
	3. Transportation	1,648	1,801	0	0
	4. Installation Common Services	10.846	11.158	0	0
	Total, Management and Operations	18,592	16,174	0	0
D.	Implementation of Project CORE	0	3,142	0	0
	Total, Operation of Installation	53,898	60,252	0	0

Explanation of Fund Requirements

Operation of Installation provided a broad range of services, supplies, and equipment in support of the Center's institutional activities. These are divided into three major functional areas: Facilities Services, the cost of maintaining and repairing institutional administrative facilities and equipment, and the cost of custodial services and utilities; Technical Services, the cost of automatic data processing for management activities, and the cost of educational and informational programs and technical shops supporting institutional activities; and Management and Operations, the cost of administrative communications, reproduction, transportation, medical and logistic services, and administrative supplies, support and equipment acquisition. Additionally, in **1992** Operation of Installation included funding for the implementation of Project CORE, which will convert certain functions from contractors to civil servants.

The activities that had been budgeted in the Operation of Installation account are no longer included in the Research and Program Management (R&PM) budget. Project CORE funds are budgeted in the Salary and Related

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thausands of Dollars)		

Costs account and the remainder are included in the Research and Development and Space Flight, Control and Data Communications budgets.

A. Facilities Services

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Rental of Real Property	1	10	0	0

Funds covered the cost of leasing rights of way for access at model drop zone areas at Plum Tree Island, Virginia, rental of trailers, and off-site leasing of office buildings for existing and additional personnel.

2. Maintenance and Related Services	5,092	5,636	0	0

Provided funds for maintenance and repair of institutional administrative buildings and other facilities, and roads and grounds maintenance.

3. Custodial Services	4,416	4,685	0	0

Provided for janitorial, security, and ambulance services. These services are provided by support contractors and include office cleaning, pest control, minor laundry services, trash removal, badging of all on-site personnel and visitors, and vehicle identification. Fire protection is purchased from the City of Hampton.

4. Utility Services	12,994	15,877	0	0

Provided for purchase of electric service from Virginia Power Company, fuel oil from a local supplier, and water and sewage charges. Also included were funds for heat and steam services from the Air Force for East Area facilities, the purchase of steam from the City of Hampton, and operation of the NASA cooperative refuse

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			

burner for facilities located in the west area of Langley. Contractor support for the steam generating and high pressure air plant is included.

B. Technical Services

1. Automatic Data Processing	6,697	8,457	0	0

This estimate provided for Langley's business data systems complex which provides the Center's accounting and management information data. Included are equipment lease, purchase, and maintenance; paper and other expendable supplies; and a contract for programming and operations.

2. Scientific and Technical Information	6,106	6,271	0	0

This estimate provided support contract and related materials for the operation of the technical library and the Visitor Information Center. Funding for all the Center's public affairs activities, technical documentation, safety, graphics, and photographic services are included. Additionally, coordination of tours and special events, construction and transportation of exhibits, and other educational and informational programs are included.

C. Management and Operations

1. Administrative Communications	4,543	1,595	0	0

Included funds for local telephone and exchange costs, and datafax and telegraph service.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
2. Printing and Reproduction	1,595	1,620	0	0

This function provided for administrative printing including the operating cost of the printing and reproduction facility as well as supplies, materials, equipment acquisitions and outside procurements. Also included were services performed by other agencies, chiefly the Government Printing Office. All common processes of duplicating including photostating, blueprinting, microfilming, and other reproductions were included. These services were provided by a support contractor.

3. Transportation	1,648	1,801	0	0

Funds provided for the operation, maintenance, and purchase of motor vehicles; shipping, transportation, and freight charges. Also included are charges for local transportation, pickup and delivery of freight.

4. Installation Common Services	10,846	11,158	0	0

Provided for medical services, hazardous waste disposal, mail delivery, stock issue and warehousing, and other general administrative support. Also included are the rental and maintenance of office aopy machines and equipment, minority programs, and other administrative services and supplies.

D. Implementation of Project CORE	0	3,142	0	0

The Langley Research Center had planned to convert 80 positions from contractors to civil servants. Because of Congressional action, these plans are under review. Until this review is completed, funds for such conversions are being held in the Salary and Related Costs account.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

LANGLEY RESEARCH CENTER

ORGANIZATION AND STAFFING CHART

RPM 7-23

STAFFING SUMMARY

	92	93
SES	*40	*25
GS/GM 16	0	0
GS/GM 15	əu	əu
GS/GM 14	386	386
OTHER GS/GM	2264	[illegible]
WAGE	10	10
TOTAL	2924	2920

* Includes 4 STs

OFFICE OF THE DIRECTOR

	92	93
SES	5	4
GS/GM 16	0	0
GS/GM 15	2	2
GS/GM 14	2	2
OTHER GS/GM	21	21
WAGE	0	0
TOTAL	30	29

OFFICE OF DIRECTOR FOR ELECTRONICS

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	1	1
GS/GM 14	I	1
OTHER GS/GM	3	3
WAGE	0	0
TOTAL	6	6

ANALYSIS AND COMPUTAT'N DIVISION

	92	93
SES	1	0
GS/GM 16	0	0
GS/GM 15	10	10
GS/GM 14	6	6
OTHER GS/GM	84	84
WAGE	0	0
TOTAL	101	100

INSTRUMENT RESEARCH DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	11	11
GS/GM 14	19	19
OTHER GS/GM	110	110
WAGE	0	0
TOTAL	141	141

FLIGHT ELECTRONICS DIVISION

	92	93
SES	1	0
GS/GM 16	0	0
GS/GM 15	7	7
GS/GM 14	23	23
OTHER GS/GM	86	87
WAGE	0	0
TOTAL	117	117

PROJECTS DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	9	9
GS/GM 14	11	11
OTHER GS/GM	20	20
WAGE	0	0
TOTAL	41	41

OFFICE OF DIRECTOR FOR STRUCTURES

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM II	1	I
GS/GM 14	0	0
OTHER GS/GM	2	2
WAGE	0	0
TOTAL	4	4

LOADS AND AEROELASTICITY DIVISION

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	6	6
GS/GM 14	12	12
OTHER GS/GM	45	45
WAGE	0	0
TOTAL	63	63

STRUCTURES & DYNAMICS DIVISION

	92	93
SES	1	0
GS/GM 16	0	0
GS/GM 15	10	10
GS/GM 14	19	19
OTHER GS/GM	47	47
WAGE	0	0
TOTAL	77	76

STRUCTURES TECH PROGRAM OFFICE

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	2	2
GS/GM 14	0	0
OTHER GS/GM	3	3
WAGE	0	0
TOTAL	5	5

MATERIALS DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	15	15
GS/GM 14	13	13
OTHER GS/GM	38	38
WAGE	0	0
TOTAL	67	67

ACOUSTICS DIVISION

	92	93
SES	1	0
GS/GM 16	0	0
GS/GM II	II	I1
GS/GM 14	6	6
OTHER GS/GM	33	33
WAGE	0	0
TOTAL	51	50

OFFICE OF DIRECTOR FOR AERONAUTICS

	92	93
SES	2	1
GS/GM 16	0	0
GS/GM II	0	0
GS/GM 14	2	2
OTHER GS/GM	4	4
WAGE	0	0
TOTAL	8	7

HYPERSONIC TECHNOLOGY OFFICE

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	3	[illegible]
GS/GM 14	4	4
OTHER GS/GM	8	8
WAGE	0	0
TOTAL	16	16

ADVANCED VEHICLES DIVISION

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	8	8
GS/GM 14	4	4
OTHER GS/GM	21	21
WAGE	0	0
TOTAL	33	33

APPLIED AERODYNAMICS DIVISION

	92	93
SES	2	2
GS/GM 16	0	0
GS/GM 15	6	6
GS/GM 14	23	23
OTHER GS/GM	84	84
WAGE	0	0
TOTAL	115	115

FLIGHT APPLICATIONS DIVISION

	92	93
SES	1	0
GS/GM 16	0	0
GS/GM 15	9	9
GS/GM 14	8	8
OTHER GS/GM	53	52
WAGE	2	2
TOTAL	73	72

FLUID MECHANICS DIVISION

	92	93
SES	*2	*2
GS/GM I6	0	0
GS/GM 15	15	II
GS/GM 14	[illegible]	[illegible]
OTHER GS/GM	59	59
WAGE	0	0
TOTAL	99	99

OFFICE OF DIRECTOR FOR MANAGEMENT OPERATIONS

	92	93
SES	2	1
GS/GM 16	0	0
GS/GM II	4	4
GS/GM 14	I	I
OTHER GS/GM	8	8
WAGE	0	0
TOTAL	19	18

FINANCIAL MGMT. DIVISION

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	1	1
GS/GM 14	2	2
OTHER GS/GM	46	46
WAGE	0	0
TOTAL	49	49

MANAGEMENT SUPPORT DIVISION

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	1	1
GS/GM 14	3	3
OTHER GS/GM	43	43
WAGE	0	0
TOTAL	47	47

HUMAN RESOURCES MANAGEMENT DIVISION

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	1	1
GS/GM 14	6	6
OTHER GS/GM	41	41
WAGE	0	0
TOTAL	48	48

BUSINESS DATA SYSTEMS DIVISION

	92	93
SES	0	0
GS/GM I6	0	0
GS/GM I6	1	1
GS/GM 14	3	3
OTHER GS/GM	11	11
WAGE	0	0
TOTAL	15	15

ACQUISITION DIVISION

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	1	1
GS/GM 14	8	8
OTHER GS/GM	77	77
WAGE	0	0
TOTAL	86	86

PROGRAMS & RESOURCES DIVISION

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM II	I	I
GS/GM 14	3	3
OTHER GS/GM	20	20
WAGE	0	0
TOTAL	24	24

RESEARCH INFO. & APPLICATIONS DIVISION

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	1	1
GS/GM 14	2	2
OTHER GS/GM	68	68
WAGE	8	8
TOTAL	79	79

OFFICE OF DIRECTOR FOR SYS ENG & OPERATIONS

	92	93
SES	3	2
GS/GM 16	0	0
GS/GM II	0	0
GS/GM 14	1	1
OTHER GS/GM	3	3
WAGE	0	0
TOTAL	7	6

SYSTEMS SAFETY, QUALITY AND RELIABILITY DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	2	2
GS/GM 14	5	5
OTHER GS/GM	32	32
WAGE	0	0
TOTAL	40	40

FABRICATION DIVISION

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	2	2
GS/GM 14	5	5
OTHER GS/GM	301	301
WAGE	0	0
TOTAL	308	308

FACILITIES PROGRAM DEVELOPMENT OFFICE

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	2	2
GS/GM 14	2	2
OTHER GS/GM	5	5
WAGE	0	0
TOTAL	9	9

SYSTEMS ENGINEERING DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	9	9
GS/GM 14	18	18
OTHER GS/GM	108	108
WAGE	0	0
TOTAL	136	136

FACILITIES ENGINEERING DIVISION

	92	93
SES	0	0
GS/GM I6	0	0
GS/GM 15	12	12
GS/GM 14	14	14
OTHER GS/GM	98	98
WAGE	0	0
TOTAL	124	124

OPERATIONS SUPPORT DIVISION

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	I	I
GS/GM [illegible]	6	I
OTHER GS/GM	413	413
WAGE	0	0
TOTAL	420	420

8 FT HIGH TEMP. SHAKEDOWN PROJECT OFFICE

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	2	2
GS/GM 14	2	2
OTHER GS/GM	1	1
WAGE	0	0
TOTAL	5	5

OFFICE OF DIRECTOR FOR SPACE

	92	93
SES	1	1
GS/GM I6	0	0
GS/GM 15	1	1
GS/GM 14	4	4
OTHER GS/GM	5	5
WAGE	0	0
TOTAL	11	11

SPACE STATION FREEDOM OFFICE

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	7	7
GS/GM 14	6	6
OTHER GS/GM	22	22
WAGE	0	0
TOTAL	36	36

ATMOSPHERIC SCIENCES DIVISION

	92	93
SES	0	0
GS/GM 16	0	0
GS/GM 15	22	22
GS/GM 14	26	26
OTHER GS/GM	46	46
WAGE	0	0
TOTAL	94	94

SPACE SYSTEMS DIVISION

	92	93
SES	2	0
GS/GM 16	0	0
GS/GM 15	15	15
GS/GM 14	20	20
OTHER GS/GM	56	56
WAGE	0	0
TOTAL	93	91

SPACE EXPLOR INITIATIVE OFFICE

	92	93
SES	1	0
GS/GM 16	0	0
GS/GM I6	2	2
GS/GM 14	3	3
OTHER GS/GM	2	2
WAGE	0	0
TOTAL	8	7

OFFICE OF DIRECTOR FOR FLIGHT SYSTEMS

	92	93
SES	1	1
GS/GM I6	0	0
GS/GM 15	2	2
GS/GM 14	I	1
OTHER GS/GM	3	3
WAGE	0	0
TOTAL	7	7

INFORMATION SYSTEMS DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	10	10
GS/GM 14	10	10
OTHER GS/GM	57	57
WAGE	0	0
TOTAL	78	78

GUIDANCE & CONTROL DIVISION

	92	93
SES	1	0
GS/GM 16	0	0
GS/GM 15	13	13
GS/GM 14	22	22
OTHER GS/GM	48	48
WAGE	0	0
TOTAL	84	83

FLIGHT MANAGEMENT DIVISION

	92	93
SES	1	1
GS/GM 16	0	0
GS/GM 15	5	5
GS/GM 14	13	13
OTHER GS/GM	34	34
WAGE	0	0
TOTAL	53	53

LEWIS
RESEARCH CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1993 ESTIMATES

LEWIS RESEARCH CENTER

DESCRIPTION

The Lewis Research Center (LeRC) occupies two sites in north central Ohio. The original site, established in 1941, is adjacent to the Cleveland-Hopkins International Airport. It includes 366 acres, 14 of which are leased from the City of Cleveland. There are over 170 buildings and structures, including wind tunnels, test chamber, laboratories and other research facilities at the Cleveland location.

The second site is Plum Brook Station, established in 1956, which is located south of Sandusky, Ohio, about 50 miles west of Cleveland. It is on land formerly occupied by the Plum Brook Ordinance works. There are 6,454 acres owned by NASA and approximately 47 acres in easements. Following a standby period from 1975 to 1987, several major test facilities have been reactivated. Four major test programs are in process for NASA programs and in support of other government agencies.

The total capital investment of Lewis and Plum Brook Station, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1991, was $673,106,000.

CENTER ROLES AND MISSIONS

Lewis was established as an aircraft engine research laboratory to develop superior aircraft propulsion systems. Since then, Lewis has developed and constructed many unique facilities for testing full-scale aircraft engines and engine components, chemical rocket engines, electric propulsion systems, space and terrestrial power generation systems, microgravity phenomena and space communication systems. The principal and supporting roles are:

PRINCIPAL:

Aeronautical Research and Technology - plans, advocates, and directs aeropropulsion research and technology (R&T) which significantly contributes to maintaining a preeminent national capability in fundamental aeropropulsion disciplines and aeronautical propulsion technologies.

Transatmospheric Research and Technoloev - combines aeronautics and space disciplines to provide the technology for a future class of vehicles capable of horizontal takeoff to orbit and/or hypersonic cruise.

Space Station Freedom - manage the design, development, fabrication and test of the Space Station Freedom Power System. This includes responsibility for the overall end-to-end power architecture, delivery of three power modules, their integration into the shuttle, and their assembly on orbit.

Communications - Develop the high-risk technologies required to ensure continued U.S. preeminence in space communications which will be applicable to a wide range of future systems required by NASA, U.S. industry, and other U.S. government agencies.

Expendable Launch Vehicles - manage procurement and operation of intermediate and large class expendable launch vehicle services for NASA and other government agencies.

Space Propulsion Svstems Technoloev - develop and enhance the technology base for nuclear and electric advanced high and low thrust primary and auxiliary propulsion systems, including associated structures, materials and analytical technologies.

Space Energy Processes and Svstems Technoloev · develop and maintain the technology base for space power and energy conversion systems, including associated structures, materials and analytical technologies.

In-Space Flieht Experiments - conduct microgravity experiments in materials, combustion, and fundamental sciences and fluid physics and develop flight experiments that contribute to space power, propulsion, and thermal and fluid management technologies.

Commercialization of Space - promote and facilitate the commercialization of space by providing technical support to the Centers for the Commercial Development of Space and by increasing the awareness of U.S. industry of commercial space opportunities.

Technolonv Utilization - plan, organize and facilitate the transfer of NASA-developed technology to the non-aerospace community.

SUPPORTING:

Enerav Processes and Svstems Technolonv - manage selected research and technology projects for terrestrial propulsion systems synergistic to NASA programs.

High Performance Computing and Communications - conduct research to develop necessary computational technology for the numerical simulation of propulsion systems.

DISTRIBUTION OF FULL TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

LEWIS	1991 ACTUAL	1992 BUDGET ESTIMATE	1992 CURRENT ESTIMATE	1993 BUDGET ESTIMATE
SPACE STATION	380	426	390	400
SPACE FLIGHT PROGRAMS	81	71	60	60
SPACE TRANSPORTATION CAPABILITY DEV	5	7	5	5
SPACE TRANSPORTATION OPERATIONS	76	64	55	55
SPACE SCIENCE AND APPLICATIONS	319	294	247	230
PHYSICS AND ASTRONOMY	0	0	0	0
LIFE SCIENCES	0	0	0	0
PLANETARY EXPLORATION	0	0	0	0
SPACE APPLICATIONS	319	294	247	230
AERONAUTICS AND SPACE TECHNOLOGY	1,414	1,476	1,481	1,495
AERONAUTICAL RESEARCH AND TECHNOLOGY	875	869	881	915
SPACE RESEARCH AND TECHNOLOGY	493	555	550	550
TRANSATMOSPHERIC RESEARCH AND TECH	46	52	50	30
SPACE EXPLORATION	0	0	0	0
COMMERCIAL PROGRAMS	11	8	23	23
SAFETY, RELIABILITY & QUALITY ASSURANCE	1	2	2	2
ACADEMIC PROGRAMS	0	0	0	0
TRACKING AND DATA PROGRAMS	10	4	15	15
SUBTOTAL - DIRECT FULL-TIME PERM FTEs	2,216	2,281	2.218	2,225
CENTER MANAGEMENT AND OPERATIONS	583	510	572	562
SUBTOTAL - FULL-TIME PERM FTEs	2,799	2,791	2,790	2.787
OTHER FTEs	38	40	41	44
SUBTOTAL - FULL-TIME EQUIVALENTS	2,837	2.831	2.831	2.831
PROJECT CORE	0	61	30	81
GRAND TOTAL - FULL-TIME EQUIVALENTS	2.837	2.892	2.861	2.912

PROGRAM DESCRIPTION

	Permanent Civil Service Workyears
SPACE STATION	***400***

In 1993, civil service personnel will continue to manage the detail design, development and hardware fabrication activities, leading to qualification of flight hardware. Civil service employees will also continue the activities at Lewis associated with the power system integrated test bed in the Power Systems Facility; nickel hydrogen battery tests, and preparing the engineering support center for the operations phase.

SPACE FLIGHT PROGRAMS	**60**
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT	**5**

During 1993, Lewis will continue to conduct studies which provide long-range planning for future launch systems. Lewis will manage in-house and contractor studies that will define concepts and technology required for future missions including Lunar/Mars, Mission to Planet Earth and planetary robotic missions.

SPACE TRANSPORTATION OPERATIONS	***55***

Lewis is responsible for procurement and management of commercial launch services for the intermediate (Atlas/Centaur and Titan 111) and large (Titan IV) class expendable launch vehicles in the NASA Mixed Fleet. Contracts are in place for five Geostationary Operational Environmental Satellite (GOES) missions and one Solar and Heliospheric Observatory (SOHO) mission on Atlas/Centaur vehicles, and for Mars Observer (MO) on Titan 111. In addition, feasibility studies, launch vehicle/spacecraft integration activities, and procurement actions are underway for missions such as Tracking and Data Relay Satellite System II, Cassini, Advanced X-Ray Astrophysics Facility (AXAF), and Earth Observation System (EOS).

	Permanent Civil Service Workyears
SPACE SCIENCE AND APPLICATIONS	**230**
SPACE APPLICATIONS................................	**230**

Space Applications activity at Lewis consists of: microgravity science and applications research, design, and development of space flight experiments, operation of ground and space flight experiments in materials, combustion, and fluid physics, and related instrumentation and advanced development activities.

Lewis is managing development of the Advanced Communications Technology Satellite. Spacecraft prelaunch tests and integration with the TOS Upper Stage and Shuttle will be made in 1993 at Kennedy Space Center. Following launch and placement on-orbit, the Spacecraft will be checked-out. A two-year experiments program will then be initiated using a variety of ground station types, with many experimenters from Government, industry and academia under the direction of the Office of Commercial Programs.

Lewis will continue and expand its work in advanced design, development and operation of microgravity experimental flight hardware and conduct ground-based research and flight experiments in basic science and technology associated with materials, combustion, fluid dynamics phenomena, and power and propulsion technology in reduced gravity. Development of associated instrumentation, advanced technology, and research facilities for Space Station Freedom will also continue during 1993 under the direction of the Office of Commercial Programs.

AERONAUTICS AND SPACE TECHNOLOGY	1,495
AERONAUTICAL RESEARCH AND TECHNOLOGY................	915

The Aeronautics research and technology program at Lewis provides innovative aerospace propulsion research and technology. The primary goal is to develop aeropropulsion technology which contributes significantly to the continuing preeminence of the U.S. civil and military aircraft industry. The approach is to provide the technology base for developing advanced aeronautical propulsion systems which will lead to higher speed;

longer range; improvements in fuel efficiency, operating cost, reliability and durability; and/or which will operate with acceptable environmental impact with respect to reduced NOX emissions and community (sonic boom)/airport noise. The Lewis aeropropulsion program includes key generic discipline research, focused interdisciplinary research, and efforts focused on specific propulsion systems/vehicle applications. The Propulsion Directorate of the U.S. Army Laboratory Command is co-located with Lewis Research Center. Both program offices share a mutual interest in independent research and technology development.

The generic discipline research includes internal computational fluid mechanics (ICFM); instrumentation and controls technology; materials, and computational structural mechanics. The objective of this research is to develop an understanding of the physical phenomena involved in these disciplines so that advanced concepts and accurate analytical tools can be developed to predict and to improve propulsion system performance. The scope of the ICFM research includes computational methods, modeling and verification, and applications. The focus of the instrumentation and controls technology is the development of nonintrusive research instrumentation and engine sensors/controls for the "smart" adaptive propulsion systems of the future. The advanced materials research is focused on polymers, intermetallics, ceramics and advanced composites for high temperature propulsion system applications. Computational structural mechanics involves the development and verification of advanced analytical methods for high temperature structures, structural dynamics, fracture mechanics, and the development of life prediction methodology.

The focused interdisciplinary research includes systems analysis, icing technology, high temperature materials, numerical propulsion system simulator (NPSS) and integrated high-performance turbine engine technology (IHPTET) program. Icing research brings together disciplines such as fluid mechanics and heat transfer to improve the analytical tools required for predicting icing effects, and to develop ice protection systems. The goal of icing research is to develop the technology base required to provide improved all-weather capability for civil and military aircraft. High temperature materials technology is aimed at providing improved durability and reliability of higher temperature propulsion system components through the development of advanced materials and improved experimental and analytical tools. The objective of NPSS is to develop a multidisciplinary software analysis and advanced computing hardware system capable of simulating the performance of advanced propulsion systems and predicting their life, durability, weight and cost. The goal of IHPTET is to double the thrust-to-weight ratio of military engines, thereby significantly improving their performance. The IHPTET efforts are conducted in cooperation with DoD.

As part of the Federal high performance and computing and communications program, Lewis will develop computational techniques and algorithms for propulsion systems in the computational aerosciences Grand

Challenges.

In vehicle focused research and technology, Lewis is developing the enabling propulsion technology for specific engines and propulsion systems. Research and Technology in this area involves small gas turbine engines, advanced ducted propellors, convertible engines, variable cycle engines, and new, innovative propulsion concepts such as supersonic through-flow compression systems. Applications for these focused propulsion systems research efforts include subsonic transports, commuters, supersonic cruise (High Speed Research), hypersonic aircraft, rotorcraft, general aviation, and high performance aircraft.

The Lewis aeropropulsion technology program is supported by advanced propulsion system studies and by propulsion facilities ranging from small research test rigs to large propulsion system altitude tanks and wind tunnels.

	Permanent Civil Service Workyears
SPACE RESEARCH AND TECHNOLOGY.....................	550

The Lewis program in space research and technology supports future NASA missions requiring advancements in space science, exploration and transportation systems, space platforms, and operations. This program is planned to provide significant advancements in advanced satellite, platform, and planetary power systems; to develop new propulsion options for high- and low-thrust systems--both auxiliary and primary; to greatly extend space communication capabilities and advanced space electronics; and, to provide effective means to manage cryogenic fluids in microgravity. The program includes key supporting technologies: materials, space mechanisms and tribology; structural analysis and life prediction; and power management and distribution, including fault tolerance and autonomy. Thus, this effort supports the entire range of potential NASA missions to planet earth and from planet earth. Key technologies will be validated by carefully defined in-space flight experiments in both the technologies and in the underlying basic sciences. Such technology and science experiments include those in surface and rover power; chemical and nuclear thermal and/or electric propulsion; communications; etc.

In 1993, civil service personnel will continue to support studies and proof-of-concept technology development for various advanced satellite communications systems directed at providing additional frequency bands and improved communications services.

Lewis primary propulsion programs emphasize the extensions and advancement of the technologies of hydrogen-fueled engines such as the Space Shuttle Main Engine, National Launch Systems, etc., toward long-life, reusable, serviceable, cost-effective systems for Earth-to-orbit applications. These programs concentrate on thrust chamber cooling and life, critical turbomachinery components, advanced structural analysis and life prediction, and diagnostics and automated control via expert systems. Advanced propulsion concepts are also studied.

Another major thrust is to provide the technology at the component and system level for the next generation of cryogenic hydrogen/oxygen orbital and lunar/Martian transfer propulsion systems with emphasis on performance, life and reusability and autonomy based on expert systems. Focus is on combustion and heat transfer, long-life lightweight reusable components and subsystem assemblies and their evaluation in system level test beds, high expansion area nozzles, operability, and health monitoring and diagnostics. Nuclear electric and thermal propulsion system technologies will receive increasing emphasis for potential future Lunar/Mars/etc. missions.

The Lewis low thrust propulsion programs are directed toward space platforms; orbiting satellites; e.g. EOS, TDRSS, III etc.; future transportation systems; and space science applications. Technologies are being developed for gaseous hydrogen-oxygen thrusters, resistojets capable of using various fuels, arcjets, inert gas ion thrusters, and high temperature thrusters for storable reactants.

The Lewis low thrust propulsion programs are directed toward space platforms; orbiting satellites; e.g. EOS, TDRSS 11, etc.; future transportation systems; and space science applications. Technologies are being developed for gaseous hydrogen-oxygen thrusters, resistojets capable of using various fuels, arcjets, inert gas ion thrusters, and high temperature thrusters for storable reactants. Lewis conducts critical in-space experiments in support of power and propulsion and fluid and thermal management technology advancements. These experiments are carried out under programs involving university, industry and other NASA centers.

Space power programs are focused toward evolutionary space station, lunar/planetary surface and rover power and other future space mission needs. This includes solar photovoltaic, solar dynamic, electrochemical energy conversion and storage, nuclear thermal energy conversion, thermal and power management, and power component and circuit development. The photovoltaic program seeks improvement in solar cell efficiency and life with a potential reduction in cost. In solar dynamics a higher efficiency alternative that reduces weight and area at high power levels is sought. Electrochemical research supports extended operating life and improved energy density for batteries and regenerative fuel cells and systems. The nuclear energy conversion program is directed toward the development of advanced static and dynamic thermal energy conversion technologies and associated subsystems. Major emphasis is placed on the free piston Stirling heat engine technology as the advanced dynamic conversion system for nuclear and solar thermal sources.

Fault tolerant, radiation hard power component, circuit and system autonomy technologies for hundred kilowatt and above power systems are being investigated and demonstrated at the system test bed level. New high reliability, light-weight electromechanical actuator system concepts are being studied and technology is being developed for a wide range of aerospace applications that also have many industrial spin-offs. Interactions between the space plasma environment and satellites and their power systems, as well as materials durability, are also being studied.

The space communications program includes base R&T and focused technology development on electron beam and solid state devices; antennas; RF and digital components and systems; electro-optics; high-temperature superconductors; and, the applications of knowledge-based expert systems. The program develops advanced concepts, techniques, and communications systems technologies which meet the needs of NASA missions, U.S. industry, and other government agencies.

The Lewis program in space materials and structures research and technology emphasizes the development of improved materials, advanced structural analysis and life prediction, and long-life, reliable space mechanisms for advanced space power generation and propulsion systems as well as for satellite communications systems.

During 1992-1993, Lewis will continue its involvement in selected, enabling technologies in the areas of power, cryogenic and advanced propulsion, transportation systems, cryogenic fluid management, and communications systems.

	Permanent Civil Service Workvears
TRANSATMOSPHERIC RESEARCH AND TECHNOLOGY............	30

Activities at Lewis are directed toward understanding and defining a class of airbreathing propulsion systems, using hydrogen fuel, that are applicable to orbital accelerator, and hypersonic cruise vehicles. These activities include advancements in variable geometry inlets and nozzles, characterizing a family of materials and cooling concepts compatible with extremely hot reusable engine structures, development of the computational methods necessary to analyze and define the flow in complex internal ducts and passages; and conducting the studies necessary to integrate these components into an efficient and capable propulsion system.

Permanent Civil
Service Workyears

COMMERCIAL PROGRAMS............................. 23

The Space Commercialization program at Lewis will continue to assist industry in evaluating the commercial potential of space, utilizing the Lewis Research Center's ground-based facilities and microgravity aircraft, and the technical expertise of its staff to assist industry in evaluating and testing new ideas/concepts. A major thrust will be the coordination of the ACTS experiment program following launch in 1993, as previously discussed.

The 1993 technology utilization program at Lewis will continue to concentrate on the identification and evaluation of technology which can be transferred to the non-aerospace industry, and on the development of new methods to communicate, transfer and license NASA-developed technology consistent with Federal regulation and Agency policy.

Lewis will continue to evaluate proposals for Phase I and Phase II Small Business Innovation Research (SBIR) projects and award contracts to successful offerors. Efforts will continue to increase awareness of the program among small R&D firms.

SAFETY, RELIABILITY AND QUALITY ASSURANCE.......... 2

In 1993, Lewis will continue to expand the research and technology activities being conducted in areas addressing SR&QA disciplines. Fire safety will be further investigated for design requirements for Space Station Freedom and advanced spacecraft. Lewis has established itself as a Center of Excellence in microgravity combustion and spacecraft fire-safety applications through past and ongoing studies, both out-of-house and in the unique microgravity facilities existing at Lewis. Also in 1993, Lewis will continue its lead efforts to enhance the safety reliability, and performance of NASA's aerospace battery program for use in primary and secondary space power systems. Lewis will expand its non-destructive evaluation technology efforts to address advanced composite materials and to further investigate enhanced turbine blade crack detection methodologies and techniques. Other study efforts will investigate improved and different insulation materials for wiring in space applications. Lewis will continue efforts to document reliability design practices for spaceflight systems to provide for the application of proven techniques which will assure the life and performance of systems such as Space Station Freedom and future manned and unmanned systems used for exploration of the Solar System. Efforts will also continue to provide uniform, timely, and useful data to enable the management of the risks associated with the development of new systems and the utilization of existing Aeronautics test facilities at the Center. In conjunction with these activities, independent assessments will be conducted on selected issues to assist Project Managers in reducing program risk and achieving success.

	Permanent Civil Service Workyears
CENTER MANAGEMENT AND OPERATIONS..................	562

Center Management and Operations Support is defined as support or services being provided to all Lewis organizations which cannot be directly identified to a benefitting program or project. The Civil Service personnel involved are:

Director and Staff - The Center Director, Deputy Director, and immediate staff, e.g., the Comptroller, and Directors of Equal Opportunity, External Affairs, Chief Counsel, Health Services, Interagency and Industry Programs, University Programs and Safety, Reliability and Quality Assurance.

Management Support - Those who provide information and control services supporting all levels of Center program and functional management. Specific functions include resources planning and management, contracting and procurement, personnel management, property management, financial management, and management information systems and analysis.

Operations Support - Those who provide for the operation and maintenance of institutional facilities, buildings, systems, and equipment, including those who manage or provide technical services such as general automatic data processing, medical care, and graphics support.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

			1992		1993
		1991 Actual	Budget Estimate	Current Estimate	Budget Estimate
			(Thousands of Dollars)		
I.	PERSONNEL AND RELATED COSTS	157.621	172.027	168,738	178.400
II.	TRAVEL	4,200	4,423	4,325	4,738
III.	OPERATION OF INSTALLATION	68,239	78,959	0	0
	A. Facilities Services	34,582	37,980	0	0
	B. Technical Services	13,957	15,240	0	0
	C. Management and Operations	19,700	23,609	0	0
	D. Implementation of Project CORE	0	2,130	0	0
	Total, Fund Requirement	230.060	255.409	173.063	183.138

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

RESOURCES REQUIREMENTS BY FUNCTION

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
I. PERSONNEL AND RELATED COSTS	157.621	172.027	168.738	178.400

Summary of Fund Requirements

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A. Compensation and Benefits				
1. Compensation				
a. Full-time permanent	126,354	135,930	133,809	139,637
b. Other than full-time permanent	2,222	2,553	2,634	2,835
c. Reimbursable detailees	0	0	0	0
d. Overtime and other compensation	2,110	3,034	2,222	1,491
Subtotal, Compensation	130,686	141,517	138,665	143,963
2. Benefits	23,971	27,226	26,372	28,830
Subtotal, Compensation and Benefits	154,657	168,743	165,037	172,793

Basis of Cost for Permanent Workyears

In 1993. the cost of permanent workyears will be $139.637.00. The increase from 1992 is calculated as follows:

Cost of permanent workyears in 1992......................		$133.809
Cost of increases in 1993................................		8.335
Within grade and career advancements..............		
Full year effect of 1992 actions..................	1.298	
Partial year effect of 1993 actions...............	1.872	
Full year cost of 1992 pay raise..................	1.374	
Partial year effect of 1993 pay raise.............	3.791	
Cost of changes in 1993.............................. ...		- 2.507
Full year effect of 1992 actions..................	- 867	
Partial year effect of 1993 actions...............	- 1,148	
One less day...................................	- 492	
Cost of Full-Time Permanent Workyears in 1993.............		139.637

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
b. Other than full-time permanent				
(1) cost	2,222	2,553	2,634	2,835

The increase from the 1992 Budget Estimate to the 1992 Current Estimate reflects higher salaried temporary and part-time permanent positions than planned. The 1993 increase reflects a continuation of the 1992 program with full year funding of the 1992 pay raise and the cost of the anticipated pay raise in January 1993.

C. Reimbursable detailees	0	0	0	0
d. Overtime and other compensation	2,110	3,034	2,222	1,491

The overtime and other compensation category consists of overtime, holiday pay, incentive awards, night differential, Sunday premium pay and overseas assignments. Use of overtime and other compensation is primarily used for off-peak operation of major facilities, primarily wind tunnel operations. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate is due to a re-evaluation of overtime requirements for wind tunnel operations. The decrease in the 1993 Budget is required to divert funding to compensation in an effort to maintain our current approved FTE ceiling.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
2. Benefits	23,971	27,226	26,372	28,830

The following are the amounts of contribution by category:

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
Retirement Fund and Thrift Plan....................	12,577	13,362	13,729	14,634
Employees Life Insurance..;...	207	235	217	230
Employees Health Insurance........................	6,258	7,918	6,779	7,800
Workers' Compensation............................	544	773	590	684
FICA...	3,116	3,508	3,669	4,078
Medicare...	1,212	1,405	1,328	1,342
Other Benefits...................................	57	25	60	62
Total..	93,971	27.226	26.372	28.830

The decrease from the 1992 Budget Estimate to the 1992 Current Estimate reflects a revised estimate of benefits to reflect decreased health insurance and medicare costs, offset by the additional .2% percent January 1992 pay raise and an increase in FICA and FERS. The 1993 estimate reflects the full year effect of the 1992 pay raise, the anticipated 1993 pay raise and expected increases above the pay raise in health insurance, retirement programs, medicare and FICA. The retirement and FICA costs are increased based on most of the new hires participating in the more expensive FERS program. Health insurance increases are in line with prior annual rate experience.

B. Supporting Costs

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Transfer of Personnel	320	626	185	310

This supporting costs category includes movement of household goods, subsistence and temporary expenses, real estate costs and miscellaneous moving expenses related to change of duty station. The decrease in the 1992 Budget Estimate to the 1992 Current Estimate is based on a hiring plan which indicates less hires eligible for these benefits. The 1993 Budget is consistent with normal hiring skill mixes.

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)			
2.	Investigative Services and Core Conv	0	0	900	2,575

The 1992 Current Estimate reflects the implementation of the approved Core conversions. The 1993 Estimate includes the full funding of the 1992 Core conversions, and the transfer of the security investigation responsibility from Headquarters to the centers.

3.	Personnel Training	2,644	2,658	2,616	2,722

The purpose of the LeRC training program is to continue to develop the skills and knowledge of civil service employees in order to more efficiently support center roles and missions. The benefits derived by NASA from training and educational programs are: enhancement of scientific and engineering leadership in the scientific community; maintenance of a high degree of professional competency with the administrative and clerical force; development of needed skills and knowledge required in center mission activities; extending our Center's workforce capability; increasing productivity; and emphasizing "Upward Mobility" training of women and minorities and Equal Opportunity Seminars. The 1993 Budget Estimate reflects the same level with inflation.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
II. TRAVEL	4,200	4,423	4,325	4,738

Summary of Fund Requirements

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A. Program Travel	2,720	3,043	2,859	3,154
B. Scientific and Technical Development Travel	752	652	721	812
C. Management and Operations Travel	728	728	745	772
Total, Travel	4,200	4.423	4.325	4.738

Explanation of Fund Requirements

A. Program Travel	2,720	3,043	2,859	3,154

Program travel is directly related to the accomplishment of the Center's mission. These funds are necessary for the management of major contractual programs in aeronautical research and technology, Space Station, space propulsion, materials research and development and space energy processes and systems technology. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate is due to a reallocation of funds based on Center priorities. The 1993 Budget Estimate increase is due to inflation.

B. Scientific and Technical Development Travel	752	652	721	812

Scientific and technical development travel provides employees the opportunity to participate in meetings and seminars with other representatives of the aerospace community. The benefits derived from exposure to technological advances outside Lewis, as well as to present both accomplishments and problems to their associates is invaluable. The increase from the 1992 Budget to the 1992 Current is due to increased program requirements. The 1993 Budget Estimate is increased due to a Total Quality Management (TQM) training initiative and inflation.

		1992		1993
	1991 Actual	Budget Estimate	Current Estimate	Budget Estimate
	(Thousands of Dollars)			
C. Management and Operations Travel	728	728	745	772

Management and operations travel is required for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, procurement, travel of the Center's top management to NASA Headquarters and other NASA Centers, training travel, and local transportation. The change in the 1992 Budget Estimate to the 1992 Current Estimate reflects an increase in the number of trips. The increase in the 1993 Budget estimate is primarily due to inflation.

		1992		1993
	1991 Actual	Budget Estimate	Current Estimate	Budget Estimate
	(Thousands of Dollars)			
III. OPERATION OF INSTALLATION	68,239	78,959	0	0

Summary of Fund Requirements

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A. Facilities Services				
1. Rental of Real Property	783	1,144	0	0
2. Maintenance and Related Services	9,708	10,367	0	0
3. Custodial Services	6,034	6,751	0	0
4. Utility Services	18,057	19,718	0	0
Total, Facilities Services	34,582	37,980	0	0
B. Technical Services				
1. Automatic Data Processing	7,727	8,690	0	0
2. Scientific and Technical Information	3,658	4,006	0	0
3. Shop and Support Services	2,572	2,544	0	0
Total, Technical Services	13,957	15,240	0	0

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
C. Management and Operations				
1. Administrative Communications	2,049	2,344	0	0
2. Printing and Reproduction	685	839	0	0
3. Transportation	4,606	4,818	0	0
4. Installation Common Services	12,360	15,608	0	0
Total, Management and Operations	19,700	23,609	0	0
D. Implementation of Project CORE	0	2,130	0	0
Total, Operation of Installation	68,239	78,959	0	0

Explanation of Fund Requirements

Operation of Installation provided a broad range of services, supplies and equipment in support of the Center's institutional activities. These are divided into three major functional areas: (1) Facilities Services, the cost of maintaining and repairing institutional facilities and equipment, and the cost of custodial services and utilities; (2) Technical Services, the cost of automatic data processing for management activities and the cost of educational and informational programs and technical shops supporting institutional activities; and (3) Management and Operations, the cost of administrative communications, reproduction, printing, transportation, medical services and administrative supplies, support services and equipment acquisition. Additionally, in 1992 Operation of Installation included funding for the implementation of Project CORE, which will convert certain functions from contractors to civil servants.

The activities that had been budgeted in the Operation of Installation account are no longer included in the Research and Program Management (R&PM) budget. Project CORE funds are budgeted in the Salary and Related

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

Costs account and the remainder are included in the Research and Development and Space Flight, Control and Data Communications budgets.

A. Facilities Services

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Rental of Real Property	783	1,144	0	0

These funds provided for lease of office space for civil servants.

2. Maintenance and Related Services	9,708	10,367	0	0

Funds provided for the operation and maintenance of facilities at the Cleveland site and at the Plum Brook Station. Facilities maintenance included buildings and grounds maintenance and maintenance of heating, ventilating, and air-conditioning systems and equipment.

3. Custodial Services	6,034	6,751	0	0

Funded custodial services including janitorial services, security services, fire protection, trash removal, pest control and industrial cleaning of walls and lights on an as-needed basis.

4. Utility Services	18,057	19,718	0	0

Funds provided utility services to Lewis. Electrical power is provided by the local utility company. Natural gas is the primary heating fuel with oil as a backup fuel.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
B. Technical Services				
1. Automatic Data Processing	7,727	8,690	0	0

Funds provided support to all LeRC administrative ADP functions for centralized systems analysis, programming, operations, and related computational services to meet the management and administrative computing requirements. Also included were institutional portions of lease, periodic equipment replacement and maintenance costs of hardware systems within the Central Computer Facility, as well as contractor effort for computer programming, operations, keypunch, and other support personnel. The ADP systems support included: institutional management, accounting and finance, procurement contract status and tracking, personnel management and utility tracking.

2. Scientific and Technical Information	3,658	4,006	0	0

Funded in this activity was the support of the Center's Library, educational programs, public information services, operation of the Visitor Information Center (VIC), tours and special events, construction and transport of special exhibits, and related activities.

3. Shop and Support Services	2,572	2,544	0	0

These funds provided for a support contractor who provides LeRC graphics and photographic services, Graphic materials are prepared for use in presentations and senior management reviews. Also included are supplies, materials, and equipment.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
C. Management and Operations				
1. Administrative Communications	2,049	2,344	0	0

This estimate provided local and long distance telephone service and non-telephone communications. Local telephone service includes the leased lines and equipment to serve the Center population. Non-telephone communications include telex, advanced record system teletype, rapidfax, datafax, teleconference equipment, oceanic cable service, and usage charges for airline reservation service.

2. Printing and Reproduction	685	839	0	0

Funds supported administrative printing including the operating costs of the printing and reproduction facility as well as supplies, materials, and equipment, All common processes of duplication, including photostating, blueprinting and microfilming are included.

3. Transportation	4,606	4,818	0	0

Funding covered the cost of the support contract for bus, mail and package delivery, stock issuance and administrative aircraft maintenance. It also covered moving and hauling services and motor vehicle purchase, lease and maintenance.

4. Installation Common Services	12,360	15,608	0	0

This funding provided for administrative services for Center management and staff and administrative recordkeeping at Plum Brook Station. Included are the cost of staff medical examinations, clinic support, medical supplies and equipment, special X-ray equipment for the in-house occupational health program, and

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

equipment for the physical fitness facility. Funding is also included for maintenance and periodic replacement of administrative equipment and supplies, mail delivery, stock issue, warehousing, environmental compliance activities and postage. All of these services are provided by support contractors.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
D. Implementation of Project CORE	0	2,130	0	0

The Lewis Research Center had planned to convert 81 positions from contractors to civil servants. Because of Congressional action, these plans are under review. Until this review is completed, funds for such conversions are being held in the Salary and Related Costs account.

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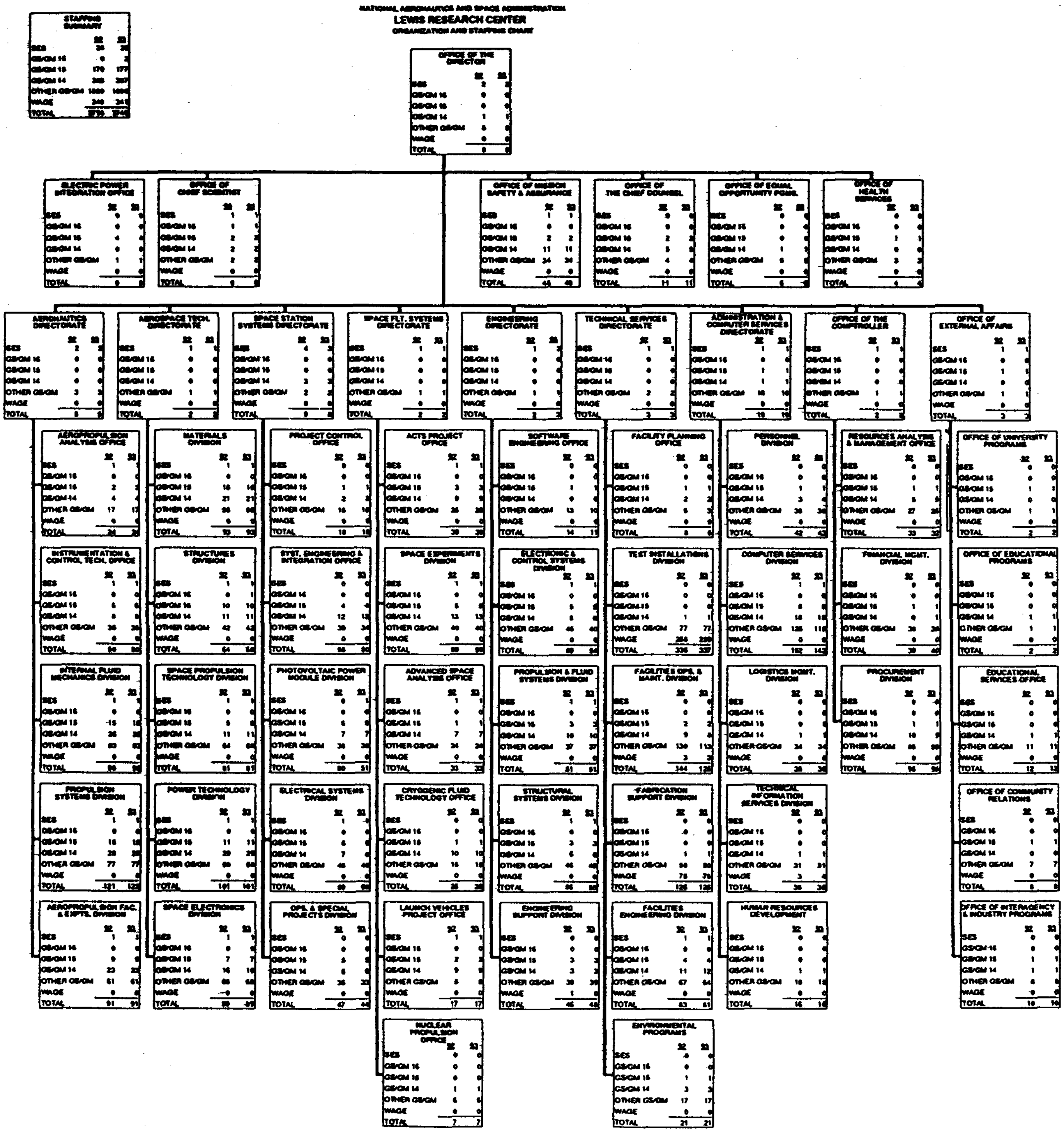


NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LEWIS RESEARCH CENTER
ORGANIZATION AND STAFFING CHART
STAFFING SUMMARY
OFFICE OF THE DIRECTOR
ELECTRIC POWER INTEGRATION OFFICE
OFFICE OF CHIEF SCIENTIST
OFFICE OF MISSION SAFETY & ASSURANCE
OFFICE OF THE CHIEF COUNSEL
OFFICE OF EQUAL OPPORTUNITY PGMS.
OFFICE OF HEALTH SERVICES
AERONAUTICS DIRECTORATE
AEROSPACE TECH. DIRECTORATE
SPACE STATION SYSTEMS DIRECTORATE
SPACE FLT. SYSTEMS DIRECTORATE
ENGINEERING DIRECTORATE
TECHNICAL SERVICES DIRECTORATE
ADMINISTRATION & COMPUTER SERVICES DIRECTORATE
OFFICE OF THE COMPTROLLER
OFFICE OF EXTERNAL AFFAIRS
AEROPROPULSION ANALYSIS OFFICE
MATERIALS DIVISION
PROJECT CONTROL OFFICE
ACTS PROJECT OFFICE
SOFTWARE ENGINEERING OFFICE
FACILITY PLANNING OFFICE
PERSONNEL DIVISION
RESOURCES ANALYSIS & MANAGEMENT OFFICE
OFFICE OF UNIVERSITY PROGRAMS
INSTRUMENTATION & CONTROL TECH. OFFICE
STRUCTURES DIVISION
SYST. ENGINEERING & INTEGRATION OFFICE
SPACE EXPERIMENTS DIVISION
ELECTRONIC & CONTROL SYSTEMS DIVISION
TEST INSTALLATIONS DIVISION
COMPUTER SERVICES DIVISION
FINANCIAL MGMT. DIVISION
OFFICE OF EDUCATIONAL PROGRAMS
INTERNAL FLUID MECHANICS DIVISION
SPACE PROPULSION TECHNOLOGY DIVISION
PHOTOVOLTAIC POWER MODULE DIVISION
ADVANCED SPACE ANALYSIS OFFICE
PROPULSION & FLUID SYSTEMS DIVISION
FACILITIES OPS. & MAINT. DIVISION
LOGISTICS MGMT. DIVISION
PROCUREMENT DIVISION
EDUCATIONAL SERVICES OFFICE
PROPULSION SYSTEMS DIVISION
POWER TECHNOLOGY DIVISION
ELECTRICAL SYSTEMS DIVISION
CRYOGENIC FLUID TECHNOLOGY OFFICE
STRUCTURAL SYSTEMS DIVISION
FABRICATION SUPPORT DIVISION
TECHNICAL INFORMATION SERVICES DIVISION
OFFICE OF COMMUNITY RELATIONS
AEROPROPULSION FAC. & EXPTS. DIVISION
SPACE ELECTRONICS DIVISION
OPS. & SPECIAL PROJECTS DIVISION
LAUNCH VEHICLES PROJECT OFFICE
ENGINEERING SUPPORT DIVISION
FACILITIES ENGINEERING DIVISION
HUMAN RESOURCES DEVELOPMENT
OFFICE OF INTERAGENCY & INDUSTRY PROGRAMS
NUCLEAR PROPULSION OFFICE
ENVIRONMENTAL PROGRAMS

NASA HEADQUARTERS/
SPACE STATION
PROGRAM OFFICE

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1993 ESTIMATES

NASA HEADQUARTERS

DESCRIPTION

NASA Headquarters is located at 400 Maryland Avenue, SW, Washington, D.C., and occupies other buildings in the District of Columbia, Maryland, and Virginia. Headquarters is currently planning to move into its new building at 300 E Street, SW, beginning in May 1992.

HEADQUARTERS ROLES AND MISSIONS

The mission of Headquarters is to plan and provide executive guidelines for the implementation of national space and aeronautics programs consistent with the objectives stated in the National Aeronautics and Space Act of 1958, as amended.

The following offices at Headquarters assist in carrying out the technical aspects of the mission:

Office of Space Flight

This office plans, directs, executes, and evaluates the acquisition and operations of space flight programs including the Space Shuttle and other space flight related programs.

The Space Shuttle is a key element of the National Space Transportation System. The Shuttle Director, located at KSC, has full responsibility and authority for operations of the Shuttle including budget, schedule, program requirements, engineering, and performance. The Shuttle Director reports directly to the Associate Administrator for Space Flight. Included in the Shuttle are the orbiters, external tanks, solid rocket boosters, space shuttle main engines, the ground systems, and the flight systems which are the various project elements that make up the Shuttle system. the Office of Space Flight also develops and implements policy for all system users who interface with the Shuttle, and promotes improvements in safety, reliability, and effectiveness of Shuttle operational performance.

Other space related programs which are managed by the Office of Space Flight include Spacelab, Payload Operations and Support Equipment, the Engineering Technical Base at the manned centers, the Tethered Satellite System, and Space Station operations planning. This office also maintains relationships with industry, international organizations, foreign entities, universities, the scientific community, and other government agencies with respect to space flight programs in coordination with the Office of External Relations. Finally, the Office of Space Flight is the agency's representative to the Office of Management and Budget, as well as, the Congress on the Space Shuttle and related programs.

Office of Space Systems Development

This office plans, directs, executes, and evaluates the research and development of space systems, as well as, the design, development, test, evaluation and overall management of the Space Station Freedom program.

The major development being initiated is the New Launch System (NLS). This is a joint program being conducted by both NASA and the DOD. It will provide a new evolutionary unmanned (but man-ratable) launch capability to support both civil and defense applications. Reporting directly to the Associate Administrator for Space Systems Development is the Director of Flight Systems who will interface with the Joint Program Office which is responsible for managing the development of the NLS. Also included within this office are the Advanced Programs which conduct definition studies and selected advanced developments to support future new development programs, systems improvements, and expanded capabilities for space transportation systems.

Included in the Space Station Freedom program is the development of program policy and budget formulation program direction to the various elements supporting the Space Station, external affairs (in conjunction with the Office of External Affairs) and commercialization evaluation (in conjunction with the Office of Commercial Programs). Also included are requirements definition and control; system development; configuration control; end-to-end program integration; test and verification; development oversight and assessment; and technical and administrative support. In addition, the Office of Space Systems Development coordinates an outreach program to all potential users of the Station and is responsible for ensuring that user requirements are built into the station design and that potential users are kept informed of the Station and is responsible for ensuring that user requirements are built into the station design and that potential users are kept informed of the Station status and evolution. Since the Space Station Freedom includes elements from the European Space Agency, Canada, and Japan, and Italy, responsibilities include the coordination and integration of their Space Station elements with those of the U.S. elements and the subsequent planning for operations and utilization of the Space Station Freedom.

Office of Space Science and Applications (OSSA) - Responsible for research and development efforts utilizing a variety of flight system and ground-based observations to increase man's knowledge of the universe. The Earth, Sun, Moon, the planets, interplanetary space, other stars and galaxies, and the interaction among those bodies and systems are all objects of these investigations, as well as assuring medical safety and understanding the basic mechanisms of biological processes using the unique capabilities of the space program. Responsible also for the Earth Observing System (EOS) project which includes a series of polar orbiting platforms for observation of the Earth's land, biosphere, atmosphere, and oceans. OSSA's research and development activities are carried out through the following program areas: Earth Science and Applications, Life Sciences, Solar Systems Exploration, Flight Systems, Astrophysics, Space Physics, and Microgravity Science and Applications. Responsibilities also include the procurement of Expendable Launch Vehicle Services for NASA and other civil government programs.

Office of Aeronautics and Space Technology - Plans, directs, executes, and evaluates the aeronautical, transatmospheric, and space research and technology programs. The Aeronautical Research and Technology program goal is to conduct aeronautical research and develop technology to strengthen U.S. leadership in civil and military aviation. The program is based on a strong commitment to develop a broad technology base in support of the aviation industry, enhance safety and capacity of the national airspace system, and assure U.S. superiority for national security. The Transatmospheric Research and Technology program is a portion of the joint NASA/Department of Defense National Aero-Space Plan (NASP) program. The NASP program objective is to develop and then demonstrate in an experimental flight vehicle, the technology required to permit the nation to develop reusable, single-stage-to-orbit vehicles with airbreathing primary propulsion as well as horizontal takeoff and landing capability. The goal of the Space Research and Technology Program is to provide advanced, enabling technologies, validated at a level suitable for user-readiness for future space missions in order to ensure continued U.S. ieadership in space. The Space Research and Technology program supports a broad-based activity to advance the state-of-the-art at the concept, subsystems and system level; to develop technical strengths in the engineering disciplines within NASA, industry, and academia; and to perform critical flight experiments in areas where testing in the space environment is necessary for technology development. The Office of Aeronautics and Space Technology is also responsible for coordinating the total NASA program of supporting research and technology related to specific programs and projects to insure a comprehensive, properly balanced agency research and technology program.

Office of Space Exploration - The goal of the Space Exploration Initiative (SEI) is return to the Moon-- back to stay, and on to Mars. The SEI objectives are to conduct mission studies to define candidate architectures utilizing robotic precursor and manned missions; to define research and technology needs for satisfying mission and support elements requirements; develop requirements; and develop, in coordination with participating agencies, foreign and domestic, a strategic plan to establish the integration of existing and future activities of the exploration effort.

Office of Space Communications - These capabilities are provided to meet the requirements of NASA's Earth orbital, planetary and solar system exploration spacecraft missions, launch vehicles, research aircraft, sounding rockets and balloons. Included in Earth orbital activities are the Space Transportation System (STS), Spacelabs, and scientific and applications missions. The various capabilities provided include: (a) tracking to determine the position and trajectory of vehicles in space; (b) acquisition of science and space applications data from on-board experiments and sensors; (c) acquisition of engineering data on the performance of spacecraft and launch vehicle systems; (d) reception of television transmissions from space vehicles; (e) transmissions of commands from ground facilities to the spacecraft; (f) voice communications with astronauts; (g) transfer of information between the various ground facilities and control centers; and (h) processing of data acquired form the launch vehicles and spacecraft. These capabilities are essential for operating and maintaining U.S. space assets to achieve the scientific objectives of all flight missions and for executing the critical decisions necessary to the success of these missions. Provides the vital tracking, telemetry, command, data acquisition, communications, and data processing required by all NASA flight projects.

Office of Safety and Mission Quality (OSMQ) - Actively supports NASA-wide goals. The overall objective is to assure the safety and quality of NASA missions. This is achieved through the development, implementation, and oversight of uniform safety, reliability, maintainability, and quality assurance (SRM&QA) policies and procedures. OSMQ conducts independent technical assessments of all major flight and nonflight projects to determine compliance to SRM&QA requirements. The SRM&QA functions include programs assurance; development of technical standards and demonstration of key technologies for improving program assurance; systems assessments and trend analyses; safety, reliability, maintainability, quality assurance; and quality management initiatives. This office strives to maintain an SRM&QA workforce that is staffed with qualified people who are properly trained and equipped, dedicated to superior performance and the pursuit of excellence, and who will provide the leadership in implementing continuous improvement to the entire NASA/industry work force.

Office of Commercial Programs - Provides direct assistance to industry in the development and growth of space enterprise and markets and a focus within NASA for an agency-wide program supporting the expansion of U.S. private sector investment and involvement in civil space activities, for space commercial user development, for actively supporting new high technology commercial space ventures and for the commercial application and dissemination of existing aeronautics and space technology. This Office also provides a focus within NASA for an agency-wide program to stimulate technological innovation in the U.S., use of Small Business to help meet Federal research and development needs, and to encourage commercial applications of Federally supported research innovations.

General - The Headquarters responsibilities include providing a balanced Agency Headquarters workforce capable of Planning, formulating, and advocating executive direction to national programs to implement the objectives stated in the National Aeronautics and Space Act of 1958, as amended.

:E STATION FREEDOM PROGRAM OFFICE

The Space Station Freedom organization was modified during FY 1991. The Space Station Director now reports to the Associate Administrator for Space Systems Development. The Space Station Director is located in Washington, D.C. and has overall responsibility for managing the Space Station Freedom program. The day-to-day management of the program resides at the Level II office, which is located in Reston, Virginia, approximately 21 miles from downtown Washington, D.C. The buildings known as Parkridge III and IV, are leased by NASA.

ROLES AND MISSIONS

Space Station is a complex and long-term program. It includes participation not only by every NASA Center, but also the European Space Agency, the Japanese, the Canadians and the Italians. There are four prime work package contractors for the Unites States elements and hundreds of first, second, and third tier subcontractors who will be providing support.

The Level II Space Station Freedom Office in Reston is utilized solely for management of Space Station and is not used for activities of any other NASA program. Its primary functions consist of day-to-day program management, development, and control, including requirements definition, implementation, and control; system engineering, analysis, and integration; operations capability development; end-to-end program integration, test, and verification; and budget formulation, implementation, and control. This office is subordinate to the Level I office, located at NASA Headquarters in Washington, D.C. from which it receives policy direction from the Space Station Freedom Director. In order to facilitate this effort, the various program functions have been assigned to the following specific offices:

Space Station Freedom - Director - Located in Washington, D.C. and consists of the Space Station Freedom Director and the Level I Division Directors. Directs management and review of the program. Directs overall configuration changes, exercises budget control, manages program reserves, and plays a critical role in evaluating the efforts of the Level II office, work packages, and NASA Centers. Takes policy direction from the Associate Administrator for Space Systems Development and ensures that this policy gets translated into key program requirements which are monitored for technical, schedule, and budgetary compliance.

Space Station Freedom - Deputy Director, Program and Operations - Located in Reston, Virginia, and consists of Deputy Director, Deputy Manager and Technical Assistants. Directs day-to-day management of the program. Maintains and controls Level II requirements, implements the Level I requirements, and plays a critical role in evaluating the efforts of the work packages and Centers.

Deputy Manager - Integration - During FY 1990, the systems and element integration functions were strengthened by moving a significant part of these activities to the largest work package centers: Johnson Space Center (JSC) in Houston, Texas and the Marshall Space Flight Center (MSFC) in Huntsville, Alabama, respectively. These Centers have in-house expertise to perform these critical tasks. The transfer of functions were accomplished primarily by a redistribution of positions, and augmentation of the JSC and MSFC staffs, rather than actual movement of civil servants. In addition, an electric power integration function was established at the Lewis Research Center (LeRC), Cleveland, Ohio. These Level II offices report to the Deputy Director in Reston, Virginia.

Deputy Manager - Operations - Provides utilization planning for the space Station including user requirements and accommodations processes definition and control and user integration and operations concept assessment, and space operations requirements integration and advocacy. Assesses the facilities and processing concepts for ground operations including the ground support equipment, transportation, and ground verification and test. Performs utilization and operations cost modeling and analysis, systems engineering and integration assessment, technical operations planning, and manifest integration. Services as the Level II utilization and operations interface with international partners. Oversees Space Station data systems development including end-to-end architecture and system testing, assurance, and performance assessment.

Program Engineering Office - Develops the overall architecture and engineering requirements for the Space Station Freedom. Defines the assembly sequence and allocates the functional and resources parameters such as weight and power. Evaluates performance of the Station systems and determines if they meet the design criteria. Provides development and control of integration requirements and elements requirements. Manages maintainability and commonality. Develops and controls the master verification plan. Oversees development of the various types of support equipment. Manages the verification of hardware, software, and on-orbit assembly. Provides strategic and technology planning for software engineering including test bed programs and industry liaison.

Management Integration - Provides administrative operations support such as personnel, travel, supply and equipment, and records management. Maintains liaison with Level I Policy Division and assists them in the preparation of position papers, presentation, and Congressional testimony. Manages the Technical Management Information System (TMIS) development and implementation. Performs contract management functions for the Level II contracts including requirements definition, performance assessment, and technical direction. Maintains configuration management for Level 11. Coordinates and tracks configuration control board activities. Baselines the program requirements and monitors and controls changes. Keeps program documentation updated.

Proeram Control Office - Directs Level II and Level III budget preparation and integration and maintains financial control of assigned Space Station budgets. Oversees and tracks the development, status, and updating of program plans and schedules including schedule analysis and risk assessment. Develops and maintains the program work breakdown structure. Performs analysis of cost, schedule, and manpower including the development of data bases for resource tracking and control. Formulates cost models, cost/engineering trades, and option development.

International Proerams Office - Maintains liaison with the international partners ensuring that international participation is consistent with existing policies and agreements.

DISTRIBUTION OF FULL TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

HEADQUARTERS	1991 ACTUAL	1992 BUDGET ESTIMATE	1992 CURRENT ESTIMATE	1993 BUDGET ESTIMATE
SPACE STATION	272	282	285	285
SPACE FLIGHT PROGRAMS	197	205	206	208
SPACE TRANSPORTATION CAPABILITY DEV	39	38	41	41
SPACE TRANSPORTATION OPERATIONS	158	167	165	167
SPACE SCIENCE AND APPLICATIONS	221	254	253	249
PHYSICS AND ASTRONOMY	63	65	66	64
LIFE SCIENCES	27	28	28	27
PLANETARY EXPLORATION	33	34	35	33
SPACE APPLICATIONS	98	127	124	125
AERONAUTICS AND SPACE TECHNOLOGY	137	158	143	143
AERONAUTICAL RESEARCH AND TECHNOLOGY	66	69	69	69
SPACE RESEARCH AND TECHNOLOGY	63	81	66	66
TRANSATMOSPHERIC RESEARCH AND TECH	8	8	8	8
SPACE EXPLORATION	13	0	15	15
COMMERCIAL PROGRAMS	42	48	46	46
SAFETY, RELIABILITY & QUALITY ASSURANCE	78	94	87	90
ACADEMIC PROGRAMS	23	28	26	26
TRACKING AND DATA PROGRAMS	59	61	61	61
SUBTOTAL - DIRECT FULL-TIME PERM FTEs	1,042	1,130	1,122	1,123
CENTER MANAGEMENT AND OPERATIONS	850	900	884	883
SUBTOTAL - FULL-TIME PERM FTEs	1,892	2,030	2,006	2,006
OTHER FTEs	94	61	85	85
SUBTOTAL - FULL-TIME EQUIVALENTS	1,986	2,091	2,091	2,091
PROJECT CORE	0	115	87	107
GRAND TOTAL - FULL-TIME EQUIVALENTS	1,986	2,206	2,178	2,198

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

			1992		
		1991 Actual	Budget Estimate	Current Estimate	1993 Budget Estimate
			(Thousands of Dollars)		
I.	PERSONNEL AND RELATED COSTS	142.778	165.696	166.487	174.500
II.	TRAVEL	9,615	11,500	11,500	12,603
III.	OPERATION OF INSTALLATION	148.381	174,538	0	0
	A. Facilities Services	38,373	49,203	0	0
	B. Technical Services	64,586	68,843	0	0
	C. Management and Operations	45,422	47,406	0	0
	D. Implementation of Project CORE	0	9,086	0	0
	Total, Fund Requirement	300.774	351.734	177.987	187.103

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			

RESOURCES REQUIREMENTS BY FUNCTION

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
I. PERSONNEL AND RELATED COSTS	142,778	165,696	166,487	174,500

Summary of Fund Requirements

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A. Compensation and Benefits				
1. Compensation				
a. Full-time permanent	104,647	121,300	117,645	123,470
b. Other than full-time permanent	4,338	2,875	4,707	4,915
c. Reimbursable detailees	558	462	630	658
d. Overtime and other compensation	3,932	4,695	4,711	5,026
Subtotal, Compensation	113,475	129,332	127,693	134,069
2. Benefits	17,434	22,891	21,125	24,056
Subtotal, Compensation and Benefits	130,909	152,223	148,818	158,125

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
B. Supporting Costs				
1. Transfer of personnel	2,152	3,844	2,016	1,573
2. Investigative Services 6 Core Conv	2,768	3,792	8,465	8,756
3. Personnel training	6,949	5,837	7,188	6,046
Subtotal, Supporting Costs	11,869	13,473	17,669	16,375
Total, Personnel and Related Costs	142,778	165,696	166,487	174,500

Explanation of Fund Requirements

A. Compensation and Benefits

1. Compensation

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
a. Full-time permanent	104,647	121,300	117,645	123,470

The change in compensation from the 1992 Budget Estimate to the 1992 Current Estimate results from repricing compensation due to a lower than anticipated 1991 base because of lower salaried new hires, fewer promotions and less salary growth in 1991. The 1993 Budget Estimate includes pay raises, agency SES bonuses, the effect of within-grade increases and promotions, and other personnel pay actions. In 1993, we plan to fund our full approved ceiling FTE by maximizing our lapse savings, hiring more freshouts and reducing discretionary salary growth factors.

Basis of Cost for Permanent Positions

In 1993 the cost of permanent work-years will be $123,470,000. The increase from 1992 results from the following:

Cost of full-time permanent work-years in 1992.......		$117,645
Cost increases in 1993............................		$7,449
Within grade and career advances:		
Full year effect of 1992 actions............	897	
Partial year effect of 1993 actions......	2,263	
Full year effect of 1992 pay raise.............	1,218	
Partial year effect of 1993 pay raise..........	3,071	
Turnover costs:		-1,624
Full year effect of 1992 actions.....	-984	
Partial year effect of 1993 actions............	-208	
Fewer paid days in 1993:......................	-432	
Cost of full-time permanent work-years in 1993......		$123,470

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
b. Other than full-time permanent				
(1) cost	4,338	2,875	4,707	4,915

This category includes the Co-op program funding, although they are not shown in the FTE ceiling. The increase from the 1992 Budget Estimate to the 1992 Current Estimate is due to a revised plan to utilize temporary and part-time employees. The 1993 Budget Estimate includes full year funding for the 1992 pay raise, the 1993 pay raise and normal growth.

c. Reimbursable detailees	558	462	630	658

The services of a small group of military officers and civilian detailees from other government agencies are used by NASA Headquarters where such assignments are of mutual benefit. The increase from the 1992 Budget Estimate to the Current Estimate is due to retaining the current number of personnel employed in detailee assignments. The increase from 1992 to the 1993 Budget Estimate is due to the 1992 pay raise and the January 1993 pay raise.

d. Overtime and other compensation	3,932	4,695	4,711	5,026

The increase from the 1992 Current Estimate to the 1993 Budget Estimate is due to the full year funding of the 1992 pay raise, the 1993 pay raise and adjustments in the agency awards program.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
2. Benefits	17,434	22,891	21,125	24,056

The following are the NASA Headquarters costs for employee benefits by category:

Retirement Fund and Thrift Plan....	9,515	12,633	11,861	13,169
Employee Life Insurance............	199	235	216	228
Employee Health Insurance..........	3,780	4,683	4,342	5,103
Workmen's Compensation.............	299	430	430	425
FICA............................	1,766	3,231	1,927	2,814
Medicare.........................	1,361	1,286	1,791	1,736
Other benefits...................	514	393	558	581
Total.......................	17,434	22,891	21,125	24,056

The changes from the 1992 Budget Estimate to the 1992 Current Estimate results from a decrease in the number of employees covered by the benefits programs and revised rate estimates. The increases from 1992 to 1993 for benefit costs are due to the pay raises, the continued growth in FERS participation, and health benefits anticipated rate increases.

B. Supporting Costs

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Transfer of Personnel	2,152	3,844	2,016	1,573

These are the costs associated with transfer of government personnel from other duty stations to NASA Headquarters. The costs include movement of household goods, subsistence and temporary expenses, real estate

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

and miscellaneous moving expenses related to change of duty station. The decrease from the 1992 Budget Estimate to the 1992 Current Estimate is due to a reduction in the number of hires using relocation services. The decrease from 1992 to the 1993 Budget Estimate is due to the decrease in the number of relocations associated with the hiring effort in 1993.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
2. Investigative Services & Core Conv	2,768	3,792	8,465	8,756

Headquarters reimburses the OPM for background checks of new hires and re-investigations of current employees for the entire Agency. The cost of investigations is a function of two variables, the number of investigations to be conducted, and the unit charge made by the Office of Personnel Management, the Federal Bureau of Investigation, and the Defense Investigative Service. The increase from the 1992 Budget Estimate to the 1992 Current Estimate is due to revised cost estimates based on 1991 experience for investigative services and implementation of the 1992 Core conversions. The increase from 1992 to 1993 is due to the decentralization of the agency's investigative costs to each of the centers, offset by the full year funding of 1992 Core conversions.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
3. Personnel Training	6,949	5,837	7,188	6,046

The maintenance and expansion of skills is essential in carrying out the Agency's many complex technical programs. Part of the training consists of courses offered by other Government agencies, usually for a fee. The remainder of the training is provided through non-government sources. The costs are for tuition, fees and related costs for training at colleges, universities, technical institutions, and for the cost of seminars and workshops. The increase from the 1992 Budget Estimate to the 1992 Current Estimate is based on requirements for new hires and a strong TQM program. The decrease from the 1992 Current Estimate to the 1993 Budget Estimate is the result of constrained funding to divert funds to maintain our current approved FTE program.

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
			(Thousands of Dollars)		
II.	TRAVEL	9,615	11,500	11,500	12,603

Summary of Fund Requirements

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A.	Program Travel	4,054	5,612	5,546	6,376
B.	Scientific and Technical Development Travel	983	1,096	1,010	1,050
C.	Management and Operations Travel	4,578	4,792	4,944	5,177
	Total, Travel	9,615	11,500	11,500	12,603

Explanation of Fund Requirements

A.	Program Travel	4,054	5,612	5,546	6,376

Program travel funds are used in support of NASA's space transportation operations and research and development programs including the Space Station, the Space Transportation System, Aeronautics and Space Technology, Space Science and Applications, and other direct research and development programs. The 1993 estimate provides for inflationary increases and for minimum increases in programmatic travel necessary to support operations and program development activities at various NASA centers and to accomplish Headquarters program oversight responsibilities.

B.	Scientific and Technical Development Travel	983	1,096	1,010	1,050

Scientific and technical development travel permits employees to participate in meetings and seminars with

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

other representatives of the aerospace community. This participation allows personnel to benefit from exposure to technological advances in the field which arise outside NASA, as well as to present both accomplishments and problems to their associates. Many of these meetings are working panels convened to solve certain problems for the benefit of the Government. The increase from 1992 to the 1993 Budget Estimate is due primarily to inflation.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
C. Management and Operations Travel	4,578	4,792	4,944	5,177

Management and operations travel is for the direction and coordination of general management matters, travel by senior officials to review Center requirements, and operations and career development travel in order to broaden the experience of NASA employees. Travel costs of functional managers (in personnel, financial management, and procurement) to assure Agency policies and procedures are being implemented at all NASA installations are also included. The increase from the 1992 Budget Estimate to the 1992 Current Estimate is due to the subsidies given to federal employees for using public transportation. The increase from 1992 to the 1993 Budget Estimate is due primarily to inflation.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
III. OPERATION OF INSTALLATION	148,381	174,538	0	0

Summary of Fund Requirements

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A. Facilities Services				
1. Rental of Real Property	19,046	21,410	0	0
2. Maintenance and Related Services	18,519	26,834	0	0
3. Custodial Services	808	959	0	0
4. Utility Services	0	0	0	0
Total, Facilities Services	38,373	49,203	0	0
B. Technical Services				
1. Automatic Data Processing	40,333	44,018	0	0
2. Scientific and Technical Information	21,864	21,247	0	0
3. Shop and Support Services	2,389	3,578	0	0
Total, Technical Services	64,586	68,843	0	0

		1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)			
C.	Management and Operations				
	1. Administrative Communications	10,310	12,298	0	0
	2. Printing and Reproduction	3,903	3,721	0	0
	3. Transportation	2,693	2,214	0	0
	4. Installation Common Services	28,516	29,173	0	0
	Total, Management and Operations	45,422	47,406	0	0
D.	Implementation of Project CORE	0	9.086	0	0
	Total, Operation of Installation	148,381	174,538	0	0

Explanation of Fund Requirements

Operation of Installation provided a broad range of services, supplies, and equipment in support of the Headquarters' institutional activities. These are divided into three major functional areas: Facilities Services including rental of real property, acquisition, maintenance and repair of institutional facilities and equipment, and the cost of security and custodial services; Technical Services including the cost of automatic data processing operations and acquisitions in support of management activities, and the cost of educational and informational programs, and institutional support activities; and Management and Operations including the cost of administrative communications, printing, transportation, and medical services. Funding is also included but not limited to the following agencywide activities: Automated Information Management Program (AIM); Federal Telecommunications Systems (FTS); Scientific and Technical Information Facility (STIF); and the NASA Equipment Management System (NEMS). Additionally, in 1992 Operation of Installation included funding for the implementation of Project CORE, which will convert certain functions from contractors to civil servants.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		

The activities that had been budgeted in the Operation of Installation account are no longer included in the Research and Program Management (R&PM) budget. Project CORE funds are budgeted in the Salary and Related Costs account and the remainder are included in the Research and Development and Space Flight, Control and Data Communications budgets.

A. Facilities Services

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
1. Rental of Real Property	**19,046**	**21,410**	**0**	**0**

These funds covered all office rental costs of NASA Headquarters. NASA Headquarters is comprised of an office space complex located in six buildings in the District of Columbia, two buildings in Crystal City, Virginia, the Scientific and Technical Institute Facility (STIF) near Baltimore, Maryland, and the Space Station Program Office (SSPO) in Reston, Virginia. The buildings located in the District of Columbia are government-owned or leased facilities for which NASA must provide reimbursement to the General Services Administration in accordance with P.L. **92-313.** The STIF facility is subleased from the Department of Defense. The SSPO and the Crystal City offices are leased from private owners.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
2. Maintenance and Related Services	**18,519**	**26,834**	0	**0**

This estimate included maintenance, repair, and alterations of buildings such as partition changes, auxiliary air conditioning systems for ADP equipment, telephone changes, and general buildings maintenance.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
3. Custodial Services	**808**	**959**	0	**0**

These funds covered security guard and safety support services in the various Headquarters buildings. They also included reimbursement to GSA for the installation and maintenance of security alarm systems and equipment in the NASA Headquarters buildings.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
B. Technical Services				
1. Automatic Data Processing	40,333	44,018	0	0

This estimate provided for the lease, purchase, maintenance, programming and operations services of automatic data processing (ADP) equipment. Some of the operations services are agencywide. They are NASA Personnel/Payroll System (NPPS), NASA Accounting and Financial Information Systems (NAFIS), NASA Training and Development System (NTDS), NASA Institutional Environmental Management System (NIEMS), Facilities Management System (FMS), and the NASA Supply Management Systems (NSMS).

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
2. Scientific and Technical Information	21,864	21,247	0	0

Funds supported educational and informational programs, the NASA Headquarters technical library, and the operations and support of the Scientific and Technical Information Facility (STIF) and the American Institute of Aeronautics and Astronautics (AIAA).

The education and information programs provided for gathering and disseminating information about the Agency's programs to the professional aerospace and aeronautics scientific and technical community, the mass communications media, the general public, and the educational community at the elementary and secondary levels. Assistance to the mass communications media includes gathering and distributing newsworthy material in support of their requests through press kits, news releases, television and radio information tapes and clips, and feature material. Funding also supported equal employment opportunity exhibits and films to relate the key roles that women and minorities have in the United States space program.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
3. Shop and Support Services	2,389	3,578	0	0

These funds provided for the continuation of studies on NASA-wide safety, reliability, and quality assurance standards, and graphic and photo processing services.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
C. Management and Operations				
1. Administrative Communications	**10,310**	**12,298**	**0**	**0**

Funded in this category were the costs of leased lines, long distance tolls, total Agency FTS charges, telephone exchange services, and other communications.

2 Printing and Reproduction	**3,903**	**3,721**	0	**0**

Funds provided for contractual printing and the related composition and binding operations. This included services performed by other agencies, chiefly the Government Printing Office, or by commercial printing firms. All common processes of duplicating including photostating, blueprinting, microfilming, and other reproductions are included.

3. Transportation	**2,693**	**2,214**	0	**0**

Transportation services funded rental of trucks, as well as the movement of supplies, materials, equipment and related items. Also included were the costs of operating and maintaining the administrative aircraft which are assigned to the Jet Propulsion Laboratory and Headquarters.

4. Installation Common Services	**28,516**	**29,173**	0	**0**

This function funded incidental services which support the Headquarters, such as: patent services, maintenance and repair of office equipment and vehicles; minor Government services; trucking and labor services; and program management and administrative support services.

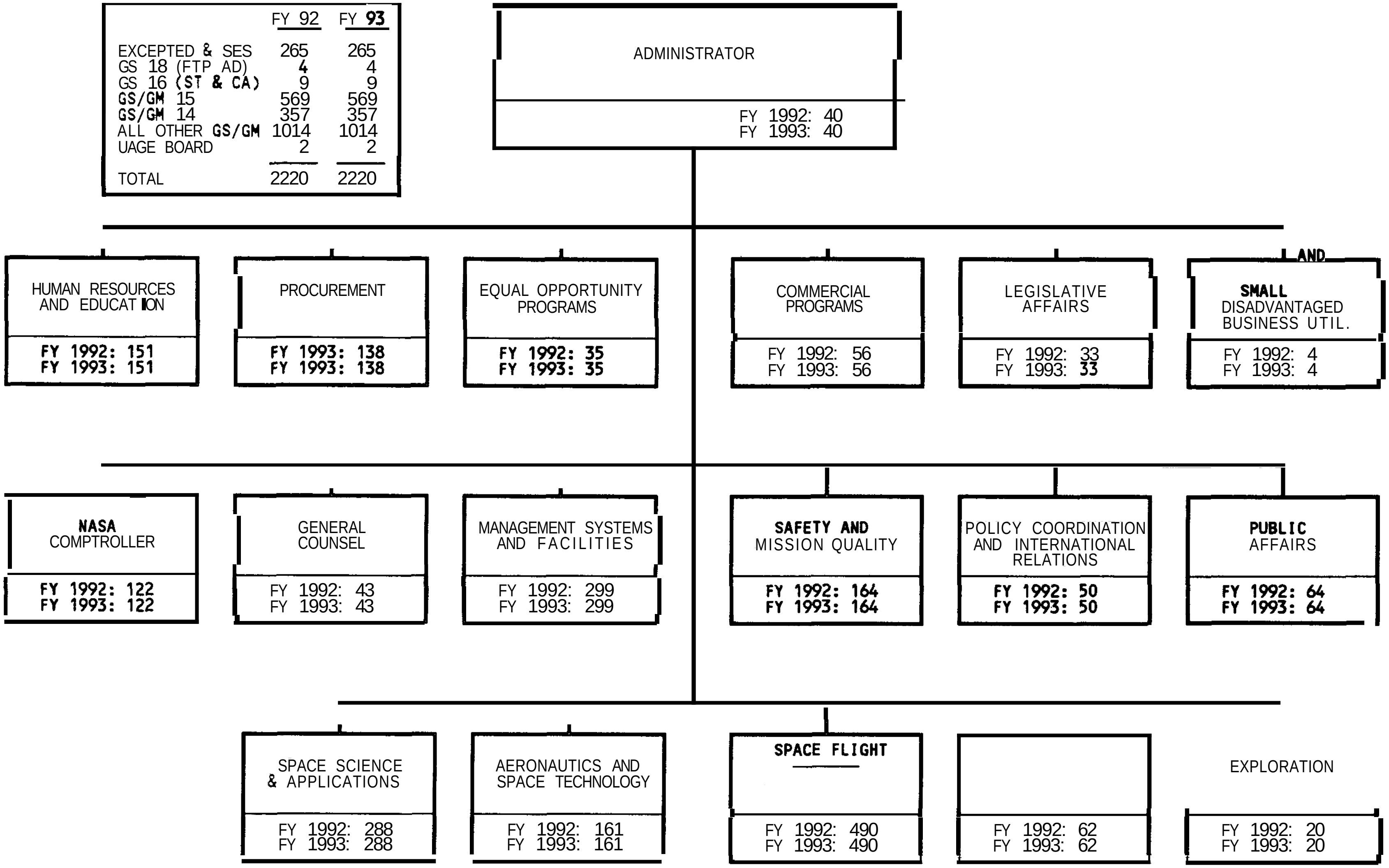
	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
D. Implementation of Project CORE	0	9,086	0	0

Headquarters had planned to convert 206 positions from contractors to civil servants. Because of Congressional action, these plans are under review. Until this review is completed, funds for such conversions are being held in the Salary and Related Costs account.

ORGANIZATION AND STAFFING
NASA HEADQUARTERS

HEADQUARTERS STAFFING SUMMARY

	FY 92	FY 93
EXCEPTED & SES	265	265
GS 18 (FTP AD)	4	4
GS 16 (ST & CA)	9	9
GS/GM 15	569	569
GS/GM 14	357	357
ALL OTHER GS/GM	1014	1014
UAGE BOARD	2	2
TOTAL	2220	2220



NOTE: DATA BASED ON APPROPRIATION LANGUAGE AND PENDING REORGANIZATIONS.
DATA REPRESENTS ESTIMATED PAID ON-BOARD EMPLOYEES AT END OF FISCAL YEAR.

FMI/01/06/92

INSPECTOR GENERAL

INSPECTOR GENERAL

FISCAL YEAR 1993 ESTIMATES

OFFICE OF INSPECTOR GENERAL

BASIS OF FY 1993 ESTIMATE

The Office of Inspector General (OIG) continues to set priorities for its reviews of NASA programs and operations concentrating on identified high risk issues. Audit coverage will address the most critical and vulnerable activities on the basis of available funding, program needs and characteristics, Congressional/Administration/public concerns, and prior audit findings. Audits will also cover NASA's financial management practices, systems, controls, and information flow. Investigative coverage will continue to focus on the most serious allegations of criminal or fraudulent activity impacting NASA's programs and operations.

Expected growth and new initiatives in NASA's programs and operations will require the OIG to selectively provide oversight of those areas most vulnerable to fraud and abuse. The OIG must provide a reasonable level of assurance that NASA's high risk areas and other internal control weaknesses are identified early to ensure that timely corrective actions can be implemented. Areas of emphasis will include: institutional support contracting; procurement and contract/subcontract management; information resource management; computer security; product integrity and quality; safety; financial management systems, controls and reports; environmental management; and critical sources of supply for programs and missions.

The OIG audit workload is defined primarily in a structured, internal audit universe which encompasses NASA's programs and operations and an external universe comprised of NASA's prime contractors, their subcontractors, and grantees; and legislation requiring the OIG involvement in the audit of financial systems controls, reports, and statements. The OIG audit program sets priorities for internal and external audits to maximize the return on available audit resources. Ideally each universe should provide audit coverage on a three year cycle. At the FY 1992 audit staffing level, the OIG is operating on an inadequate 16.3 year internal audit cycle. The growth being experienced in NASA's programs and projects increases the need for OIG audit oversight to determine contractor/subcontractor cost, schedule and performance effectiveness. This overwhelming audit workload requires continuous adjustment of priorities to provide balanced coverage of programs and operations most vulnerable to abuse and mismanagement.

NASA's continued reliance on contractors and grantees (about 90 percent of the Agency's total program obligations are for procurement actions, including grants and reimbursements to other agencies) requires direct OIG audit work and oversight of the Defense Contract Audit Agency's (DCAA's) audit results to ensure effective contract execution and administration. NASA was billed approximately $17.0 million during FY 1991 for contract audit services.

OBJECTIVES AND STATUS

The proposed FY 1993 budget reflects an increase of 10 full-time equivalents (FTEs). The increased staffing level will enable the OIG to maintain its effectiveness in fulfilling its responsibilities to conduct audits and investigations of NASA's programs and operations. The increased staff will also permit the OIG to provide audit and investigative coverage of those conditions and concerns demanding immediate attention. The OIG will also expand its oversight of NASA's operations by assigning audit and/or investigative staff to the Dryden Flight Research Facility and by increasing the staff at the Stennis Space Center. Through these assignments, OIG staff will concentrate on the major programs and operations being performed at each installation, the efficiency of their operations and adequacy of internal controls.

The additional audit workyears will enable the OIG to improve the scope, timeliness, and thoroughness of it's oversight of NASA programs and operations and enhance its capability to assist NASA management to achieve program goals. Procurement management, including contract/subcontract management and administration, will remain an OIG audit priority. Audit emphasis will be directed to assessing financial systems and controls supporting agency financial statements and to program and operational effectiveness by addressing cost and schedule impact and potential vulnerabilities to waste and mismanagement.

Vulnerabilities are determined by taking into consideration the following: whether program/project objectives are accomplished in the most cost-effective manner; if NASA's more than $1 billion annual expenditure on information technology is providing expected programmatic and financial information needed to make sound decisions (NASA is the top ranked civilian agency in information technology spending); NASA management's actions to correct internal control weaknesses reported under the Federal Manager's Financial Integrity Act; NASA's improvements in financial management systems, practices, controls and information; effectiveness of the audit follow-up system in enabling management to maintain the status of corrective actions; completeness of safety and mission quality activities; and the adequacy of agencywide corrective actions addressing environmental concerns.

The OIG investigations program will remain focused on complex white collar criminal cases - fraud against the Government by contractor and government employees, false claims, false statements, wire fraud, and conspiracy - which normally demand staff commitments for extended periods. Historically, these criminal cases have represented approximately 85 percent of the total caseload. In addition, the non-criminal caseload includes procurement irregularities, unethical and improper conduct, prohibited personnel practices, and waste and mismanagement.

The OIG investigative workload of both criminal and non-criminal cases continues to exceed the availability of investigative resources. Growth in the investigative program has caused us to be primarily reactive with emphasis given to the more serious criminal allegations. The FY 1992 investigative staffing level does not allow adequate flexibility to effectively respond to an increasingly complex workload. With the number of complex fraud cases continuing to increase, such cases take longer to resolve, further reducing our management flexibility to improve and expand the program. Also, the increasing quantity of investigative allegations received requires a preliminary evaluation to determine their potential impact and, if serious, opening an investigation; further adversely affecting the timely completion of the ongoing case load. The FY 1993 request would allow for an investigative staff increase to enhance the investigative program's effectiveness by: improving the timely resolution and reporting of ongoing investigations; increasing investigative coverage of expanding NASA programs; providing greater OIG participation in multi-agency investigative task forces; targeting manufacturers and suppliers suspected of supplying NASA and its contractors with defective and/or falsely certified parts and products; implementing initiatives to detect fraud and mismanagement; reducing average case duration; and maintaining a quality and manageable case load of criminal allegations. Investigative staff increases will reduce risks associated with vulnerabilities and improve Agency operations.

FISCAL YEAR 1993 CONGRESSIONAL BUDGET

DISTRIBUTION OF PERMANENT WORKYEARS BY PROGRAM

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
fill-time permanents	161	196	196	206
Other controlled FTE's	10	10	10	10
Total (full-time equivalents)	171	206	206	216

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate	Page Number
		(Thousands of Dollars)			
I. Personnel and related costs	9,560	13,130	13,280	14,366	IG -6
11. Travel	561	720	720	756	IG 10
111. Operation of installation	344	750	600	778	IG-10
A. Facilities services	(--)	(--)	(--)	(--)	
B. Technical services	(226)	(455)	(455)	(513)	
C. Management and operations	(118)	(295)	(145)	(265)	
Total	10,465	14,600	14,600	15,900	

RESOURCES REQUIREMENTS BY FUNCTION

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
I. PERSONNEL AND RELATED COSTS	9,560	13,130	13,280	14,366

Summary of Fund Requirements

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
A. Compensation and Benefits				
1. Compensation				
a. Full-time permanent	7,023	9,800	9,950	10,600
b. Other than full-time permanent	276	200	200	220
c. Overtime and other compensation	92	105		215
Subtotal	7,391	10,105	10,255	11,035
2. Benefits	1,281	1,612	1,612	1,788
Subtotal, Compensation & Benefits	8,672	11,717	11,867	12,823
B. Supporting Costs				
1. Transfer of personnel	817	1,200	1,200	1,348
2. Personnel training	60	165	165	175
3. OPM Services........	11	48	48	20
Subtotal, Support Costs	888	1,413	1,413	1,543
Total, Personnel and Related Costs	9,560	13,130	13,280	14,366

Explanation of Fund Requirements

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
A. Compensation and Benefits	8,672	11,717	11,867	12,823
1. Compensation	7,391	10,105	10,255	11,035
a. Full-time permanent	7,023	9,800	9,950	10,600

Basis of Cost for Permanent Positions

In 1993, the cost of permanent workyears will be $10,600,000. The increase from 1992 results from the following:

Cost of full-time permanent workyears in 1992		9,950	
Cost changes in 1993		1,317	
Within-grade and career advances:			
Full year effort of 1992 actions	+84		
Partial year effect of 1993 actions	+47		
Additional FTE	+600		
Full year effect of 1992 pay raise	+268		
Partial year cost of 1993 pay raise	+318		
Turnover Effect		-667	
Full year 1992 effect	-388		
Part year 1993 effect	-279		
Cost of full-time permanent workyears in 1993			10,600

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
b. Other than full-time permanent				
(1) cost	276	200	200	220
(2) Workyears	10	10	10	10
c. Overtime and other compensation	92	105	105	215
2. Benefits	1,281	1,612	1,612	1,788
Contributions by category:				
Retirement fund and thrift plan	776	922	922	1,035
Employee life insurance	14	17	17	18
Employee health insurance.	290	419	419	450
Workmen's compensation	--	20	20	22
FICA	104	122	122	137
Medicare	97	112	112	126
Total	1.281	1,612	1.612	1.788
B. Supporting costs	888	1.413	1.413	1.543
1. Transfer of personnel	817	1,200	1,200	1,348

The costs associated with transfer of personnel include movement of household goods, subsistence and temporary expenses, and real estate and miscellaneous moving expenses related to change of duty station. The FY 1993 figure reflects the costs of additional requested FTE and the escalating costs associated with change of station moves.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
2. Personnel training	60	165	165	175

The maintenance and expansion of skills through various training and educational activities is essential in carrying out the Inspector General's mission. Part of the training consists of courses offered by other Government agencies, usually for a fee. The remainder of the training is provided through non-government sources. The costs are for tuition, fees, and related costs for training at colleges, universities, technical institutions, and for the cost of seminars and workshops. The 1993 training funds are needed to fund training requirements resulting from revisions to the GAO audit standards, training for financial management audits, and requested additional FTE.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
3. OPM services (Headquarters only)	11	48	48	20

The costs associated with the Office of Personnel Management's (OPM) investigation of new hires for the OIG is included here. In FY 1991, NASA OIG conducted investigations of new hires due to a backlog at OPM. The OPM will conduct a large percentage of these investigations in FY 1992 and FY 1993.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
II. TRAVEL	561	720	720	756

Summary of Fund Requirements

Travel funding is required to carry out audit, investigation and management duties. The increase from the current estimate in **1992** to the **1993** budget estimate is due to additional FTE, increased airline cost, and increased work load.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
III. OPERATION OF INSTALLATION	344	750	600	778
Technical services.	226	455	455	513
Management and operations	118	295	145	265

Explanation of Fund Requirements

Operation of Installation provides a broad range of services and equipment in support of the Inspector General's activities.

A. Technical services	226	455	455	513

This estimate provides for all equipment, including the lease, purchase, maintenance, programming and operations services of automated data processing (ADP) equipment. NASA provides common services items such as; office space, communications, supplies, and printing and reproduction at no charge to the OIG. The additional funds for Technical Services will cover the cost of providing equipment to new employees, and replacing equipment that becomes outdated or unserviceable. Also, minicomputers will be placed at OIG locations which presently are not part of the existing Electronic Data Processing (EDP) system.

B. Management and Operations	118	295	145	265

Summary of Fund Requirements

1. Administrative communications	--	--	--	--
2. Printing and reproductions ...	--	--	--	--
3. Installation common services.	118	295	145	265

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands and Dollars)		

Explanation of Fund Reauirements

1. & 2. Administrative Communication/ Printing & Reproduction	--	--	--	--

The costs of some of these services for the Inspector General's office are provided at no charge to the Inspector General by NASA.

3. Installation Common Services.	118	295	145	265

Included in this category are miscellaneous expenses within the Inspector General's Office, i.e., GSA cars, confidential fund, miscellaneous contracts, supplies not provided by NASA, etc. The increase in Installation Common Services will primarily allow for audit and investigative contractor support and other specialized activities which the OIG cannot perform internally.

SPECIAL ANALYSES

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1993 ESTIMATES

JET PROPULSION LABORATORY

DESCRIPTION

The Jet Propulsion Laboratory (JPL) is located in Pasadena, California, approximately 20 miles north of downtown Los Angeles with subsidiary facilities located at Goldstone, California (tracking and data acquisition), Edwards Air Force Base, California (hazardous testing), Table Mountain, California (atmospheric remote sensing, solar studies and astronomy), Kennedy Space Center, Florida (support of JPL launches at KSC), Vienna, Virginia (support to the Technology and Applications Programs Office), and Washington, DC (support to the Visiting Senior Scientist and JPL Detailee Programs).

At Pasadena, the Laboratory occupies 177 acres of land of which 156 acres are owned by NASA and 21 acres are leased. At Goldstone, facilities are located on land occupied under permit from the Army. At Edwards Air Force Base, facilities are located on land occupied under permit from the Air Force. The facilities at Table Mountain are located on land occupied under permit from the Forest Service of the Department of Agriculture. The Eastern Launch Site Office is located at Kennedy Space Center; the other east coast offices are leased. The capital investment of the Jet Propulsion Laboratory, including the Deep Space Network, fixed assets in progress, and contractor held facilities, as of September 30, 1991, was $863,520,000.

The Jet Propulsion Laboratory is a Government-owned installation that is staffed and managed by the California Institute of Technology. Contract NAS7-918 between NASA and Caltech governs research, development, and related activities at the Laboratory with facilities being provided under a separate facilities contract NAS7-920(F). The cost of operating JPL for NASA activities is borne by the Research and Development and the Space Flight, Control, and Data Communications appropriations.

The activities that had been budgeted in the Operation of Installation account are no longer included in the Research and Program Management (R&PM) budget. They are now included in the Research and Development (R&D)

and Space Flight, Control and Data Communications (SFCDC) budgets. Accordingly, the R&PM costs presented in this special analysis for JPL are for purposes of comparison only and are not a part of the NASA R&PM budget.

ROLES AND MISSIONS

The Jet Propulsion Laboratory is responsible for the conduct of NASA automated missions concerned with scientific exploration of the solar system and deep space; for spacecraft tracking and data acquisition; for research and analysis; and for the development of advanced spacecraft technologies including propulsion, power, structures, guidance and control systems, thermal control, electronics, and others. The Laboratory is also assigned responsibility for selected automated Earth-orbital projects and for the development and application of Earth remote sensing technology and instruments. Implicit in these assignments is a broad range of engineering, scientific, and management functions devoted to:

1. The conduct of complete spaceflight projects, including overall project management and all phases of project activity beginning with mission design and following with spacecraft design, development, testing, flight operations, and data analysis.

2. The development and operation of the Deep Space Network (DSN) which provides tracking and data acquisition services for all NASA projects involving missions beyond near-Earth orbits.

3. Continuing programs of scientific investigation, research and analysis, instrument and technology development.

In more specific terms, the principal Laboratory activities in support of NASA can be categorized as follows:

Solar System Exploration - Since the beginning of the Nation's space activities, JPL has devoted a major part of its efforts to exploration of the planets, their satellites, and the interplanetary medium. The Laboratory has had project responsibility for all of the Mariner missions, including design, fabrication, assembly and testing of the spacecraft. During almost three decades, beginning with the Mariner 2 flight to Venus in 1962, these missions have produced enormous scientific returns.

The Jet Propulsion Laboratory was a major participant in the Viking project, carrying out, among other assignments, the development of the two orbiters which reached Mars during the summer of 1976, each carrying a lander. The Viking mission operations were repeatedly extended as the spacecraft far out-lived their design lander. The Viking mission operations were repeatedly extended as the spacecraft far out-lived their design lifetimes. Operations were completed in 1983 when Viking Lander I, the last operating unit of the four, ceased functioning.

In the continuing series of planetary missions, JPL has project responsibility for the Voyager mission. The two Voyager spacecraft were launched in 1977 and made close flybys of Jupiter and its major satellites in 1979. In 1980 and 1981, the Voyager spacecraft encountered Saturn. Each of these four Voyager planetary encounters resulted in major scientific discoveries and obtained unique data. Both spacecraft remained in good operating condition following the Saturn encounters, and in consequence the Voyager mission was considerably extended beyond its original objectives. Voyager 2 was targeted to a flyby of Uranus, which occurred in January 1986, with highly satisfactory scientific results, and has completed its "grand tour" of the solar system with a flyby of Neptune in August 1989. Voyagers 1 and 2 continue to collect and transmit data on the interplanetary space environment as they proceed out of the solar system.

The Laboratory also has project responsibility for the Galileo mission, which is planned to orbit Jupiter and dispatch an instrumented probe that will make direct measurements of the physical and chemical properties of the Jovian atmosphere. During its in-orbit lifetime of about 22 months, the orbiter will observe Jupiter and its system of satellites at close range. JPL is the management center for the Galileo project and developed the orbiter in-house. The Ames Research Center was responsible for the probe development. Galileo was launched successfully in October 1989, flew by Venus in February 1990, by Earth for the first time in December 1990, and encountered the asteroid Gaspra in October 1991. The spacecraft will fly by the Earth again in December 1992 before its final journey to the outer solar system. Galileo will arrive at Jupiter in December 1995

The Magellan mission is obtaining high resolution global radar imagery and altimetric and gravity data from a spacecraft orbiting Venus. The objectives are to address fundamental questions regarding the origin and evolution of the planet. The primary data gathering period lasted over one Venusian year equal to 243 Earth days. Magellan is now in its extended mission phase. JPL manages the project, including responsibility for mission design and operations. Industry developed the spacecraft and synthetic aperture radar under contracts to JPL. Magellan was launched successfully in May 1989.

The Ulysses Project is a cooperative effort between NASA and the European Space Agency (ESA) to study the sun at high solar latitudes. JPL managed the development of the United States instruments on the ESA spacecraft, plus the corresponding data analysis. In addition, JPL is providing mission support to ESA. ESA developed the spacecraft and a set of its own instruments. Ulysses was launched by the Shuttle successfully in October 1990, and is currently enroute to Jupiter in February 1992 for a gravity-assist maneuver. This will allow the spacecraft to turn back towards the inner solar system for a polar pass around the Sun beginning in 1994.

The Mars Observer mission will undertake planet-wide studies of the composition and physical state of Martian materials, examine the major surface forming processes and their timescales, and explore the structure and circulation aspects of the atmosphere. The Jet Propulsion Laboratory is the management center with responsibility for the scientific payload, and has contracted with industry for development of the spacecraft bus. Launch is scheduled for September 1992.

JPL also has project responsibility for the Cassini mission which will undertake investigations of the planet Saturn. The scientific goals will be to determine cloud properties and atmospheric composition, determine atmospheric wind velocities and temperatures, and study the internal structure and rotation of the planet. The Cassini spacecraft will carry an ESA probe that will investigate one of Saturn's moons, Titan. Cassini's trajectory is designed to have the spacecraft fly by an asteroid where it will characterize the physical and geological structure, determine the major mineralogical phases on the surface and their spatial distribution, measure the mass and density of the body, and characterize the physical properties of the surface. The JPL Visible Infrared Mapping Spectrometer (VIMS) instrument is being developed in-house by JPL.

Astrophysics - Consistent with its role as a center for Earth-orbital spacecraft development, JPL managed the Infrared Astronomical Satellite (IRAS) project which was launched in January 1983. This was a cooperative mission with the Netherlands and the United Kingdom. The spacecraft itself was designed and built in the Netherlands. JPL was responsible for the infrared telescope development, system testing activities, and data analysis. Flight operations were completed in November 1983. IRAS has been a highly successful scientific undertaking, producing a database comprised of photometric observations of asteroids, stars, and galaxies in four wavelength bands from near to far infrared. This unique database is of such size that analysis will continue for many years.

The Wide Field/Planetary Camera I (WF/PC I), developed and fabricated at JPL, was orbited successfully as an instrument on the Hubble Space Telescope in April 1990. JPL's WF/PC 11, with lenses to correct the spherical aberration of the Hubble, will be delivered/installed in orbit in late 1993.

Earth Science and Applications - In the area of space applications, JPL is a principal center for work in oceanographic applications of space technology. Development was initiated in FY 1987 on the Ocean Topography

Experiment (TOPEX)/Poseidon Project, a cooperative effort with the French government, to develop and launch an ocean-observing satellite which will map the circulation of the Earth's oceans. JPL has project management responsibility for the TOPEX/Poseidon, as well as responsibility for mission operations and science data processing. Launch on the Ariane is scheduled for July 1992.

The Laboratory also conducts significant activities in upper atmospheric and Earth resources research and in development and implementation of remote sensing techniques for Earth observations. Major flight instruments and experiments include the Shuttle borne Atmospheric Trace Molecule Spectrometers, the Upper Atmosphere Research Satellite (UARS) Microwave Limb Sounder and the Active Cavity Radiometer Irradiance Monitor 11, (both successfully launched on the UARS in September 1991) the Shuttle Imaging Radar-C, and the NASA Scatterometer on ADEOS. Microgravity experiments being developed for Shuttle flights include the Drop Physics Module and the Lambda Point Experiment. In addition, a variety of instruments are being studied and developed for the Earth Observing System (EOS). Finally, geodynamics and plate tectonics are two other important areas of research in space applications.

<u>Spacecraft Flight Operations</u> - The Jet Propulsion Laboratory is responsible for the design, development, maintenance, and operation of NASA's worldwide Deep Space Network (DSN) and a multi-mission Space Flight Operations Center (SFOC). The DSN tracking stations, located in California, Spain, and Australia, support projects involving flights beyond near-Earth orbit, including some international missions. The Space Flight Operations Center is located at JPL, and is the facility for actual day-to-day operations of deep-space missions. JPL has also implemented the Network Consolidation Program which co-locates major facilities of the Space Tracking and Data Network (STDN) near-Earth tracking stations with the three DSN stations. These consolidated facilities are managed by JPL and provide an efficient, technically advanced, and cost effective means of operation.

<u>Research and Analysis</u> - The Jet Propulsion Laboratory maintains an effective program of advanced technical development to provide sound technologies for present and prospective project assignments and to further the general capabilities of NASA. Areas of involvement include spacecraft advanced technology and development, controls and robotics, space power and propulsion, structures, microelectronics and sensors, information systems, advanced computer concepts, and satellite communications. Ground-based research programs are carried out in the planetary sciences, physics and astronomy, and Earth and ocean physics. These activities involve broad collaboration with the scientific and academic communities and with staff members from other NASA field installations.

JET PROPULSION LABORATORY
FY 1993 SIMULATED RESEARCH AND PROGRAM MANAGEMENT (R&PM)
DISTRIBUTION OF PERMANENT WORKYEARS BY PROGRAM

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
Space Station	47	77	16	16
Space Flight Programs	15	22	15	15
Space Transportation Capability Development	6	12	6	6
Space Shuttle	9	10	9	9
Space Science and Applications	2.110	2.142	2.221	2.204
Physics and Astronomy	183	165	190	188
Life Science	15	14	16	15
Planetary Exploration	1,251	1,265	1,330	1,321
Space Applications	661	698	685	680
Commercial Programs	4	5	4	4
Aeronautics Exploration and Technology	170	202	176	174
Aeronautics R&T	3	4	3	3
Space R&T	167	198	173	171
Safety, Reliability, Maintainability & Quality Assurance (SRMQA)	26	28	28	28
Tracking and Data Advanced Systems	457	522	473	471
DIRECT SUPPORT	656	563	683	672
CENTER MANAGEMENT AND OPERATIONS	1,835	1,516	1,870	1,890
Total, Permanent Workyears	5.320	5.077	5.486	5.474

JET PROPULSION LABORATORY
FY 1993 SIMULATED RESEARCH AND PROGRAM MANAGEMENT (R&PM)
FUNDING PLAN BY FUNCTION

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
I. Personnel and Related Costs.....	352,179	378,242	388,490	407,662
11. Travel......................................	13,553	16,961	14,716	15,408
Total, Fund Requirements.................	365.732	395.203	403.206	423.070

Explanation of Fund Reauirements

I. Personnel and Related Costs......	352,179	378,242	388,490	407,662

The increase from the 1992 Budget Estimate to the 1992 Current Estimate is due to the change in estimated workforce levels, revised salary estimates based on 1991 experience, and related benefit costs. The increase from the 1992 Current Estimate to the 1993 Budget Estimate is due to normal salary increases, associated increases in personnel benefits, and the change in the estimated workforce level.

11. Travel.......................................	13,553	16,961	14,716	15,408

The decrease from the 1992 Budget Estimate to the 1992 Current Estimate is based on a reduction in the planned number of trips as a result of reallocation of funds based on center priorities. The increase in the 1993 Budget Estimate is attributed to inflation and represents essentially the same number of trips.

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1993 ESTIMATES

BUDGET SUMMARY

OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY

AIR TRANSPORTATION

SUMMARY OF RESOURCES REQUIREMENTS

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
		(Thousands of Dollars)		
Research and development	559,500	627,200	574,500	687,000
Research operations support	--	--	96,780	110,885
Construction of facilities	46,000	51,600	42,300	50,100
Research and program management	362.930	396.820	281.180	290.220
Total	968.430	1.075.620	994.760	1.138.205
Number of direct workyears associated with air transportation	3,203	3,366	3,360	3,326

The goal of the NASA program is to conduct aeronautical research and develop technology to strengthen U.S. leadership in civil and military aviation. The program is based on a strong commitment to develop a broad technology base in support of the aviation industry, enhance the safety and capacity of the national airspace system, and assure U.S. superiority for national security. With the U.S. challenged as never before in aeronautics, the FY 1993 estimate reflects the need to address critical barriers and strengthen technology development in selected high payoff areas that are vital to our long-term leadership in aviation. NASA's aeronautics program is focused on six strategic thrusts: (1) develop selected, high-leverage technologies and explore new means to ensure competitiveness of U.S. subsonic aircraft and to enhance the safety and productivity of the national aviation system; (2) resolve the critical environmental issues and establish the technology foundation for economical, high-speed air transportation; (3) ready technology options for revolutionary new capabilities in future high-performance aircraft; (4) develop critical technologies to support ground and flight demonstration of the X-30 National Aero-Space Plane and the development of future hypersonic vehicles; (5) pioneer the development of innovative concepts, and provide the physical understanding and the theoretical, experimental, and computational tools required for the efficient design and operation of advanced aerospace systems; and

(6) develop, maintain and operate critical national programs. In accomplishing these thrusts, the program will maintain NASA laboratory strength, including enhanced experimental and computational capabilities and staff excellence; ensure timely domestic technology transfer; ensure strong university involvement; and ensure strong support for and cooperation with the DOD, Federal Aviation Administration, and industry partners.

The transatmospheric research and technology program is the NASA portion of the National Aero-Space Plane (NASP) program, which is jointly managed and funded by NASA and the DOD. The objective of the NASP program is to develop and then demonstrate, in an experimental flight vehicle, the technologies required to develop reusable, single-stage-to-orbit vehicles with airbreathing primary propulsion and horizontal takeoff and landing. The current (second) phase of the NASP program will establish the technology base for a decision in 1993 as to whether to proceed to the design, construction and flight test of an experimental vehicle, the X-30.

The Research and Program Management funding in FY 1993 provides for the salaries and travel of direct civil service workyears. Beginning in FY 1992 funding for the utilities necessary to conduct wind tunnel operations, and for other general operation and installation costs necessary to conduct the NASA aeronautics and transatmospheric research and technology programs has been transferred from Research and Program Management to Research and Operations Support.

The construction of facilities funding in FY 1993 provides for continuation of the multiyear effort to restore and modernize NASA's aeronautical research and development facilities.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1993

SUMMARY OF CONSULTING SERVICES ESTIMATES

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
Research and Program Management				
Consultants employed by NASA.......	592	1,300	650	650
Contractual Services..........................	15,021	6,426	16,404	14,685
Subtotal...............................	15,613	7,726	17,054	15,335
Research and Development				
Contractual Services..........................	39,958	11,254	56,234	59,522
Space Flight, Control and Data Communications				
Contractual Services..........................	1,526	548	2,236	2,093
Total, NASA............................	57,097	19,528	75,524	76,950

NASA uses paid consultants and consulting services contracts to provide advice and expert input in addition to or beyond that available from its in-house civil service workforce. Management controls are established which assure that before entering into either a consultant services arrangement with an individual or consulting services contract, there is ample justification presented and the action is approved at top management levels. The use to which these services will be put is as follows:

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			

Research and Program Management

Consultants Employed by NASA..	592	1,300	650	650

NASA hires experts and consultants to provide expert advice and input on the selection of experiments for future space missions. The use of contract employees, in addition to NASA civil service personnel, provides the agency with an independent view that assures the selection of experiments likely to have the greatest scientific merit. Other individuals are employed to provide independent looks at technical and functional problems in order to give top management the widest possible range of views before making major decisions.

Contractual Services....................	15,021	6,426	16,404	14,685

NASA contracts with consulting services firms for studies of management policies and programs in such areas as ADP, life sciences, microgravity, space physics, utility consumption, safety, reliability and quality assurance, and strategic planning.

Research and Development

Contractual Services.........	39,958	11,254	56,234	59,522

In consonance with its legislative charter, NASA seeks advice from many sources in the private sector on what would be the most productive future programs. The purpose for seeking such advice is to assure the widest review of programmatic thrust is available. Funds are required to provide external expertise and input into organizational decisions, and evaluation of program effectiveness. In 1993, the funds will be used to support analyses conducted by the National Academy of Sciences, and others in the Space Science and Applications and Aeronautics and Space Technology program areas, Commercial programs, life science, microgravity, space physics, and safety, reliability and quality assurance.

	1991 Actual	1992 Budget Estimate	1992 Current Estimate	1993 Budget Estimate
	(Thousands of Dollars)			
Space Flight, Control and Data Communications				
Contractual Services...........................	1,526	548	2,236	2,093

NASA hires experts and consultants to provide advice on space flight operations, mission planning, operations research, feasibility studies, computer program support, and safety, reliability and quality assurance.

DETAIL OF PERMAMENT POSITIONS

NASA AGENCY

	FY 1991	FY 1992	FY 1993
Executive level II	1	1	1
Executive level III	1	1	1
Executive level V	0	0	0
	2	2	2
ES-6	47	52	53
ES-5	136	138	137
ES-4	299	305	294
ES-3	37	35	38
ES-2	27	27	24
ES-1	29	32	31
	575	589	577
GS-18	3	4	6
GS-16	23	22	23
GSJGM-15	2,383	2,358	2,353
GSJGM-14	3,765	3,733	3,718
GS/GM-13	5,539	5,492	5,488
GS-12	3,639	3,605	3,638
GS-11	2,454	2,373	2,351
GS-10	335	340	326
GS-09	1,139	1,089	1,106
OS-08	332	332	329
GS-07	1,102	1,077	1,084
GS-06	716	695	683
GS-05	1,130	1,098	1,057
GS-04	282	271	255
GS-03	44	41	42
OS-02	13	9	10
	22,899	22,539	22,469
SPECIAL UNGRADED POSITIONS ESTABLISHED BY NASA ADMINISTRATOR	8	15	17
UNGRADED POSITIONS	768	746	745
TOTAL PERMAMENT POSITIONS	24,252	23,891	23.810
UNFILLED POSITIONS, EOY	0	0	0
TOTAL PERM EMPLOYMENT, EOY	24,252	23,891	23.810

PERSONNEL SUMMARY

	FY 1991	FY 1992	FY 1993
AVERAGE GSGM GRADE	11.7	11.7	11.7
AVERAGE ES SALARY	$99,083	$103,766	$107,618
AVERAGE GS/GM SALARY	$46,543	$49,132	$51,321
AVERAGE SALARY OF SPECIAL UNGRADED POSITIONS ESTAB- LISHED BY NASA ADMINISTRATOR	$82,142	$87,322	$90,714
AVERAGE SALARY OF UNGRAOED POSITIONS	$34,803	$35,673	$37,423

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ESTIMATED FY 1993 EQUIPMENT OBLIGATIONS TO BE PLACED
AT NASA INSTALLATIONS

	(MTUIONS OF DOLLARS)
RESEARCH AND DEVELOPMENT	316.6
Space Station	104.3
Space Transportation Capability Development	30.8
Physics and Astronomy	3.4
Life Sciences	2.2
Planetary Exploration	10.5
Space Applications	67.1
Aeronautical Research and Technology	86.1
Transatmospheric Research and Technology	1.0
Space Research and Technology	11.2
SPACE FLIGHT. CONTROL AND DATA COMMUNICATIONS	136.1
Shuttle Production and Capability Development	55.0
Shuttle Operations	48.8
Expendable Launch Vehicles	0.8
Space and ground networks, communications and data systems	31.5
TOTAL	452.7

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
SPACE STATION	HEAOOUARTERS LOCATION 1001-T1, 890053	SPACE STATION TMIS (A)-SPACE STATION TMIS AOP EOUIPMENT PURCHASES	MANAGEMENT AND INTEGRATION	3421.6
SPACE STATION	LEWIS RESEARCH CENTER LOCATION 2202-85, 920026	SPACE STATION SUPPORT-SPACE STATION SUPPORT SYSTEM HW	POWER SYSTEM	1161.0
SPACE STATION	MARSHALL SPACE FLIGHT CENTER LOCATION 6201-XX, 890014	SYS OEV & IMP. MIS MULTI SYS PERIPHERALS-MGMNT INFORMATION SYS PERIPHERALS AND TERMINALS	PRESSURIZED MOOULES	1155.0
SPACE STATION	MARSHALL SPACE FLIGHT CENTER LOCATION 6206-OO, 890090	SOFTWARE 8 DATA MANAGEMENT, IGDS MULTI-INTERACTV GRAPHIC OESIGN SYS CENTRL SYS REQUIREMT	PRESSURIZED MOOULES	150.0
SPACE STATION	MARSHALL SPACE FLIGHT CENTER LOCATION 6206-CT. 890104	SOFTWARE 6 DATA MANAGEMENT. IGDS-INTERACTIVE GRAPHICS DESIGN SYS MODIF BLOG 4487	PRESSURIZED MOOULES	500.0
SPACE STATION	MARSHALL SPACE FLIGHT CENTER LOCATION 6210-GU, 890154	PROPULSION IGDS-INTERACTIVE GRAPICS DESIGN SYS MODS BLDG 4610	PRESSURIZED MODULES	300.0
SPACE STATION	MARSHALL SPACE FLIGHT CENTER LOCATION 6208-CU, 890162	MATERIALS & PROCESSES IGDS-INTERACTIVE GRAPHICS DESIGN SYSTEM MOOS BLDG 4108	PRESSURIZED MODULES	380.0
SPACE STATION	MARSHALL SPACE FLIGHT CENIER LOCATION 6203-P6. 910038	HUNTSVILLE OPERATIONS SUPPORT CNTR, HOSC-HVL OPNS SPT CEN/CENTRAL PROCESS SYS AUG	OPERATIONS/ UTILIZATION CAPABILITY OEVELOPMENT (OUCD)	4591.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
SPACE STATION	MARSHALL SPACE FLIGHT CENTER LOCATION 6209-00. 920028	SVSTEMS ANALYSIS 6 INTEGRATION-TERMINAL EQUIPMENT. BLDG 4610	PRESSURIZE0 MODULES	475.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7264-EA. 910110	SVSTEMS ENGINEERING OIVISION-SIMULATION SYSTEMS BRANCH PURCHASE/AUGMENTATION	OPERATIONS/ UTILIZATION CAPABILITY OEVELOPMENT (OUCD)	929.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7205-OA. 930042	SS GROUND SOFTWARE PRODUCTION FACILITY-SS GROUNO SOFTWARE PRODUCTION FACILITY HARDWARE	OPERATIONS/ UTILIZATION CAPABILITY DEVELOPMENT (OUCD)	632.0
SPACE STATION	JOIINSON SPACE CENTER LOCATION 7206-DA. 930044	SPACE STATION TRAINING FACILITV-SPACE STATION TRAINING FACILITY HARDWARE	OPERATIONS/ UTILIZATION CAPABILITY OEVELOPMENT (OUCD)	9657.0
SPACE STATION	JOHNSON SPACE CENTER LOCAIION 7206-DA, 930046	SPACE STATION TRAINING FACILITV-SPACE STATION TRAINING FACILITY HOST HARDWARE	OPERATIONS/ UTILIZATION CAPABILITY DEVELOPMENT (OUCD)	4969.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7207-OA. 930050	SPACE STATION CONTROL CENTER-SPACE STATION CONTROL CENTER HARDWARE	OPERATIONS/ UTILIZATION CAPABILITY OEVELOPMENT (OUCD)	3301.6
SPACE STATION	JOIINSON SPACE CENTER LOCATION 7207-DA, 930052	SPACE STATION CONTROL CENTER-SPACE STATION CONTROL CENTER HOST HAROWARE	OPERATIONS/ UTILIZATION CAPABILITY DEVELOPMENT (OUCD)	1300.0

Summary of Major ADP Equipm nt Acq isition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7265-EA, 930156	NAVIGATION. CONTROL 6 AERONAUTICS SYSTEM-GUIDANCE NAVIGATION & CONTROL EMULATOR TESTBEO	ASSEMBLY HARDWARE/ SUBSYSTEMS	720.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7283-KA. 930182	SPACE STA PROJECT OFF OATA SUPPORT SYSTE-ADDITIONAL OIRECT ACCESS STORAGE	ASSEMBLY HARDWARE/ SUBSYSTEMS	250.0
SPACE STAIION	JOHNSON SPACE CENTER LOCATION 7283-KA. 930186	SPACE STA PROJECT OFF OATA SUPPORT SYSTE-DATA SUPPORT SYSTEM HARDWARE AUGMENTATION	ASSEMBLY HARDWARE/ SUBSYSTEMS	1200.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7285-EA. 930188	SOFTWARE SUPPORT ENVIRON.	MANAGEMENT AND INTEGRATION	261.0
SPACE STATION	KENNEDY SPACE CENTER LOCATION 7624-FO. 890058	SSFP SOFTWARE OEVELOPMENT FACILITY-SPACE STATION S/W OEVELOPMENT FACILITY	OPERATIONS/ UTILIZATION CAPABILITY OEVELOPMENT (OUCD)	3684.0
SPACE STATION	KENNEDY SPACE CENTER LOCATION 7624-FB. 900030	SPACE STATION TEST. CONT. & MON. SYS-SPACE STATION TEST. CONT. 8 MON. SYS	OPERATIONS/ UTILIZATION CAPABILITY OEVELOPMENT (OUCD)	11342 0
SPACE STATION	KENNEDY SPACE CENIER LOCATION 7624-82, 930036	AUTOMATED TEST EQUIPMENT (ATE)-AUTOMATED TEST EOUIPMENT (ATE)	OPERATIONS/ UTILIZATION CAPABILITY DEVELOPMENT (OUCD)	1366.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT	MARSHALL SPACE FLIGHT CENTER LOCATION 6201-01, 890178	ENGINEERING ANALYSIS 6 DATA SYSTEM, EADS-ENGINEERING ANALYSIS & DATA SYSTEM	RESEARCH & TEST OPERATIONS	13125.0
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT	STENNIS SPACE CENTER LOCATION 6410-60, 930026	SSC CADD/E SYSTEMS-FOSC CADD/ ENGINEERING HARDWARE	OPERATIONS SUPPORT	466.0
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT	JOHNSON SPACE CENTER LOCATION 7208-DA, 930056	SHUTTLE MISSION SIMULATOR-SHUTTLE MISSION TRAINING FACILITY HARDWARE	PAYLOAD SUPPORT OPERATIONS	1797.5
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT	JOHNSON SPACE CENTER LOCATION 7211-PA, 930068	ENGINEERING COMPUTATION FACILITY-CLASS VI COMPUTER PURCHASE	RESEARCH & TEST OPERATIONS	6813.0
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT	KENNEDY SPACE CENTER LOCATION 7612-02, 900046	PAYLOAD DATA MANAGEMENT SYSTEM-PAYLOAD DATA MANAGEMENT SYSTEM	MULTIMISSION & PAYLOAD SUPPORT EQUIP	1000.0
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT	KENNEDY SPACE CENTER LOCATION 7604-P3, 930018	COMPUTER AIDED DESIGN/ ENGINEERING SYSTEM-COMPUTER AIDED DESIGN/ENGINEERING SYSTEM	LAUNCH SYSTEMS OPERATIONS	806.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
PHYSICS AND ASTRONOMY	GOOOARO SPACE FLIGHT CENTER LOCATION 5101-AN, 930024	SPACE TELESCOPE SCIENCE SYSTEM-SPACE TELESCOPE SCIENCE SYSTEM	HUBBLE SPACE TELESCOPE (HST) OPERATIONS AND SERVICING	868.0
PHYSICS AND ASTRONOMY	MARSHALL SPACE FLIGHT CENTER LOCATION 6203-09. 910034	HUNTSVILLE OPERATIONS SUPPORT CNTR. HOSC-HVL OPNS SPT CEN/VAX CLUSTER UPGRADE	SPACELAB MISSION MGT--APPROVED MISSN	357.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
LIFE SCIENCES	JOHNSON SPACE CENTER LOCATION 7261-SA, 930140	LIFE SCIENCES FLIGHT EXPERIMENTS PROG-UPGRADE LIFE SCIENCES COMP AIDED DESIGN/ENG'RING	HUMAN SPACE FLIGHT AND SYSTEMS ENGINEERING	1085.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
PLANETARV EXPLORATION	JET PROPULSION LABORATORY LOCATION 5516-SO, 910052	FLIGHT PROJ. OPERATIONAL SYSTEMS-NOT SELECTED,COMET RENDEZVOUS ASTEROID/CASSINI	MISSION OPERATIONS & OATA ANALYSIS	3941.0
PLANETARY EXPLORATION	JET PROPULSION LABORATORY LOCATION 5516-OP. 920044	FLIGHT PROJ. OEVELOPMENT & PROTOTYPE SVS-NOT SELECTED; SFOC REPLENISHMENT & SUSTAINING	MISSION OPERATIONS & DATA ANALYSIS	711.0
PLANETARY EXPLORATION	JET PROPULSION LABORATORY LOCATION 5516-OP, 920058	FLIGHT PROJ. OEVELOPMENT & PROTOTYPE SYS-NOT SELECTED. TEST STRING	MISSION OPERATIONS & OAIA ANALYSIS	517.0
PLANETARY EXPLORATION	JET PROPULSION LABORATORV LOCATION 5516-OP, 930038	FLIGHT PROJ. OEVELOPMENT & PROTOTYPE SVS-SYSTEM OEVELOPMENT	MISSION OPERATIONS 6 OATA ANALYSIS	905.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
SPACE APPLICATIONS	GOOOARO SPACE FLIGHT CENTER LOCATION 5101-AA. 930016	SPACE AND EARTH SCIENCES COMPUTING CTR-SPACE AND EARTII SCIENCES COMPUTING CENTER	OATA SYSTEMS	531.0
SPACE APPLICATIONS	COOOARO SPACE FLIGHT CENTER LOCATION 5101-AB. 930018	NATIONAL SPACE SCIENCF OAIA CENTER SYSTE-NATIONAL SPACE SCIENCE OATA CENIER SYSTEM	OAIA SYSTEMS	2316.0
SPACE APPLICAIIONS	GOOOARD SPACE FLIGHT CENTER LOCATION 5103-AN. 930056	EARTH OBSERVING SYS-OAIA INFORMATION SYS-EARTH ORSERVINC SYSTEM - DATA INFORMATION SYSTEM	EARTH OBSERVING SYSTEM (EOS) OATA INFORMATION SVSTEM (DIS)	40000.0
SPACE APPLICATIONS	GOOOARO SPACE FLIGHT CENTER LOCATION 5103-DD, 930082	PROJECTS MANAGEMENT SYSTEM-PROJECTS MANAGEMENT SYSTEM	EARTti OBSERVING SYSTEM (EOS) OATA INFORMATION SYSTEM (DIS)	405.0
SPACE APPLICATIONS	GODDARD SPACE FLIGHT CENTER LOCATION 5101-AA, 930210	SPACE AND EARTH SCIENCES COMPUTING CTR-SPACE AND EARTH SCIENCES COMPUTING CENTER	OATA SYSTEMS	5719.0
SPACE APPLICATIONS	GODDARD SPACE FLIGHT CENTER LOCATION 5101-AB. 930212	NATIONAL SPACE SCIENCE DATA CENTER SYSTE-NATIONAL SPACE SCIENCE OATA CENTER SYSTEM	OATA SYSTEMS	429.0
SPACE APPLICATIONS	JET PROPULSION LABORATORY LOCATION 5511-AA, 920014	ADMINISTRATIVE APPLICATIONS SYSTEMS-IBM 3090-200 ALTERNATE PURCHASE PLAN	APPL SYSTEMS ANALYSES AND STUDIES	1275.0
SPACE APPLICAIIONS	JET PROPULSION LABORATORY LOCAIION 5511-CN. 920016	COMMUNICATIONS AND NETWORK EQUIPMENT-INSTITUTIONAL LOCAL AREA NETWORK	APPL SYSTEMS ANALYSES AND STUDIES	500.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
SPACE APPLICATIONS	JET PROPULSION LABORATORY LOCATION 5517-SS, 920072	ENGINEERING SERVICES SUPPORT SYSTEM-CAD/CAE WORKSTATIONS AND PERIPHERAL EOUIPMENT	APPL SYSTEMS ANALYSES AND STUO ES	300.0
SPACE APPLICATIONS	JET PROPULSION LABORATORY LOCATION 5518-IL. 930042	INSTRUMENT LOAN POOL SUPPORT SYSTEMS-INSTRUMENT CONTROLLERS	APPL SYSTEMS ANALYSES AND SIUD ES	1000.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
Aeronautical;	MARSHALL SPACE FLIGHT CENTER LOCATION 6218-01, 930028	TELECOMMUNICATIONS CENTER-VOICE/VIDEO EOUIPMENT PURCHASE	PROGRAM SUPPORT COMMUNICATIONS	4628.0
AERONAUTICAL RESEARCII & 1ECHNOLOGY	AMES RESEARCH CEN ER LOCATION 21RN-00, 890660	NUMERICAL AERODYNAMIC SIMULATION SYSTEMS-HIGH SPEED PROCESSOR 2	NUMERICAL AERODYNAMIC SIMULATION (NAS)	5393.0
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RISEARCH CEN ER LOCAIION 21RN-00, 890662	NUMERICAL AERODYNAMIC SIMULATION SYSTEMS-HIGH SPEED PROCESSOR 3	NUMERICAL AERODYNAMIC SIMULAIION (NAS)	5668.0
AERONAUTICAL RESEARCII E TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21FF-00, 900122	FULL-SCALE AFRODYNAMICS RESEARCII DIV-HARDWARE PURCHASE	ACRONAUIICS R&T BASE	525.0
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21RA 01, 900310	AERODYNAMICS DIVISION. SWIDS DATA ACQUISITION AND COMPUTER EOUIPMENT	AFRONAUTICS RET BASE	2656.5
AERONAUTICAL RESEARCII 6 TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21RN-00, 920034	NUMERICAL AERODYNAMIC SIMULATION SYSTEMS-WORKSTATION DEVELOPMENT	NUMERICAL AERODYNAMIC SIMULAIION (NAS)	2618.0
AERONAUTICAL RESEARCH 6 TECHNOLOGY	AMES RESEARCH CEN ER LOCATION 21RN 00, 920038	NUMERICAL AERODYNAMIC SIMULATION SYSTEMS-OPERATIONS HARDWARE	NUMERICAL AERODYNAMIC SIMULAIION (NAS	1235.0
AERONAUTICAL RESEARCH E TECHNOLOCY	AMES RESEARCH CENTER LOCATION 21RN 00, 920040	NUMERICAL AERODYNAMIC SIMULATION SYSTEMS-MASS STORAGE OEVELOPMENI	NUMERICAL AFRODYNAMIC SIMULATION (NAS	1320.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21FF-01, 930016	FULL-SCALE AERODYNAMICS RESEARCH, SWTOS-NFAC DATA SUPPORT UPGRADE	AERONAUTICS RAT BASE'	504.0
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21RN-00, 930034	NUMERICAL AEROOYNAMIC SIMULATION SYSTEMS-TECHNICAL FACILITIES/DEVELOPMENT	NUMERICAL AERODYNAMIC SIMULATION (NAS)	683.0
AERONAUTICAI. RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21RN-00, 930036	NUMERICAL AERODYNAMIC SIMULATION SYSTEMS-TELECOM HARDWARE	NUMERICAL AERODYNAMIC SIMULATION (NAS)	325.0
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21YO-01, 930046	AEROFLIGHTDYNAMICS DIRECTORATE (DIST)-HARDWARE PURCHASE	AERONAUTICS R&T BASE	731.5
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21FL-01, 930066	AEROSPACE HUMAN FACTORS REASEARCH (DACI)-GLASS COCKPIT SIMULATOR	AERONAUTICS R&T BASE	272.0
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCA ION 21FS-01, 930068	FLIGHT SYSTEMS AND SIMULATION RESEARCH (-LEASE OF VAX 9000	AERONAUTICS R&T BASE	630.0
AERONAUTICAL RESEARCH O TECHNOLOGY	AMES RESEARCH CENTER LOCA ION 21RN-00, 930074	NUMERICAL AEROOYNAMIC SIMULATION SYSTEMS-OPERATIONS-HSP2	NUMERICAL AEROOYNAMIC SIMULATION NAS	3596.0
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21RN-00, 930076	NUMERICAL AERODYNAMIC SIMULATION SYSTEMS-OPERATIONS-HSP3	NUMERICAL AERODYNAMIC SIMULATION (NAS)	5446.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2201-VC. 890030	CENTRAL SCIENTIFIC CLUSTER-CENTRAL SCIEN. CLUSTER HAROWARE	AERONAUTICS R&T BASE	460.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
AERONAUTICAL RESEARCH 6 TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2201-04, 890110	HIGH SPEED COMPUTATIONAL SYS-SUPER-COMPUTER HARDWARE	AERONAUTICS R&T EASE'	8935.0
AERONAUTICAL RESEARCH 6 TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2201-PP. 900014	PARALLEL PROCESSOR-PARALLEL PROCESSOR HARDWARE	AERONAUTICS R&T BASE	425.0
AERONAUTICAL RESEARCH 6 TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2201-03, 900036	CAOAW SVS-SCIENTIFIC SYSTEM HARDWARE	AERONAUTICS R&T BASE	500.0
AERONAUTICAL RESEARCH 6 TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2200- , 920016	LERC - ADP ACTIVITY-OISTRIBUTEO HIGH END WORKSTATIONS	AERONAUTICS R&T BASE	1955.0
AERONAUTICAL RESEARCH &- TECHNOLOGY	LEWIS RESEARCH CENTER LOCAIION 2200- , 930014	LERC - ADP ACTIVITY-ADVANCE0 COMPUTATIONAL CONCEPTS LAB HARDWARE	AERONAUTICS R6T EASE	600.0
AERONAUTICAL RESEARCH 6 TECHNOLOGY	LEWIS RESEARCH CENTER LOCAIION 2200- , 930016	LERC - ADP ACTIVITV-ARCHIVAL MASS STORAGE HAROWARE	AERONAUTICS R6T EASE	3320.0
AERONAUTICAL RESEARCH 6 TECHNOLOGY	LEWIS RESEARCH CENIER LOCAIION 2200- . 930018	LERC - AOP ACTIVITY-LEWIS INFO. NETWK COMPONENTS	AERONAUTICS R&T EASE	1800.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LEWIS RESEARCH CENIER LOCATION 2200- , 930020	LERC - ADP ACTIVITY-MAINT/ OPERATIONS CONTRACT (CCNS)	AERONAUTICS R&T EASE	3549.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LEWIS RESEARCH CENIER IOCATION 2201-07, 930026	SCIENTIFIC MINI SUPER SYS-CONVEX COMPUTER HARDWARE	AERONAUTICS R&T EASE	620.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUOGET LINE ITEM	RECEIVING INSTALLATION BUILOING LOCATION. AND ADP/EAD CONTROL NUMBER	EQUIPMENT OESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
AERONAUTICAL RESEARCH & TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2201-08, 930028	LEWIS INFO MANAGEMENT SYS-LEWIS INFO. MGT. SYS. WORKSTATION HW	AERONAUTICS R&T BASE	542.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LEWIS RESEARCH CENIER LOCATION 2202-93, 930036	TRADAR REPLACEMENT-TRANSIENT OATA RECORDER 111 HW	AERONAUTICS R&T RASE	350.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LANGLEY RESEARCH CENTER LOCATION 2302-10. 890018	LARC CENTRAL SCIENTIFIC COMPUTER COMPLEX-MASS STORAGE	AERONAUTICS R&T BASE	1500.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LANGLEY RESEARCH CENTER LOCATION 2302-10, 890026	LARC CENTRAL SCIENTIFIC COMPUTER COMPLEX-NETWORKS LOCAL AND DISTRIBUTED	AERONAUTICS R&T BASE	1000.0
AERONAUTICAL RESEARCH & TECHNOLOGV	LANGLEY RESEARCH CENTER LOCAIION 2302-10. 890028	LARC CENTRAL SCIENTIFIC COMPUTER COMPLEX-SUPER COMPUTING AND MASSIVELY PARALLEL	AERONAUTICS RBI BASE	9000.0
AERONAUTICAL RESEARCH & TECHNOLOGV	LANGLEV RESEARCH CENTER LOCATION 2302-10, 890030	LARC CENTRAL SCIENTIFIC COMPUTER COMPLEX-MID-RANGE COMPUTING-SIMULATION & GENERAL PURPOSE	AERONAUTICS R&T BASE	800.0
AERONAUTICAL RESEARCH a TECHNOLOGY	LANGLEY RESEARCH CENTER LOCATION 2302 10, 890034	LARC CENTRAL SCIENTIFIC COMPUTER COMPLEX-PERIPHERALS	AERONAUTICS R&T BASE	2600.0
AERONAUTICAL RESEARCH a TECHNOLOGY	LANGLEY RESEARCH CENIER LOCATION 2304-01, 890064	AERODYNAMICS RESEARCH DAIA SYS-1-NATIONAL TRANSONIC FACILITY OAIA SYS UPGRADE	AERONAUTICS R&T BASE	600.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION. AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
AERONAUTICAL RESEARCH 6 TECHNOLOGY	LANGLEY RESEARCH CENTER LOCATION 2304-C1, 910042	AERODYNAMICS RESEARCH OATA SYS-TDT OATA SYS UPGRAOE	AERONAUTICS R6T BASE	600.0
AERONAUTICAL RESEARCH 6 TECHNOLOGY	LANGLEY RESEARCH CENTER LOCATION 2303-30, 930020	AERONAUTICS DISTRIBUTE0 S&E COMPUTING-NUMERICAL AERODYNAMIC SIMULATOR WORKSTATIONS	AERONAUTICS R&T BASE	300.0
AERONAUTICAL RESEARCH 6 TECHNOLOGY	LANGLEY RESEARCH CENTER LOCATION 2304-C1, 930032	AERODYNAMICS RESEARCH DATA SYS-FULL SCALE TUNNEL	AERONAUTICS R&T BASE	300.0
AERONAUTICAL RESEARCH & TECHNOLOGY	JOHNSON SPACE CENTER LOCATION 7264-EA, 930146	SYSTEMS ENGINEERING DIVISION-GLASS COCKPIT PURCHASE AUGMENTATION	AERONAUTICS R&T ROS	450.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	STENNIS SPACE CENTER LOCATION 6400- , 930012	SSC - ADP ACTIVITY-PROGRAM SUPPORT ADP EQUIPMENT PURCHASES	SPACE SHUTTLE MAIN ENGINE (SSME)	1057.1
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	STENNIS SPACE CENTER LOCATION 6400- , 930014	SSC - ADP ACTIVITY-PTO HARDWARE	SPACE SHUTTLE MAIN ENGINE (SSME)	255.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7277-DA, 910158	SOFTWARE PRODUCTION FACILITY-SOFTWARE PRODUCTION FACILITY REPLACEMENT	LAUNCH AND MISSION SUPPORT	5178.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7203-DA, 930034	MISSION CONTROL CENTER-MISSION CONTROL CENTER HARDWARE	LAUNCH AND MISSION SUPPORT	1954.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7208-DA, 930058	SHUTTLE MISSION SIMULATOR-SHUTTLE MISSION TRAINING FACILITY HOST HARDWARE	LAUNCH AND MISSION SUPPORT	818.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7245-VA, 930118	ORBITER AND GFE PROJECTS SYSTEMS-PROJECT OFFICE AUTOMATION & MIS SYSTEMS	LAUNCH AND MISSION SUPPORT	500.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7278-EA, 900166	SOFTWARE DEVELOPMENT FACILITY-SOFTWARE DEVELOPMENT FACILITY PRINTER UPGRADE	LAUNCH AND MISSION SUPPORT	308.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7278-EA. 930168	SOFTWARE OEVELOPMENT FACILITY-SOFTWARE OEVELOPMENT FACILITY DISK STORAGE UPGRADE	LAUNCH AND MISSION SUPPORT	406.0
SPACE SHUTTLE PROOUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7278-EA. 930170	SOFTWARE OEVELOPMENT FACILITY SOFTWARE DEVELOPMENT FACILITY WORKSTATION UPGRADES	LAUNCH AND MISSION SUPPORT	367.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7281-WA. 930178	INTEGRATED MANAGEMENT INFORMATION CENTER-INTEGRATE	LAUNCH AND MISSION SUPPORT	3000.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	KENNEDY SPACE CENTER LOCATION 7635-P6, 890030	CHECKOUT, CONTROL 8 MONITOR SYSTEM II-CHECKOUT, CONIROL & MONITOR SYSTEM II	LAUNCH SITE EQUIPMENT	15404.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	KENNEOV SPACE CENTER LOCATION 7601-F1. 890036	CENTRAL. OATA SYSTEM-CENTRAL OATA SYSTEM	LAUNCH SITE EQUIPMENT	1045.0
SPACE SHUTTLE PROOUCTION AND OPERATIONAL CAPABILITY	KENNEOY SPACE CFNTER LOCATION 7601-M1, 890040	CHECKOUT, CONTROL & MONITER SYSTEM-CHECKOUT, CONTROL & MONITER SYSTEM	LAUNCH SITE EOUIPMENT	3642.0
SPACE SHUTTLE PROOUCTION AND OPERATIONAL CAPABILITY	KENNEOY SPACE CENIER LOCAIION '1623-SA. 920036	LAUNCH TEAM TRAINING SYSTEM-LAUNCH TEAM TRAINING SYSTEM	LAUNCH SITE EOUIPMENT	3977.0

Summary of Major ADP Equipment Acuisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	KENNEDY SPACE CENTER LOCATION 7E15-54, 930024	OE CONTRACTOR OR WORKSTATIONS	LAUNCH SITE EQUIPMENT	719 0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
SPACE TRANSPORTATION OPERATIONS	MARSHALL SPACE FLIGHT CENTER LOCATION 6219-27. 890030	SYSTEMS DEVELOPMENT 6 IMPLEMENTATION SPO-SHUTTLE NODE AUGMENTATION	FLIGHT HAROWARE	310.0
SPACE TRANSPORTATION OPERATIONS	MARSHALL SPACE FLIGHT CENTER LOCAIION 6202-01, 910054	SLIDELL COMPUTER COMPLEX. SCC-COMPUTER-AIDED PROOUCTIVITY MAINFRAME PERIPHERALS	FLIGHT HAROWARE	1094.0
SPACE TRANSPORTATION OPERATIONS	MARSHALL SPACE FIIGHT CENTER LOCATION 6202-01, 920016	SLIDELL COMPUTER COMPLEX. SCC-FR-80 REPLACEMENT	FLIGHT HARDWARE	385.0
SPACE TRANSPORTATION OPERATIONS	MARSHALL SPACE FLIGHT CENIER LOCATION 6202-01, 920036	SLIDELL COMPUTER COMPLEX. SCC-TAPE CARTRIDGE SUBSYSTEM AUTOMATION	FLIGHT HARDWARE	456.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7202-PA. 920026	CENTER INFORMATION SYSTEM-CENIER INFORMATION SYSTEM AUGMENTATION	FLIGHT OPERATIONS	4309.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7209-PA. 920052	CENIER INFORMATION NEIWORK-LOCAL AREA NETWORK EXPANSION	FLIGHT OPERATIONS	317.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7200-OA. 930014	MISSION OPERATIONS OIRECTORATE-MISSION OPERATIONS DIRECTORATE CSC/MOSC HARDWARE	FLIGHT OPERATIONS	831.0
SPACE TRANSPORTATION OPERA IONS	JOHNSON SPACE CENTER LOCATION 7200-OA. 9300 6	MISSION OPERATIONS DIRECTORATE-MISSION OPERATIONS DIRECTORATE HARDWARE	FLIGHT OPERATIONS	7196.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7200-EA. 930020	ENGINEERING DIRECTORATE-ORBITER OATA REDUCTION CENTER UPGRAOE	FLIGHT OPERATIONS	618.0
SPACE TRANSPORTATION OPERA IONS	JOHNSON SPACE CENTER LOCATION 7202-PA, 930032	CENTER INFORMATION SYSTEM-CENTER INFORMATION SYSTEM UPGRAOE	FLIGHT OPERATIONS	538.0
SPACE TRANSPORTATION OPERA IONS	JOHNSON SPACE CENTER LOCATION 7209-PA, 930060	CENTER INFORMATION NETWORK-CENTER INFORMATION NETWORK UPGRADE	FLIGHT OPERATIONS	575.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7210-EA, 930064	AUTOMATION AND ROBOTICS	FLIGHT OPERATIONS	300.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7222-EA, 930074	STRUCTURES AND MECHANICS ENGINEERING SYS-LIFE-CYCLE REPLACEMENT	FLIGHT OPERATIONS	310.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7234-EA, 930082	CREW AND THERMAL ENGINEERING SYSTEMS-CHAMBER AUTOMATION	FLIGHT OPERATIONS	250.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7234-EA, 930084	CREW AND THERMAL ENGINEERING SYSTEMS-COMPUTER AID DESIGN/COMPUTER AID MANUF ENHANCE	FLIGHT OPERATIONS	325.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENIER LOCATION 7234-EA, 930086	CREW AND THERMAL ENGINEERING SYSTEMS-ENHANCE CREW & THERMAL SYS OIV ANALYSIS SYSTEM	FLIGHT OPERATIONS	489.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILOING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT OESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
SPACE TRANSPORTAT ON OPERATIONS	JOHNSON SPACE CENTER LOCATION 7234-EA. 930088	CREW AND THERMAL ENGINEERING SYSTEMS-LIFE CYCLE	FLIGHT OPERAT ONS	310.0
SPACE TRANSPORTAT ON OPERA IONS	JOHNSON SPACE CENTER LOCATION 7236-EA. 930104	TRACKING AND COMMUNICATIONS SYSTEMS-LAB DATA DISPLAY SVSTEM	FLIGHT OPERAT ONS	250.0
SPACE TRANSPORTATION OPERA IONS	JOHNSON SPACE CENTCR LOCAIION 7244-SA. 930112	MAN-SYSTEMS LABORATORIES-REPLACE OBSOLETE VAX PROCESSORS	FLIGHT HARDWARE	408.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7245-VA. 930116	ORBITER AND GFE PROJECTS SYSTEMS-MISSION EVALUATION ROOM SUPPORT HARDWARE	FLIGHT OPERATIONS	525.0
SPACE TRANSPORTATION OPERAT IONS	JOHNSON SPACE CENTER LOCATION 7247-PA, 930122	JSC INFORMATION NETWORK-JSC INFORMATION NETWORK	FLIGHT OPERAT IONS	1659.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7252-PA, 930124	VAX CLUSTER-EA VAX CLUSTER UPGRADES	FLIGHT OPERAT IONS	1100.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENIER LOCATION 7264-EA. 930150	SYSTEMS ENGINEERING OIVISION-MISC. PC/MAC UPGRADES/PURCHASES	FLIGHT OPERATIONS	600.0
SPACE TRANSPORTATION OPERA IONS	JOHNSON SPACE CENTER LOCATION 7265-EA. 930158	NAVIGATION, CONTROL 6 AERONAUTICS SYSTEM-UPGRADES AND REPLACEMENTS (PMS FUNDED)	FL GHT OPERA IONS	300.0
SPACE TRANSPORTATION OPERA IONS	KENNEDY SPACE CENTER LOCAT ION 7602-AI, 890016	ADMINISTRATIVE COMPUTER SYSTEM-ADMINISTRATIVE COMPUTER SYSTEM	FL GHT OPERA IONS	367.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUOGET LINE ITEM	RECEIVING INSTALLATION BUILOING LOCATION. AND ADP/EAD CONTROL NUMBER	EOUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
SPACE TRANSPORTATION OPERATIONS	KENNEOY SPACE CENTER LOCATION 7602-AI. 920078	ADMINISTRATIVE COMPUTER SYSTEM-AOMINISTRATIVE COMPUTER SYSTEM	FLIGHT OPERATIONS	781.0
SPACE TRANSPOR AT ON OPERATIONS	KENNEDY SPACE CENTER LOCATION 7602-J3, 920080	KENNEDY INVENTORY MANAGEMENT SYSTEM-KENNEDY INVENTORY. MANAGEMENT SYSTEM	FLIGHT OPERATIONS	726.0
SPACE TRANSPOR AT ON OPERATIONS	KENNEDY SPACE CENTER LOCATION 7623-S5, 930032	LPS SOFTWARE OEVELOPMENT NETWORK-LPS SOFTWARE OEVELOPMENT NETWORK	LAUNCH AND LANDING OPERATIONS	840.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
EXPENDABLE LAUNCH VEHICLES	KENNEDY SPACE CENIER LOCATION 7605-83, 930020	EXPENDIBLE VEHICLES TELEMETRY SVSTEMS-EXPENDABLE VEHICLES TELEMETRY SYSTEMS	DELTA	102.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
SPACE AND GROUND NETWORK, COMMUNICATIONS AND OATA SY'STEMS	AMES RESEARCH CENTER LOCATION 21XR-01, 900260	DRVOEN RESEARCH ENGINEERING DIV - C A-R/T PROCESSING & DISPLAY SYS UPGRADES	GROUND NETWORK	945.0
SPACE AND GROUND NETWORK. COMMUNICATIONS AND OATA SYSTEMS	AMES RESEARCH CENIER LOCATION 21XR-01, 930038	ORVDEN RESEARCH ENGINEERING DIV - C A-DIGITAL COMM SYSTEM	GROUND NETWORK	420.0
SPACE AND GROUND NETWORK. COMMUNICATIONS AND DATA SYSTEMS	GODDARO SPACE FLIGHT CENTER LOCATION 5101-AC. 930020	CENTRAL TELEMETRY OATA PROCESSING-CENTRAL TELEMETRY OAIA PROCESSING SVSTEM	COMMUNICATIONS AND OATA SYSTEMS	1520.0
SPACE AND GROUND NETWORK, COMMUNICATIONS AND OATA SYSTEMS	COOOARO SPACE FLIGHT CENTER LOCATION 5103-BK. 930066	MISSION AND DATA OPERATIONS TEST BED-MISSION & DATA OPERATIONS TEST BED PROCESSING	COMMUNICATIONS AND DATA SYSTEMS	1482.0
SPACE AND GROUND NETWORK. COMMUNICATIONS AND DATA SYSTEMS	GOODARO SPACE FLIGHT CENTER LOCATION 5104 AA. 930084	NASA COMMUNICATIONS SYSTEM (NASCOM) NASA COMMUNICATIONS SYSTEM (NASCOM)	COMMUNICATIONS AND DATA SYS EMS	1335.0
SPACE AND GROUND NETWORK. COMMUNICATIONS AND DATA SYSTEMS	GODDARD SPACE FLIGHT CENTER LOCATION 5105-AZ. 930092	NETWORK MISCELLANEOUS SUPPORT SYSTEM-NETWORK MISCELLANEOUS SUPPORT SVSTEM. NO	SPACE NE WORK	1032.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
SPACE AND GROUNO NETWORK, COMMUNICATIONS AND DATA SVSTEMS	GODDARD SPACE FLIGHT CENTER LOCATION 5106-AE, 930094	SATELLITE OPERATIONS CONTROL CENTERS-SATELLITE OPERATIONS CONTROL CENTERS	COMMUNICATIONS AND OATA SYSTEMS	6439.0
SPACE AND CROUNO NETWORK, COMMUNICATIONS AND OATA SYSTEMS	COODARD SPACE FLIGHT CENTER LOCATION 5106-BB, 930100	COMMAND MANAGEMENT SYSTEM-	COMMUNICATIONS AND OATA SYSTEMS	1700.0
SPACE AND GROUNO NETWORK, COMMUNICATIONS AND DATA SYSTEMS	GOOOARO SPACE FLIGHT CENTER LOCATION 5106-BC, 930102	FLIGHT DYNAMICS FACILITY-OPERATIONS SUPPORT COMPUTING FACILITY SYS	COMMUNICATIONS AND OATA SYSTEMS	4660.0
SPACE AND GROUNO NETWORK, COMMUNICATIONS AND OATA SYSTEMS	GOOOARO SPACE FLIGHT CENTER LOCATION 5105-AB. 930220	TRACKING AND DATA RELAY SATELLITE SYSTEM-TRACKING AND DATA RELAY SATELLITE SYSTEM	SPACE NETWORK	300.0
SPACE AND CROUNO NETWORK. COMMUNICATIONS AND OATA SYSTEMS	JET PROPULSION LABORATORY LOCATION 5500- 920012	JPL - ADP ACTIVITY	GROUND NETWORK	5789.0
SPACE AND CROUNO NETWORK, COMMUNICATIONS AND OATA SVSTEMS	JET PROPULSION LABORATORY LOCAIION 5512-NO. 920034	NETWORK OPS. CONTROL CENTER SYSTEM-SIGNAL PROC. CENTER REPLACEMENT	GROIJNO NETWORK	250.0
SPACE AND CROUNO NETWORK, COMMUNICATIONS AND OATA SVSTEMS	JET PROPULSION LABORATORY IOCATION 5512-GO, 930016	CROUNO COMM. FAC LITY OPERATIONAL SVS. MOOCOMP 97XX PROCESSORS & PER PHERAL EOUIPMENT.	COMMUNICATIONS AND OATA SYSTEMS	890.0

Summary of Major ADP Equipment Acquisition Obligations

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(93) OBLIGATIONS ($ IN THOUSANDS)
SPACE AND GROUND NETWORK. COMMUNICATIONS AND DATA SYSTEMS	JET PROPULSION LABORATORY LOCATION 5512-NO. 930022	NETWORK OPS. CONTROL CENTER. SYSTEM-OMC UPGRADE	GROUNO NETWORK	504.0
SPACE AND GROIJNO NETWORK. COMMUNICATIONS ANI) DATA SYSTEMS	JET PROPULS ON LABORATORY LOCATION 55 2-NO, 930028	NETWORK OPS. CONTROL CENTER. SYSTEM-LMC UPGRAOE	GROUND NETWORK	290.0
SPACE AND GROIJNO NETWORK, COMMUNICATIONS AND DATA SYSTEMS	JET PROPLJLS ON LABORATORY LOCATION 5512-NO. 930030	NETWORK OPS. CONTROL CENTER. SYSTEM-MOOCOMP 97XX PROCESSOR HAROWARE	GROUNO NETWORK	740.0
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	MARSHALL SPACE FLIGHT CENTER LOCATION 6218-01, 930026	TELECOMMUNICATIONS CENTER-DATA EOUIPMENT PURCHASE	COMMUNICATIONS AND DATA SYSTEMS	8909.0
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	MARSHALL SPACE FLIGHT CENTER LOCATION 6218-01, 930030	TELECOMMUNICATIONS CENTER-NETWORK MGMT EOUIPMENT PLJRCHASE	COMMUNICATIONS AND DATA SYSTEMS	3607.0