



National Aeronautics and
Space Administration

Budget Estimates

Fiscal Year 1992

Volume III

Research and Program Management

Special Analyses

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1992 ESTIMATES

VOLUME III

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RESEARCH AND
PROGRAM
MANAGEMENT

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**SUMMARY
INFORMATION**

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1992 ESTIMATES

GENERAL STATEMENT

The Research and Program Management (R&PM) appropriation provides funds for NASA's civil service workforce, both salaries and the essential support without which they could not function. It provides for total support of those buildings and facilities that are basically administrative in function. It also provides a very considerable amount of direct support to NASA's Research and Development (R&D) Programs and activities. Finally, beginning in 1992 it will provide for the performance by civil servants a number of functions that had previously been performed by contractors and funded by other appropriations. For 1992 an appropriation of \$2,452,300,000 is requested.

NASA continually reviews its manpower requirements and utilization, and recent reviews indicated that some functions were being performed by contractors that should more properly be performed by civil servants. Therefore, when the Office of Management and Budget (OMB) asked NASA to undertake a comprehensive review of its workforce, particular attention was given to the appropriateness of contractors versus civil service performing particular functions. Undesirable situations were found, and NASA has been authorized by OMB to convert slightly over a thousand of such positions (595 full-time equivalent (FTE)) to civil servants in 1992. This conversion activity has been termed "Project CORE."

Exclusive of these conversions, NASA's 1992 programs will require only a modest increase over 1991 and will require 24,026 FTE in 1991 and 24,231 FTE in 1992. The 1992 allocation includes 6 FTE to allow for adequate preparation and audit of financial statements pursuant to the Chief Financial Officers Act of 1990.

It should be noted that beginning in 1991 OMB employment ceiling will exclude persons appointed under the Worker Trainee Opportunity Program, the Federal Cooperative Education (Co-op) program, as well as other programs (e.g., summer aids, stay-in-school, etc.). This results in a reduction of 466 FTE from NASA in 1991 and subsequent years. NASA's total employment for 1992 is planned to be 24,826 in R&PM, which includes 595 to be utilized in Project CORE, and 206 in the Inspector General's Appropriation, for a total of 25,032. (This does not include the 466 FTE previously allocated to Co-ops.)

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; select and monitor the contractors; manage the various research, development, and test activities; and oversee all of NASA's operations. The salaries and related costs of this workforce comprise the substantial majority of the requested appropriation. The Salary and Related Costs estimates for 1991 and 1992 do not include any impact of the Pay Reform Act of 1990. NASA is developing estimates related to the pay reform with options that may be open to the Agency. A few percent of the total is required to fund the travel necessary to manage NASA and its programs. The remaining amount of the R&PM appropriation provides vital support to the civil service workforce and to the centers' physical plant. This includes funding the basic work environment of the workforce--furniture; telephones; mail; typewriters; the utility bills; janitorial and fire protection services; and maintenance of roads and grounds. It also includes support contractors, equipment, and supplies in support of the Centers administrative functions.

For the facilities that are primarily administrative in function, including all of the very extensive utilities systems, the R&PM appropriation funds the operations, preventive maintenance, and rehabilitation projects under \$200,000.

In addition to the above essential support to NASA's workforce, the R&PM appropriation funds a number of items that are clearly and directly in support of R&D activities. A most obvious example of this support is the electricity to operate NASA's many wind tunnels. The library at each of the centers is also R&PM funded and is a major research tool. The photo lab, print shop, and graphics capability are necessary to document research results, to publish and present the research, and print launch related procedures. Security and fire protection are heavily R&D driven but are R&PM funded. Many special purpose vehicles are also R&PM funded, including cranes that lift test articles into place and large trucks that haul models to the wind tunnels.

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 as follows:

Office of Space Flight:

Johnson Space Center - Management of the Space Shuttle Program, including orbiter production and modification; management of Space Station Freedom's Work Package 2; selection and training of astronauts and mission specialists; and Space Transportation System operations, including mission planning, operational procedures and flight control.

Kennedy Space Center - Management of the ground operational phase of the Space Transportation System, including orbiter processing, final payload checkout and integration with the Shuttle, and Shuttle launch; 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; management of the Advanced Solid Rocket Motor (ASRM) and the propulsion system of the National 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 and ASRM 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 Space Station Freedom's Work Package 3; 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 launch services for small and intermediate 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. Exploration and Technology:

Ames Research Center - Conduct of activities involving experimental and theoretical aerodynamics research, computational fluid dynamics, aeronautical flight research and testing, rotorcraft technology, short and vertical takeoff and landing technology, technology for transatmospheric vehicles, life sciences, 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 subsonic aircraft research and technology, emphasizing fuel conservation, safety and environmental effects; hypersonic propulsion; experimental and theoretical aerodynamics; environmental quality monitoring by remote sensing; advanced space systems technology; and research in the areas of structures and materials, guidance and controls, and airframe/propulsion integration of the transatmospheric research and technology program.

Lewis Research Center - Conduct of aeronautical and space propulsion research and technology, including propulsion for the transatmospheric research and technology program; space communications research and technology; development of microgravity science and application experiments; space energy systems research and technology; management of Space Station Freedom's Work Package 4; and procurement of launch services for intermediate and large payloads.

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, etc. NASA Headquarters budgets for a number of agencywide activities, major new ADP systems developments, the FTS costs and executive development programs.

The 1991 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 (\$1,512,522,000): Includes salaries and benefits, the Government's contribution to personnel benefits for NASA civil service employees (including the Government's cost of the Federal Employees Retirement System (FERS) and the Civil Service Retirement System (CSRS)), and for personnel of other Government agencies detailed to NASA. In 1992, the budget provides for 24,231 FTE (not counting the Co-Op program or the 595 conversions) 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, and the training of NASA civil service employees. The General Schedule pay raise projected for January 1992 is included in these estimates.

11. Travel (\$54,056,000): 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.

111. Operation of Installation (\$885,722,000): Provides a broad range of services, supplies, and equipment in support of each center's activities. These are divided into four major functional areas as follows:

- A. Facilities Services (\$368,843,000): Includes rental of real property; the cost of maintenance, minor modifications and alterations, repair and related activities for administrative facilities and equipment; janitorial, security, and fire protection services; and utilities costs.
- B. Technical Services (\$202,519,000): Includes the cost of automatic data processing for administrative and management activities (including development of agencywide automated systems); education and informational programs; and other essential technical services, such as technical libraries, photographic laboratories, graphics support, and safety.
- C. Management and Operations (\$276,455,000): Includes the cost of administrative communications; printing and reproduction; administrative supplies, materials, and equipment; transportation costs; health services; mail and postage; and other miscellaneous services.

- D. Implementation of Project CORE (S37.905.000): Includes funding for continued performance of several functions in the R&PM budget. Some functions previously performed by contractors will subsequently be performed by civil servants. These are cases where the contractors' performance is being so closely monitored by civil servants that it approaches supervision, where the contractors are performing functions that appear to be properly government functions; and where the contractors was involved in project management.

SUMMARY OF THE BUDGET PLAN BY FUNCTION

	1990	1991		1992
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related Costs	1,269,853	1,392,156	1,398,860	1,512,522
II. Travel	45,672	54,056	52,056	54,056
111. Operation of Installation	707,671	806,688	760,984	885,722
A. Facilities Services	(283,495)	(342,207)	(325,262)	(368,843)
B. Technical Services	(178,598)	(197,525)	(185,335)	(202,519)
C. Management and Operations	(245,578)	(266,956)	(250,387)	(276,455)
D. Implementation of Project CORE	0	0	0	37,905
Total, NASA	2,023,196	2,252,900	2,211,900	2,452,300

SUMMARY OF CHANGES FROM THE 1991 BUDGET TO THE 1991 CURRENT ESTIMATE

The 1991 budget request of \$2,252.9 million is revised to \$2,211.9 million which must accommodate additional requirements within a reduced appropriation. The current R&PM plan includes the following changes:

1991 Budget Request	\$2,252.9
Unbudgeted Portion of January 1991 Pay Raise..	5.0
Other Unanticipated Salary Growth.....	6.3
Retirement and FICA Increases...	4.0
Health Benefits Increase.....	1.8
Agency 1991 Requirement.....	2,270.0
Required Reductions/Absorptions	- 58.1
FY 1991 Current Estimate.....	\$2,211.9

The increased personnel cost and the appropriation reduction of \$41 million result in a total shortfall of \$58.1 million which had to be accommodated by reductions in virtually all Centers and functions.

BASIS OF THE 1992 ESTIMATE

The 1992 Budget Estimate of \$2,452,300,000, an increase of \$240,400,000 over the current FY 1991 R&PM plan, provides for: a civil service ceiling of 24,826 workyears (an increase of 800 FTE from 1991, most of which are for the implementation of Project CORE); the full year cost of the 1991 pay raise; and projected 1992 pay raises. It provides for increased travel consistent with increased travel costs. It also provides for the continuation of general center support and maintenance at anticipated Support Service Contractors and utility rates.

The Research and Program Management appropriation request for 1992, by functional category, is summarized below:

I. personnel and Related Costs (\$1.512.522.0001): The 1992 estimate of Personnel and Related Costs is \$113.7 million higher than 1991. Of the increase: \$12.7 million is for compensation, benefits and supporting costs for the 205 additional FTE; \$13.1 million is for the full year cost of the 1991 pay raise; \$39.5 million is budgeted for pay raises projected to be effective in January 1992; \$25.3 million is primarily for increases in the number of employees enrolled in the new Federal Employees Retirement System (FERS), the raising of the FICA cap and increases in health care costs. \$14.0 million is for normal personnel actions such as promotions and within grade increases. The balance of \$9.1 million is for increased career development costs, and other changes in salaries and benefits paid. It should be noted that these estimates do not take Project CORE into account, because those funds will be transferred in later.

11. Travel (\$54.056.000): 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 1992 increase in travel of less than 4 percent is intended to respond to increased travel costs.

111. Operation of Installation (\$885,722,000): The 1992 plan provides for the anticipated escalation of all costs--Support Service Contractor, materials, supplies, purchased services, and utilities. It will also provides for continued emphasis on maintenance improvements and the addressing of several environmental concerns. A new item in the Operation of Installation budget will fund the implementation of Project CORE.

A. Facilities Services (\$368,843,000): The 1992 Estimate, an increase of \$43.6 million over the 1991 Current Estimate funds the anticipated usage and price rate increases in utilities, support contractor wage rates, supplies and materials, cost increases, and institutional costs associated with the increasing level of institutional activity. This includes outfitting of several new facilities and a consolidated NASA Headquarters complex. The increase will also allow NASA to continue to address maintenance problems in the R&PM funded infrastructure of several of the Centers.

B. Technical Services (\$202,519,000): The 1992 Estimate, an increase of \$13.2 million over the 1991 Current Estimate funds the anticipated price rate increases in Support Services Contractors, and in materials and supplies. It will also allow continued progress in utilizing the current and expanded capabilities of administrative ADP systems, including NASA-wide accounting, and personnel information, and management systems.

C. Management and Operations (\$276,455,000): The 1992 Estimate, an increase of \$26.1 million over the 1991 Current Estimate will cover anticipated contractor, supply and materials costs. Additionally, program related costs such as printing and transportation will increase. Management and Operations includes the funds to purchase an administrative aircraft to replace a currently-owned aircraft and to assess the extent and cleanup of environmental hazards.

D. Implementation of Project CORE (\$37,905,000): The 1992 Estimate of \$37.9 million which is included in this budget for the first time, will cover the estimated salary, travel, and supporting cost of 1,060 positions which will be converted from contractors to civil servants. Salaries will be consistent with what comparable civil servants are currently paid and travel and installation support costs will be consistent with program and center requirements and existing capabilities.

In summary, the 1992 budget requirement of \$2,452,300,000 is to provide for 24,826 full-time equivalent civil service workyears, including the 1992 pay raise, and to support the activities and maintain the physical plant 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. ComDensation:

- 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 piece 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 ComDensation: 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 benefits. 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. **Office of Personnel Management Services:** The Office of Personnel Management is reimbursed for activities such as security investigations on new hires, recruitment advertising, and Federal wage system surveys.
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.

II. 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. Payments to interagency motor pools are included in the Operation of Installation function (Management and Operations subfunction).

111. Operation of Installation

Operation of Installation provides a broad range of services, supplies, and equipment in support of the centers' institutional activities. These are divided into three major subfunctional areas: Facilities Services (the cost of renting real property, 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 information programs and technical shops supporting institutional activities); and Management and Operations (the cost of administrative communications, printing, transportation, medical, supply, and related services). A description of each major subfunction follows:

A. Facilities Services:

1. Rental of Real Property: Rental of real property includes the rental of building space directly by NASA or through the General Services Administration to meet Headquarters and offsite office, warehousing, and other requirements which cannot otherwise be provided in existing buildings at the NASA Installation. Most of the funding is required for rental of the NASA Headquarters complex of buildings in the District of Columbia, and nearby Maryland and Virginia that are either Government-owned or leased. NASA must provide rental payments to the General Services Administration in accordance with P.L. 92-313 for these facilities.
2. Maintenance and Related Activities: Maintenance and related activities include the recurring day-to-day maintenance of facilities (grounds, buildings, structures, etc.) and equipment. This involves the mowing and care of grassy areas, care of trees and shrubs,

elevators, cranes, pressure vessel inspections, painting and protective coatings, general buildings maintenance, and the maintenance of installed mechanical, electrical, and other systems. In addition, this item includes feasibility studies, project design, construction supervision, inspection, and other institutional facility engineering functions. Included also are any applicable costs associated with recurring facility work as well as materials, hardware, and equipment used in facility maintenance activities. Equipment costs include related maintenance and other services for acquisition, replacement and modification of general facility related equipment. Facilities equipment for administrative internal communications and television monitoring equipment are included below in their respective categories.

3. Custodial Services: Custodial services include janitorial and building cleaning services, pest control, fire protection services, security services including badging and identification, lock and safe repair, trash and refuse handling, window blinds and light fixture cleaning, and laundry and dry cleaning of facility related items.
4. Utilities Services: Utilities services include the purchase of utilities such as electricity, natural gas, fuel oil, coal, steam, propane, and other fuel commodities as well as water and sewage treatment services. Also included are the related maintenance and operating costs of the utility plants and systems.

B. Technical Services:

1. Automatic Data Processing:

- a. Equipment: This category provides for the lease, purchase and maintenance of general purpose data processing equipment which supports institutional operations at each installation. Excluded is equipment dedicated to specific research or operational systems which is funded from the Research and Development or the Space Flight, Control and Data Communications appropriations.
- b. Operations: Operations services include programming, computer operations and related services for institutional applications including payroll, financial management, security, maintenance, personnel, logistics, and procurement records and reports.

2. Scientific and Technical Information and Educational Programs:

- a. Libraries: The technical libraries are established to provide installation staff with books, periodicals, technical reports and other scientific documentation.
- b. Education and Information Programs: The educational and informational programs provide for the documentation and dissemination of information about the Agency's programs to the general public, the educational community at the elementary and secondary levels, and the mass communications media. Assistance to the mass communications media includes the assembly and exposition of newsworthy material in support of requests in the form of press kits, news releases, television and radio information tapes and clips, and feature materials.

3. Shop Support: Shop support services include safety, the production of general photographic services, graphics, and audio-visual materials.

C. Manaeement and Operations:

1. Administrative Communications: Included in this category are costs not dedicated to a specific program or project, and cover leased lines, long distance tolls (including FTS charges), teletype services, and local telephone service.
2. Printing and Reproduction: Included in this category are the costs for duplicating, blueprinting, microfilming, and other photographic reproductions. Also included in this category are Government Printing Office printing costs, contractual printing and the related composition and binding operations.
3. Transportation: Transportation services include the operation and maintenance of all general purpose motor vehicles used by both civil service and support contractor personnel and the operation of the NASA program support aircraft fleet. The cost of movement of supplies and equipment by commercial carriers and payments to interagency motor pools are also in this category.

4. Installation Common Services: Installation common services include support activities at each installation such as: occupational medicine and environmental health; mail service; supply management; patent services; administrative equipment; office supplies and materials; and postage.

D. Implementation of Project CORE: Funds for the Implementation of Project CORE will be used to fund the conversions of a number of functions currently being performed by contractors to civil servants. In some cases, the work environment of contractors has created a situation in which there is direct government supervision of contractors. In some cases, the contractors are performing functions that, upon critical scrutiny, seem to be inherently governmental, such as contract management. Finally, some of these contractors are performing functions inappropriately involved in actual project management

NASA has examined each contract that is to be converted and determined when during 1992 the conversion is to be made. These funds are to provide for the continuation of the subject function after that date. Most of these funds will ultimately be transferred into Personnel and Related Costs. The remainder of the funds are planned to be transferred into Travel or to be used in Operation of Installation to provide necessary support to the converted individuals. Some of these funds may, however, have to be used to continue the currently existing contracts beyond their planned conversion date if, for reasons beyond our control, the full conversion of some contracts cannot be accomplished on schedule.

DISTRIBUTION OF FULL TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

NASA TOTAL	1991			1992 BUDGET ESTIMATE
	1990 ACTUAL	BUDGET ESTIMATE	CURRENT ESTIMATE	
SPACE STATION..... (SPACE STATION PROJECT OFFICE - LEVEL II)	2,106 (207)	2,744 (264)	2,371 (220)	2,530 (220)
SPACE FLIGHT PROGRAMS.....	5,846	5,714	5,872	5,798
SPACE TRANSPORTATION CAPABILITY DEV....	1,598	1,635	1,569	1,607
SPACE SHUTTLE.....	4,248	4,079	4,303	4,191
SPACE SCIENCE AND APPLICATIONS.....	4,287	4,332	4,349	4,463
PHYSICS AND ASTRONOMY.....	2,133	2,128	2,072	2,082
LIFE SCIENCES.....	289	268	280	272
PLANETARY EXPLORATION.....	206	208	197	197
SPACE APPLICATIONS.....	1,659	1,728	1,800	1,912
AERONAUTICS EXPLORATION AND TECHNOLOGY..	5,145	5,244	5,345	5,299
AERONAUTICAL RESEARCH AND TECHNOLOGY..	3,090	3,306	3,256	3,232
SPACE RESEARCH AND TECHNOLOGY.....	1,815	1,760	1,893	1,885
TRANSATMOSPHERIC RESEARCH AND TECH....	240	178	196	182
COMMERCIAL PROGRAMS.....	119	129	130	137
SAFETY, RELIABILITY & QUALITY ASSURANCE.	112	131	133	133
ACADEMIC PROGRAMS.....	19	22	25	28
TRACKING AND DATA PROGRAMS.....	711	715	713	717
SUBTOTAL - DIRECT FULL-TIME PERM FTE'S	18,345	19,031	18,938	19,105
CENTER MANAGEMENT AND OPERATIONS.....	4,573	4,654	4,791	4,835
SUBTOTAL - FULL-TIME PERM FTE'S.....	22,918	23,685	23,729	23,940
OTHER FTE'S.....	767	781	297	291
SUBTOTAL - FULL-TIME EQUIVALENTS.....	23,685	24,466	24,026	24,231
PROJECT CORE.....				595
GRAND TOTAL - FULL-TIME EQUIVALENTS..	23,685	24,466	24,026	24,826

SUMMARY OF BUDGET PLAN BY INSTALLATION
(THOUSANDS OF DOLLARS)

	1990 ACTUAL	1991		1992 BUDGET ESTIMATE
		BUDGET ESTIMATE	CURRENT ESTIMATE	
JOHNSON SPACE CENTER	320,630	340,155	338,382	363,006
KENNEDY SPACE CENTER	277,438	302,247	297,674	320,786
MARSHALL SPACE FLIGHT CENTER.	269,267	281,858	285,911	324,482
STENNIS SPACE CENTER.	25,137	28,340	28,542	30,633
WOODWARD SPACE FLIGHT CENTER..	264,677	304,600	303,031	330,211
AMES RESEARCH CENTER	187,340	213,491	209,840	236,850
LANGLEY RESEARCH CENTER	197,879	217,170	214,500	231,189
LEWIS RESEARCH CENTER	206,006	232,416	232,702	255,409
HEADQUARTERS	274,822	332,623	301,318	351,734
TOTAL, RESEARCH AND PROGRAM MANAGEMENT	2,023,196	2,252,900	2,211,900	2,452,300

DISTRIBUTION OF FULL TIME EQUIVALENT WORKYEARS BY INSTALLATION

	1990 ACTUAL	1991		1992 BUDGET ESTIMATE
		BUDGET ESTIMATE	CURRENT ESTIMATE	
JOHNSON SPACE CENTER.....	3,587	3,625	3,618	3,617
KENNEDY SPACE CENTER.....	2,425	2,549	2,510	2,509
MARSHALL SPACE FLIHT CENTER.....	3,594	3,654	3,650	3,650
STENNIS SPACE CENTER.....	182	215	216	216
OODDARD SPACE FLIGHT CENTER.....	3,730	3,855	3,860	3,975
AMES RESEARCH CENTER.....	2,159	2,181	2,228	2,228
LANGLEY RESEARCH CENTER.....	2,887	2,932	2,923	2,923
LEWIS RESEARCH CENTER.....	2,715	2,809	2,798	2,792
HEADQUARTERS.....	1,639	1,865	1,926	2,030
(SPACE STATION PROJECT OFFICE - LEVEL 11)	(207)	(264)	(220)	(220)
SUBTOTAL, FULL-TIME PERMAMENT WORKYEARS	22,918	23,685	23,729	23,940
OTHER THAN FULL-TIME PERMAMENT WORKYEARS	767	781	297	291
SUBTOTAL, CEILINO CONTROLLED FTE.	23,685	24,466	24,026	24,231
PROJECT CORE.....				595
GRAND TOTAL, CEILING CONTROLLED FTE.	23,685	24,466	24,026	24,826

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND PROGRAM MANAGEMENT - FY 1992 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										
1990 ACTUAL	11,260,853	206,265	131,055	169,973	10,025	201,192	123,631	144,563	44,067	110,079
1991 BUDGET	11,392,156	219,805	142,019	198,292	12,094	220,542	133,258	156,089	56,603	151,254
1991 CURRENT	11,398,860	221,706	142,034	203,942	12,755	221,745	135,970	156,132	59,694	144,871
1992 BUDGET	11,512,522	237,246	153,446	219,474	13,351	240,636	144,506	166,136	72,027	165,696
TRAVEL										
1990 ACTUAL	45,672	7,065	3,615	6,771	317	6,144	4,191	4,246	3,965	9,156
1991 BUDGET	54,056	7,923	5,321	7,086	646	7,100	5,325	4,918	4,257	11,500
1991 CURRENT	52,056	7,488	4,709	7,333	649	6,837	5,283	4,622	4,259	10,675
0 9 2 BUDGET	54,056	7,777	4,890	7,615	674	7,100	5,278	4,799	4,423	11,500
OPERATION OF INSTALLATION										
1990 ACTUAL	707,671	107,300	142,768	72,523	14,395	57,341	59,515	40,066	57,974	146,567
1991 BUDGET	806,688	112,427	154,907	76,500	15,600	76,958	74,908	56,163	69,356	169,869
1991 CURRENT	760,964	109,185	150,931	74,636	15,138	74,449	68,578	53,746	66,749	145,572
1992 BUDGET	665,722	117,903	162,450	97,393	16,608	90,473	87,066	60,252	76,959	174,538
TOTAL										
1990 ACTUAL	12,023,196	320,630	277,438	269,267	25,137	264,677	187,340	197,879	206,006	274,622
1991 BUDGET	12,252,900	340,155	302,247	281,858	28,340	304,600	213,491	217,170	232,416	332,623
1991 CURRENT	12,211,900	338,382	297,674	285,911	28,542	303,031	209,840	214,500	232,702	301,318
1992 BUDGET	12,452,300	363,006	320,786	324,482	30,633	338,211	236,850	231,189	255,409	351,734

INSTALLATION
JUSTIFICATION

JOHNSON
RACE CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1992 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, 1990, was \$888,809,000.

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 truss structure, airlocks and 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, production of the replacement orbiter, 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.

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

Payload 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 counter 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; design, develop, integrate, test and launch the Lifesat series of retrievable biosatellites, a new initiative in 1992.

Supporting Roles:

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

Technoloey 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) WRKYEARS OY PROQRAM

JOHNSON SPACE CENTER	1990 ACTUAL	1991		1992 BUDGET ESTIMATE
		BUDGET ESTIMATE	CURRENT ESTIMATE	
SPACE STATION.....	683	1,015	853	977
SPACE FLIGHT PROQRAMS.....	2,147	1,938	1,978	1,854
SPACE TRANSPORTATION CAPABILITY DEV....	659	621	551	551
SPACE SHUTTLE.....	1,488	1,317	1,427	1,303
SPACE SCIENCE AND APPLICATIONS.....	140	118	127	127
PHYSICO AND ASTRONOMY.....	15	19	21	21
LIFE SCIENCES.....	91	67	76	76
PLANETARY EXPLORATION.....	32	28	26	26
SPACE APPLICATIONS.....	2	4	4	4
AERONAUTICS EXPLORATION AND TECHNOLOOY..	99	67	138	138
AERONAUTICAL RESEARCH AND TECHNOLOOY..	0	0	0	0
SPACE RESEARCH AND TECHNOLOOY.....	99	67	138	138
TRANSATMOSPHERIC RESEARCH AND TECH....	0	0	0	0
COMMERCIAL PROQRAMS.....	9	17	10	10
SAFETY, RELIABILITY & QUALITY ASSURANCE.	0	0	0	0
ACADEMIC PROQRAMS.....	0	0	0	0
TRACKING AND DATA PROQRAMS.....	0	0	0	0
SUBTOTAL - DIRECT FULL-TIME PERM FTE'S	3,078	3,155	3,106	3,106
CENTER MANAGEMENT AND OPERATIONS.....	509	470	512	511
SUBTOTAL - FULL-TIME PERM FTE'S.....	3,587	3,625	3,618	3,617
OTHER FTE'S.....	112	115	47	48
SUBTOTAL - FULL-TIME EQUIVALENTS.....	3,699	3,740	3,665	3,665
PROJECT CORE.....				12
GRAND TOTAL - FULL-TIME EQUIVALENTS..	3,699	3,740	3,665	3,677

PROGRAM DESCRIPTION

Permanent Civil
Service Workyears

RESEARCH AND DEVELOPMENT

SPACE STATION.....

977

As one of NASA's four 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 1992 provides for the management of development functions in support of the Critical Design Review activities. Specific JSC Space Station project responsibilities include the integrated truss assembly, mobile transporter, airlocks, resource nodes, and STS-to-Space Station attachment system. 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 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.

SPACE FLIGHT PROGRAMS.....

1,854

SPACE TRANSPORTATION CAPABILITY DEVELOPMENT.....

551

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 Technical 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.

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 Workyears

SPACE SHUTTLE

1,303

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 building of the replacement orbiter hardware and modifying 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 for 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.

Reconfiguration tools (hardware and software systems) to permit support of the flight rates are being implemented in the Shuttle Mission Simulator complex and procedures training facility. The capability for near-continuous training of a number of flight crews for different types of missions with different payload requirements and on different Orbiters requires management and utilization of a very high volume of data. Automated tools are essential to support this pace of training. In addition, simulator system upgrades are regularly being made to keep up with changes to the orbiter.

Furthermore, there is provision for rapid handling of mission-to-mission software changes (flight dependent data in erasable memory) and associated verification on a "near production line" basis in order to achieve greater mission rates. To accommodate the production-line type of work, emphasis is being placed on software tools and the associated automatic data processing equipment hardware to support the Software Production Facility.

Permanent Civil
Service Workyears

SPACE SCIENCE AND APPLICATIONS.....

127

PHYSICS AND ASTRONOMY.....

21

JSC has the role of mission manager for the Spacelab flights and of providing mission support. This includes 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.

Permanent Civil
Service Workvears

LIFE SCIENCES... ..

76

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 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 managements and engineering of the payload hardware, crew experiment training, operation of the payload during flights, and pre- and postflight 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..

26

The Center supports the Agency's planetary exploration 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.

SPACE APPLICATIONS

4

JSC has establish 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. EXPLORATION AND TECHNOLOGY

138

SPACE RESEARCH AND TECHNOLOGY,.....

138

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 the Moon and the human exploration of Mars. The technologies include: improvement of man-machine interactions in space, advanced thermal concepts,

evaluation of ADA language in NASA flight systems, environmentally controlled life support systems efficiencies, development of docking/berthing systems required for large space systems, data system architectural designs, methodologies to improve cost effectiveness of guidance, navigation and control systems and techniques to make use of extraterrestrial materials. Experiments compatible with STS operational capabilities are being developed to obtain research and technology data in flight regimes applicable to advanced transportation systems. This effort also includes automation and robotics, which is part of the Space Automation and Telerobotics.

Permanent Civil
Service Workyears

COMMERCIAL PROGRAMS... ..

10

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 investments 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 than 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. Two hundred NASA-sponsored middeck locker volume equivalents (MLVEs) are to be flown on six Shuttle missions, beginning in early 1993 and ending 1995.

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.....

511

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.

Manaaement 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.

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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

	1990 Actual	1991		1992
		Budget Estimate	Current Estimate	Budget Estimate
I. PERSONNEL AND RELATED COSTS	206.265	219.805	221.708	237,246
II. TRAVEL	7,065	7,923	7,489	7,777
III. OPERATION OF INSTALLATION	107.300	112.427	109.185	117,983
A. Facilities Services	37,832	37,594	39,496	44,105
B. Technical Services	33,989	36,785	32,630	34,889
C. Management and Operations	35,479	38,048	37,059	38,492
D. Implementation of Project CORE	0	0	0	497
Total, Fund Requirement	320.630	340.155	338.382	363,006

1990 <i>Actual</i>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

RESOURCES REQUIREMENTS BY FUNCTION

I.	PERSONNEL AND RELATED COSTS	206.265	219.805	221,708	237,246
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Summary of Fund Requirements

A.	Compensation and Benefits				
1.	Compensation				
a.	Full-time permanent	162,081	170,230	172,180	183,190
b.	Other than full-time permanent	2,430	2,716	2,733	2,817
c.	Reimbursable detailees	5,236	6,606	6,263	6,601
d.	Overtime and other compensation	3,238	3,771	3,663	3,970
	Subtotal, Compensation	172,985	183,323	184,839	196,578
2.	Benefits	29,779	32,020	32,989	36,645
	Subtotal, Compensation and Benefits	202,764	215,403	217,828	233,223

	1990 <i>Actual</i>	1991		1992
		Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
(Thousands of Dollars)				
B. Supporting Costs				
1. Transfer of personnel	1,081	931	1,360	1,073
2. OPM Services	0	0	0	0
3. Personnel training	2,420	3,471	2,520	2,950
Subtotal, Supporting Costs	3,501	4,402	3,880	4,023
Total, Personnel and Related Costs	206,265	219,805	221,708	237,246

Explanation of Fund Requirements

A. Compensation and Benefits

1. Compensation

a. Full-time permanent	162,081	170,230	172,180	183,190
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The increase in the 1991 Current Estimate from the 1991 Budget Estimate reflects the change in the January pay raise from 3.6 percent to 4.1 percent, the additional 4.1 percent pay raise for the Senior Executive Service personnel and a repricing due to less attritions in 1990 than planned. The 1992 Estimate includes funding for a full year of the 1991 pay raise, the 1992 pay raise, one additional day and full year funding for promotions, within grade increases, and other personnel actions.

Basis of Cost for Permanent Positions

In 1992. the cost of full-time workyears will be \$183.190.000. The increase from 1991 is calculated as follows:

Cost of full-time permanent workyears in 1991.....		\$172.180
Cost of increases in 1992.....		13.034
Within grade and career advances:		
Full year effect of 1991 actions.....	2.165	
Partial year effect of 1992 actions.....	2.996	
Full year cost of 1991 pay raise.....	2.307	
Partial year cost of 1992 pay raise.....	4.883	
Extra Day	683	
Cost Changes in 1992.....		- 2.024
Full year effect of 1991 effect actions.....	+1.247	
Partial year effect of 1992 actions.....	+ 2 3 5	
Decrease to at'tain approved FTE ceiling.....	.3.506	
Cost of full-time permanent workyears in 1992.....		\$183.190

1990 <u>Actual</u>	<u>1991</u>		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

b. Other than full-time permanent

(1) cost	2,430	2,716	2,733	2,817
(2) Workyears	112	115	47	48

The distribution of 1992 workyears is as follows:

Distribution of Other than Full-Time Workyears

<u>Program</u>	<u>Workyears</u>
Development programs.....	4
Summer programs.....	10
Other temporary programs.....	<u>34</u>
Total.....	<u>48</u>

The increase from the 1991 Budget Estimate to the 1991 Current Estimate is primarily the result of the increase in the 1991 pay raise from 3.6 percent to 4.1 percent. The 1992 Estimate reflects the full year effect of the 1991 pay raise and the cost of the anticipated pay raise in January 1992. The reduction in workyears in the 1991 Current Estimate and the 1992 Budget Estimate is the result of the Office of Management and Budget excluding Co-Ops from the Agency FTE ceiling.

C. Reimbursable detailees	5,236	6,606	6,263	6,601
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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 1991 Current Estimate is due primarily to a

1990 <u>Actual</u>	1991		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

decrease in the number of detailees offset by the FY 1991 pay raise. The 1992 Budget Estimate reflects the full year effect of the 1991 pay raise, and the anticipated FY 1992 pay raise.

d. Overtime and other compensation	3,238	3,771	3,663	3,970
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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 1991 Budget Estimate to the 1991 Current Estimate is based on flight activity. In the 1991 Congressional Budget NASA had planned for ten flights and currently we are expecting to have eight launches. Overtime in 1991 will be used primarily to support Shuttle flights, but overtime is also used for crew training and related support activities. The 1992 Budget Estimate reflects an increased level of effort to support the increased flight rate and training requirements associated with the manifest of nine flights, full year funding of the 1991 pay raise and funding for the anticipated 1992 pay raise.

2. Benefits	29,779	32,080	32,989	36,645
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The following are the amounts of contribution by category:

Retirement Fund and Thrift Plan.....	15,908	17,759	17,449	19,343
Employee Life Insurance.....	304	310	322	346
Employee Health Insurance.....	7,404	7,094	8,125	8,814
Workers' Compensation.....	670	700	629	771
FICA.....	4,018	4,151	4,952	5,897
Medicare.....	1,451	2,018	1,479	1,438
Other Benefits....	<u>24</u>	<u>48</u>	<u>33</u>	<u>36</u>
Total.....	<u>32,989</u>	<u>32,080</u>	<u>32,989</u>	<u>36,645</u>

The increase from the 1991 Budget Estimate to the 1992 Current Estimate is due to retirement and thrift, health insurance, FICA estimates, and the additional 1/2 percent of the 1991 pay raise.

1990 <u>Actual</u>	1991		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

B. Supporting Costs

1. Transfer of Personnel	1,081	931	1,360	1,073
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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 from the 1991 Budget Estimate to the 1991 Current Estimate reflects an increase in the cost per move rate for those employees eligible for these benefits. The decrease in the 1992 Budget Estimate reflects an anticipated decrease in the number of hires eligible for these benefits.

2. OPM Services	0	0	0	0
3. Personnel Training	2,420	3,471	2,520	2,950

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 decrease from the 1991 Budget Estimate to the 1991 Current Estimate results in reducing these training programs in order to adequately fund the current level of FTE's. The 1992 Budget Estimate reflects an increase of training over the 1991 level to reinstate some of the deferred training and pay for increased tuition and associated costs.

	1990	1991		1992
	Actual	Budget Estimate	Current Estimate	Budget Estimate
		(Thousands of Dollars)		
II. TRAVEL	7,065	7,923	7,489	7,777

Summary of Fund Requirements

A. Program Travel	5,586	6,064	5,926	6,147
B. Scientific and Technical Development Travel	454	439	481	492
C. Management and Operations Travel	1,025	1,420	1,082	1,138
Total, Travel	7,065	7,923	7,489	7,777

Explanation of Fund Requirements

A. Program Travel	5,586	6,064	5,926	6,147
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Program travel is specifically required for the accomplishment of the Center's mission. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is based on a reduction in the planned number of trips as a result of reallocation of funds to meet Center priorities. The increase from 1991 to 1992 is required to support operations including launch, mission support, coordination of engineering and technical activities, support of payload technical integration, and an increase in the planned flight rate.

!

	<u>1991</u>		1992
1990	Budget	Current	Budget
<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
(Thousands of Dollars)			

B. Scientific and Technical Development Travel	454	439	481	492
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Scientific and technical development travel permits employees to participate in meetings and technical seminars with other representatives of the aerospace community. The increase from 1991 Budget Estimate to the 1991 Current Estimate is based on maintaining approximately the same level of travel as expended in 1990 plus inflation. The 1992 Estimate also reflects essentially the same level as 1991.

C. Management and Operations Travel	1,025	1,420	1,082	1,138
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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 1991 Budget Estimate to the 1991 Current Estimate is based on a reduction in the planned number of trips as a result of reallocation of funds to meet Center'priorities. The increase in 1992 is to allow greater participation in management, operation, and administrative activities.

	1990 <i>Actual</i>	1991		1992
		Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
(Thousands of Dollars)				
III. OPERATION OF INSTALLATION	107.300	112.427	109.185	117.983
Summary of Fund Requirements				
A. Facilities Services				
1. Rental of Real Property	1,047	1,005	1,068	1,061
2. Maintenance and Related Services	14,563	12,478	13,238	16,093
3. Custodial Services	8,019	8,000	7,953	8,874
4. Utility Services	14,203	16,111	17,237	18,077
Total, Facilities Services	37,832	37,594	39,496	44,105
B. Technical Services				
1. Automatic Data Processing	22,993	25,943	22,818	23,519
2. Scientific and Technical Information	4,876	4,749	4,186	4,988
3. Shop and Support Services	6,120	6,093	5,626	6,382
Total, Technical Services	33,989	36,785	32,630	34,889

	1990 <u>Actual</u>	1991		1992
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
C. Management and Operations				
1. Administrative Communications	9,005	8,429	8,145	6,940
2. Printing and Reproduction	2,152	2,320	1,681	2,036
3. Transportation	3,639	4,866	4,553	4,770
4. Installation Common Services	20,683	22,433	22,680	24,746
Total, Management and Operations	35,479	38,048	37,059	38,492
D. Implementation of Project CORE	0	0	0	497
Total, Operation of Installation	107,300	112,427	109,185	117,983

Explanation of Fund Requirements

Operation of Installation provides 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 includes funding for the implementation of Project CORE, which will convert certain functions from contractors to civil servants.

1990 <i>Actual</i>	1991		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects reductions in contractor support, supplies, and minor construction as well as deferrals of maintenance and of ADP and other equipment purchases. The increase from the Facility Services 1991 Budget Estimate to the 1991 Current Estimate reflects transfers from Technical Services and Management and Operations to cover utility cost increases as a result of rate increases and additional consumption caused by the new Auxiliary Chiller Plant (Building 28). The growth between the 1991 Current Estimate and the 1992 Budget Estimate is due to inflation and the planned resumption of deferred maintenance.

A. Facilities Services

1. Rental of Real Property	1,047	1,005	1,068	1,061
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Provides 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. The 1992 Budget Estimate reflects the same level of leased space as in 1991 with no escalation allowed.

2. Maintenance and Related Services	14,563	12,478	13,238	16,093
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This activity involves routine maintenance and facilities support for Johnson Space Center at Houston, as well as WSTF and Ellington Air Force Base, and includes such activities as administrative facility alterations and painting; grounds maintenance; and other facility and system design and modification tasks. The decrease in the 1991 Budget Estimate reflects deferral of maintenance projects. The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects that the initially planned reduction was greater than could be achieved. The increase of the 1992 Budget Estimate reflects the resumption of some deferred maintenance in the R&PM budget.

1990 <u>Actual</u>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

3. Custodial Services	8,019	8,000	7,953	8,874
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This activity involves 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. The 1991 Budget Estimate and the 1991 Current Estimate all support essentially the same level of custodial effort; notwithstanding budget constraints. The 1992 Budget Estimate reflects inflation and a minimal increase in the fire protection services that have been inadequate in previous years.

4. Utility Services	14,203	16,111	17,237	18,077
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This category includes purchased utilities and support contractor effort for the operation and support service contractor maintenance of the utility distribution system. The increase from the 1990 Actual and the 1991 Budget Estimate to the 1991 Current Estimate reflects utility costs associated with JSC, WSTF, and Ellington. The new Auxiliary Chiller Plant (Building 28) which was opened for testing in July 1990 and was operational in October 1990 is essential for maintaining a delicate climate control for the Central Computer Facility. The opening of this facility and an increase in utility rates greatly increased JSC's utility requirements. The 1991 Current Estimate increase reflects a full year of utility costs associated with Building 28. The 1992 Budget Estimate covers inflation with increases for the utility costs associated with additional facilities coming on-board in 1992.

B. Technical Services

1. Automatic Data Processing	22,993	25,943	22,818	23,519
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This activity provides 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

1990 <u>Actual</u>	<u>1991</u>		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

personnel. The ADP systems supported include institutional management, finance and accounting, procurement, contract status and tracking, personnel management, payroll, and utility tracking. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects the deferral of ADP purchases in order to accommodate increased requirements in other areas. The increase from the 1991 Current Estimate to the 1992 Budget Estimate maintains the 1990 level of effort.

2. Scientific and Technical Information	4,876	4,749	4,186	4,988
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A part of this funding provides 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 include 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 provides 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 refurbishment; visitor orientation tours; lecturing; mail answering services; and other public affairs activities. The decrease in the 1991 Budget Estimate is due to budget constraints and has resulted in deferral of equipment purchases. The increase from the 1991 Current Estimate to the 1992 Budget Estimate attempts to maintain same level of support.

3. Shop and Support Services	6,120	6,093	5,626	6,382
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These funds provide 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. The decrease from the 1991 Budget Estimate

1990 <u>Actual</u>	1991		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
(Thousands of Dollars)			

reflects budget constraints. The 1992 Budget Estimate reflects the 1991 Budget Estimate level with inflation and a small increase in the public affairs effort.

C. Management and Operations

1. Administrative Communications	9,005	8,429	8,145	6,940
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Communications support for JSC and WSIF consists 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. The 1991 Budget Estimate included a one-time cost of expansion of the communications system in support of the increased civil service workforce. The 1991 Current Estimate does not include that cost. Both the 1991 Current Estimate and the 1992 Budget Estimate also reflect reduced requirements on the lease-to-ownership communications system payments at both JSC and WSTF.

2. Printing and Reproduction	2,152	2,320	1,681	2,036
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Printing services are provided by on-site and 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 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. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to budget constraints and most likely will result in greater printing backlogs. The 1992 Budget Estimate attempts to maintain the same level of effort as the 1991 Budget Estimate.

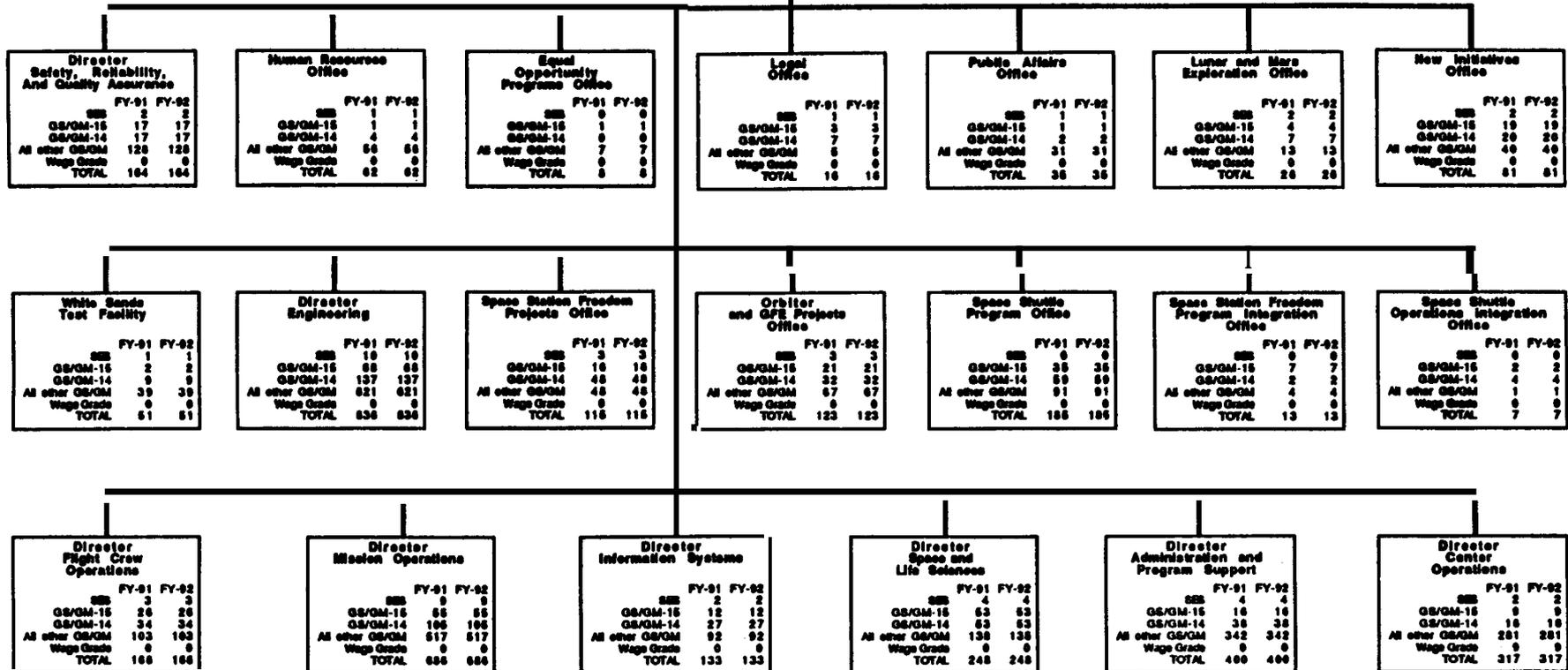
of these positions and to provide the necessary accommodations -- desks, supplies, personal computers, etc. -- needed to bring them into the Center workforce. In the event that circumstances beyond our control prevent us from having the full civil service complement in place at the date of the planned termination of the contracted functions, some of these funds will be used to provide for a continuation of the contractor support until the civil service transition can be completed.

National Aeronautics & Space Administration Johnson Space Center

Proj. SOFY Staffing Summary		
	FY-91	FY-92
SES	54	54
NASA Excepted	1	1
GS/GM-15	309	309
GS/GM-14	621	621
All other GS/GM	2632	2632
Wage Grade	0	0
TOTAL	3699	3699

Director Deputy Director Assistant Director		
	FY-91	FY-92
SES	5	5
NASA Excepted	1	1
GS/GM-15	1	1
GS/GM-14	0	0
All other GS/GM	0	0
Wage Grade	0	0
TOTAL	10	10

Office of
Inspector General
JSC



KENNEDY
SPACE CENTER



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1992 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 Space and Missile Center, at Cape Canaveral Air Force Station, Florida, and the Western Space and Missile Center 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, 1990, was \$2,017,537,000.

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 western world launch site 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 Transportation System (STS) 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 logistics; and operation and maintenance of GSE.

Space Station - Space Station Freedom (SSF) efforts at KSC will 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 final NASA launch management responsibility.

DISTRIBUTION OF FULL TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

KENNEDY SPACE CENTER	1990 ACTUAL	1991		1992 BUDGET ESTIMATE
		BUDGET ESTIMATE	CURRENT ESTIMATE	
SPACE STATION.....	163	284	201	207
SPACE FLIGHT PROQRAMS.....	1,744	1,753	1,784	1,786
SPACE TRANSPORTATION CAPABILITY DEV...	273	285	311	317
SPACE SHUTTLE.....	1,471	1,468	1,473	1,469
SPACE SCIENCE AND APPLICATIONS.....	126	96	117	105
PHYSICS AND ASTRONOMY.....	106	74	95	91
LIFE SCIENCES.....	20	22	22	14
PLANETARY EXPLORATION.....	0	0	0	0
SPACE APPLICATIONS.....	0	0	0	0
AERONAUTICS EXPLORATION AND TECHNOLOGY..	0	0	7	7
AERONAUTICAL RESEARCH AND TECHNOLOGY..	0	0	0	0
SPACE RESEARCH AND TECHNOLOGY.....	0	0	7	7
TRANSATMOSPHERIC RESEARCH AND TECH....	0	0	0	0
COMMERCIAL PROQRAMS.....	8	8	11	14
SAFETY, RELIABILITY & QUALITY ASSURANCE.	0	0	0	0
ACADEMIC PROQRAMS.....	0	0	0	0
TRACKING AND DATA PROQRAMS.....	0	0	0	0
SUBTOTAL - DIRECT FULL-TIME PERM FTE'S	2,041	2,141	2,120	2,110
CENTER MANAGEMENT AND OPERATIONS.....	384	408	390	390
SUBTOTAL - FULL-TIME PERM FTE'S.....	2,425	2,549	2,510	2,508
OTHER FTE'S.....	78	90	25	20
SUBTOTAL - FULL-TIME EQUIVALENTS.....	2,503	2,639	2,535	2,535
PROJECT CORE.....				0
GRAND TOTAL - FULL-TIME EQUIVALENTS..	2,503	2,639	2,535	2,535

PROGRAM DESCRIPTION

Permanent Civil
Service Workyears

RESEARCH AND DEVELOPMENT

SPACE STATION.....

207

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 and ground support equipment as required and payload integration and interface test equipment. Additional responsibilities include logistics operational capability development and launch site Safety, Reliability and Quality Assurance assessment.

SPACE FLIGHT PROGRAMS.....

1.786

SPACE TRANSPORTATION CAPABILITY DEVELOPMENT.....

317

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 SHUTTLE

1,469

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 upgrading the orbiter maintenance and refurbishment facility to a full-up orbiter processing facility, as well as modifications to existing 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 meet the increasing 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 the launch processing and checkout oversight of all NASA contracted for ELV launch services at both the Eastern Space and Missile Center (ESMC) and VAFB, payload checkout and processing, and NASA launch management responsibility.

Permanent Civil
Service Workyears

SPACE SCIENCE AND APPLICATIONS

105

PHYSICS AND ASTRONOMY..

91

KSC is responsible for planning and coordinating the integration of the Spacelab experiments with the Spacelab hardware system. 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.....

14

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.

COMMERCIAL PROGRAMS.....

14

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; to 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.

Permanent Civil
Service Workyears

<u>AERONAUTICS, EXPLORATION AND TECHNOLOGY</u>	7
<u>SPACE AND RESEARCH TECHNOLOGY</u>	7

In 1992, technology applications and demonstrations will continue in the areas of telerobotics and artificial intelligence, and new efforts will begin in regenerative life support and space flight research and technology.

<u>CENTER MANAGEMENT AND OPERATIONS SUPPORT</u>	390
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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 operational 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, some medical care, and photographic support.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

	1990	1991		1992
		Actual	Budget Estimate	Current Estimate
I. PERSONNEL AND RELATED COSTS	131,055	142,019	142,034	153,446
II. TRAVEL	3,615	5,321	4,709	4,890
III. OPERATION OF INSTALLATION	142,768	154,907	150,931	162,450
A. Facilities Services	82,904	95,142	93,657	101,990
B. Technical Services	12,440	13,955	12,898	13,794
C. Management and Operations	47,424	45,810	44,376	46,666
D. Implementation of Project CORE	0	0	0	0
Total, Fund Requirement	277,438	302,247	297,674	320,786

1990 <u>Actual</u>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

RESOURCES REQUIREMENTS BY FUNCTION

I.	PERSONNEL AND RELATED COSTS	<u>131,055</u>	<u>142,019</u>	<u>142,034</u>	<u>153,446</u>
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Summary of Fund Requirements

A.	Compensation and Benefits				
1.	Compensation				
a.	Full-time permanent	102,605	109,858	110,952	117,628
b.	Other than full-time permanent	1,637	1,997	1,679	1,821
c.	Reimbursable detailees	35	121	0	0
d.	Overtime and other compensation	5,471	4,885	5,708	6,856
	Subtotal, Compensation	<u>109,748</u>	<u>116,861</u>	<u>118,339</u>	<u>126,305</u>
2.	Benefits	18,864	21,155	21,201	23,900
	Subtotal, Compensation and Benefits	<u>128,612</u>	<u>138,016</u>	<u>139,540</u>	<u>150,205</u>

		1990	1991		1992
		<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)					
B.	Supporting Costs				
1.	Transfer of personnel	1,007	2,289	1,029	1,556
2.	OPM Services	0	0	0	0
3.	Personnel training	1,436	1,714	1,465	1,685
	Subtotal, Supporting Costs	2,443	4,003	2,494	3,241
	Total. Personnel and Related Costs	131.055	142.019	142.034	153.446

Explanation of Fund Requirements

A. Compensation and Benefits

1. Compensation

a.	Full-time permanent	102,605	109,858	110,952	117,628
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The increase in the 1991 Current Estimate from the 1991 Budget Estimate reflects the change in the January pay raise from 3.6 percent to 4.1 percent, the additional 4.1 percent pay raise for Senior Executive Service personnel, and a revised estimate increasing the average base cost per FTE due to 1990 staffing experience, partially offset by the reduction of 40 FTE. This reduction is consistent with the reduction in flights for the current manifest. The 1992 Estimate includes funding for a full year of the 1991 pay raise, the anticipated 1992 pay raise, one additional day and full year funding for promotions, within grade increases, and other personnel actions.

Basis of Cost for Civil Service Workyears

In 1992. the cost of full-time workyears will be \$117.628.000 . The increase from 1991 is calculated as follows:

Cost of full-time permanent workyears in 1991.....		\$110.952
Cost of increases in 1992.....		9.060
Within grade and career advances:		
Full year effect of 1991 actions.....	1,785	
Partial year effect of 1992 actions.....	2.194	
Full year cost of 1991 pay raise.....	1,423	
Partial year cost of 1992 pay raise.....	3.194	
Extra Day.....	464	
Cost Decreases in 1992.....		- 2.384
Turnover Effects:		
Full year effect of 1991 actions.....	-1.350	
Partial year effect of 1992 actions.....	- 849	
Decreases to attain approved FTE ceiling.....	- 185	
Cost of full-time permanent workyears in 1992.....		\$117.628

1990 <u>Actual</u>	1991		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

b. Other than full-time permanent				
(1) cost	1,637	1,997	1,679	1,821
(2) Workyears	78	90	25	26

The distribution of 1992 workyears is as follows:

Distribution of Other than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Other temporary programs.....	25
Development programs.....	<u>1</u>
Total.....	<u>26</u>

The decrease from the 1991 Budget Estimate to the 1991 Current Estimate results from less workyears and lower salaried positions than planned, partially offset by the additional 1/2 percent pay raise for 1991. The 1992 increase includes an increase in temporary positions, full year funding of the 1991 pay raise and the cost of the anticipated pay raise in January 1992. The reduction in workyears in the 1991 Current Estimate and the 1992 Budget Estimate is the result of the Office of Management and Budget (OMB) excluding Co-ops from the Agency FTE ceiling.

c. Reimbursable detailees	35	121	0	0
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The Kennedy Space Center no longer has military personnel detailed on a reimbursable basis in 1991 and none are planned in 1992.

	1990	1991		1992
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
d. Overtime and other compensation	5,471	4,885	5,708	6,856

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 1991 Budget Estimate to the 1991 Current Estimate is based on flight activity and greater than planned Shuttle processing activity. The increase in the 1992 Budget Estimate reflects an additional Shuttle launch in 1992, full year funding of the 1991 pay raise, the anticipated 1992 pay raise and expected overtime as a result of preparing the new Shuttle Orbiter for operational status.

2. Benefits	18,864	21,155	21,201	23,900
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The following are the amounts of contribution by category:

Retirement Fund.....	8,927	10,553	9,877	10,977
Employee Life Insurance.....	211	257	236	274
Employee Health Insurance.....	4,872	5,439	5,505	6,395
Workers' Compensation.....	300	350	338	463
FICA.....	2,417	1,910	2,846	3,144
Medicare.....	994	1,261	1,048	1,115
Other Benefits OPM Annuity & Unemployed Compensation	<u>1.143</u>	<u>1.385</u>	<u>1.351</u>	<u>1.532</u>
Total.....	<u>18.864</u>	<u>21.155</u>	<u>21.201</u>	<u>23.900</u>

The increase from the 1991 Budget Estimate to the 1992 Current Estimate is due to a re-estimate of some benefit components. Reductions have occurred in retirement programs and medicare, offset by increases in FICA, health insurance, and the additional 1/2 percent of the 1991 pay raise. The 1992 increase reflects the

1990 <u>Actual</u>	1991		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

full year effect of the 1991 pay raise, the anticipated 1992 pay raise and expected increases above the pay raise in health insurance, retirement programs, and FICA.

B. Supporting Costs

1. Transfer of Personnel	1,007	2,289	1,029	1,556
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This supporting cost 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 1991 Budget Estimate to the 1991 Current Estimate reflects a reduction in the number and mix of planned new hires and an effort to control relocation costs. The increase in the 1992 Budget Estimate reflects an anticipated increase in the number of hires eligible for relocation benefits.

2. OPM Services	0	0	0	0
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3. Personnel Training	1,436	1,714	1,465	1,685
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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 decrease from the 1991 Budget Estimate to the 1991 Current Estimate results in reducing these training programs in order to adequately fund the current level of FTE's. The 1992 Budget Estimate reflects an increase of training over the 1991 level to restore some of the delayed training and pay for increased tuition and associated costs.

1990 <u>Actual</u>	<u>1991</u>		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)			

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2.	OPM Services	0	0	0	0
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	1990 <u>Actual</u>	1991		1992
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
II. TRAVEL	3,615	5,321	4,709	4,890
Summary of Fund Requirements				
A. Program Travel	2,462	4,270	3,661	3,802
B. Scientific and Technical Development Travel	81	9	80	83
C. Management and Operations Travel	1,072	1,042	968	1,005
Total, Travel	3,615	5,321	4,709	4,890

Explanation of Fund Requirements

A. Program Travel	2,462	4,270	3,661	3,802
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Program 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 1991 Budget Estimate to the 1991 Current Estimate is due to a reduction in launch and landing support requirements consistent with a reduction of planned Shuttle launches. The 1992 Budget Estimate reflects a continuation of the 1991 program travel level of activity including support for a planned additional Shuttle of launch, and the effects of projected inflation.

B. Scientific and Technical Development Travel	81	9	80	83
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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

1990 <i>Actual</i>	1991		1992
	Budget <u>Estimate</u>	Current Estimate	Budget <u>Estimate</u>

(Thousands of Dollars)

to benefit from exposure to technological advances outside KSC, as well as to present both accomplishments and problems to associates. The 1991 Budget Estimate reflected a realignment of funds to program travel based on the Center's priorities. The increase to the 1991 Current Estimate is a restoration of funds to a level comparable with 1990 experience. The 1992 Budget Estimate represents a continuation of the 1991 level of activities adjusted for the projected effects of inflation.

C. Management and Operations Travel	1,072	1,042	968	1,005
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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 decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects a reduction in the planned number of trips to management reviews and conferences as a result of reallocation of funds to meet center priorities. The 1992 Budget Estimate represents a continuation of the 1991 level of activities adjusted for the effects of inflation.

	<u>1990</u> <u>Actual</u>	<u>1991</u>		<u>1992</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
III. OPERATION OF INSTALLATION	<u>142,768</u>	<u>154,907</u>	<u>150,931</u>	<u>162,450</u>

Summary of Fund Requirements

A. Facilities Services

1. Rental of Real Property	0	0	0	0
2. Maintenance and Related Services	20,363	22,639	27,738	29,885
3. Custodial Services	30,661	36,313	30,925	33,459
4. Utility Services	31,880	36,190	34,994	38,646
Total, Facilities Services	<u>82,904</u>	<u>95,142</u>	<u>93,657</u>	<u>101,990</u>

B. Technical Services

1. Automatic Data Processing	6,861	7,925	7,981	8,252
2. Scientific and Technical Information	1,512	1,554	1,547	1,698
3. Shop and Support Services	4,067	4,476	3,370	3,844
Total, Technical Services	<u>12,440</u>	<u>13,955</u>	<u>12,898</u>	<u>13,794</u>

	1990 <u>Actual</u>	<u>1991</u>		1992
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
C. Management and Operations				
1. Administrative Communications	4,007	4,264	4,165	3,746
2. Printing and Reproduction	8,944	8,742	9,030	9,528
3. Transportation	6,471	6,850	6,756	7,339
4. Installation Common Services	28,002	25,954	24,425	26,053
Total, Management and Operations	47,424	45,810	44,376	46,666
D. Project CORE	0	0	0	0
Total, Operation of Installation	142,768	154,907	150,931	162,450

Explanation of Fund Requirements

Operation of Installation provides 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 includes printing, transportation, administrative communications, medical, supply, administrative support and related services.

The decreases in the Operation of Installation funding requirements from the 1991 Budget Estimate to the 1991 Current Estimate is primarily the result of deferrals and reductions in supplies and materials, equipment, inventory spares, and facility projects to implement the adjustments required by the FY 1991 appropriation and

1990 <u>Actual</u>	1991		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

a reduction in utilities due to the change in the planned Shuttle flight rate from ten to eight flights. The 1992 Budget Estimate provides funding of support service contracts at anticipated wage rates; support to a Shuttle manifest of nine flights; a minor increase over 1991 in contractor manpower to support the implementation of new environmental and energy management regulations; and the accommodation of the highest priority equipment and supplies and materials requirements deferred from 1991.

A. Facilities Services

1. Rental of Real Property	0	0	0	0
2. Maintenance and Related Services	20,363	22,639	27,738	29,885

This activity involves the necessary management, engineering, and operation and maintenance required to plan, initiate, and perform services on institutional facilities, systems, and equipment. It includes 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 provides for monitoring all construction contracts, maintenance of construction management documentation files, and also provides for the necessary functions required during pre-contract award phase. Included is 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 provides 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. The increase in the 1991 Budget Estimate to the 1991 Current Estimate results from the reclassification of contractor support for the operations, maintenance and sustaining engineering of protective systems from Custodial Services and of the operations and maintenance documentation support from the Technical Services function. This reclassification was implemented to enhance

1990 <u>Actual</u>	1991		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

the management and administration of these functions which were formerly too cumbersome to monitor effectively. The increases due to these transfers have been offset, in part, by deferrals of equipment, supplies, and facility projects due to budget constraints. The 1992 Budget Estimate provides funding of support service contracts at projected wage rates; increased manpower to support compliance with new environmental and energy regulations.

3. Custodial Services	30,661	36,313	30,925	33,459
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This category provides 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, and traffic control. Other activities in this category consist of pest control services, laundry services, and supplies and equipment used by the support contractors performing these functions. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects the reclassification of contractor manpower for the operations, maintenance, and sustaining engineering of protective systems to Maintenance and Related Services. The 1992 Budget Estimate continues support at the FY 1991 level, providing funding of support service contracts at projected wage rates and increased manpower to support long-range planning for replacement and modifications of halon fire suppression systems.

4. Utility Services	31,880	36,190	34,994	38,646
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This category provides 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 include: 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

1990 <u>Actual</u>	1991		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)			

and for audits and inspections of facilities to insure conformance with energy conservation policy and to identify new energy initiatives. These energy initiatives include 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.

The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects a revision of support contractor funding requirements and reductions in utility consumption due to the reduction in the planned Shuttle flight rate from ten to eight flights. These reductions have been offset in part, by projected fuel oil rate increases. The 1992 Budget Estimate supports nine Shuttle flights and provides for increases over 1991 for anticipated support contractor wage rates, projected purchased utility rates; product consumption requirements for new facilities; and high priority facility projects.

B. Technical Services

1. Automatic Data Processing	6,861	7,925	7,981	8,252
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Automatic Data Processing (ADP) funds provide for the lease, purchase, and maintenance of ADP equipment along with programming and operations support. Support contractor activities include 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 provides operations, maintenance, and sustaining engineering to the Center's Office Automation System (OAS) which provides an integrated systems capability for information exchange between KSC organizational elements. The OAS includes word processing, electronic mail, and data management capabilities.

There is no significant difference between the 1991 Budget Estimate and the 1991 Current Estimate. The 1992 Budget Estimate allows for continuation of the 1991 level of support based on anticipated support service contractor wage rates.

1990 <u>Actual</u>	1991		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

2. Scientific and Technical Information **1,512** **1,554** **1,547** 1,698

This funding provides 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 are operated by the base operations contractor and provide technical and management books and periodicals in addition to the military, federal, and professional society specifications and standards. The contractor also operates the Shuttle and Spacelab documents repository which catalogs, classifies, and indexes documents and provides document reference and distribution services. Support to Public Affairs provides 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. In the 1991 Current Estimate, there is no significant change from the 1991 Budget Estimate. The 1992 Budget Estimate reflects the current level of services at anticipated support service contractor wage rates.

3. Shop and Support Services **4,067** **4,476** **3,370** **3,844**

Shop and Support Services funds provide 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 provide for a comprehensive safety program which includes 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 are also included.

The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects the reclassification of operations and maintenance documentation manpower support to the Facilities Services functional areas; and the reduction in photographic services for Public Affairs due to the planned Shuttle flight rate reduction from ten to eight flights. The 1992 Budget Estimates provide for funding at the 1991 level of activities based on anticipated support service contractor wage rates.

1990 <u>Actual</u>	1991		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

C. Management and Operations

1. Administrative Communications	4,007	4,264	4,165	3,746
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These funds provide 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 are 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 will perform 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 also is 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 includes management of all administrative communication systems and supplies and equipment for outfitting new and existing KSC institutional facilities. The 1991 Current Estimate is almost unchanged from the 1991 Budget Estimate and allows for completing the initial outfitting of new facility projects started in 1990. The 1992 Budget Estimate reflects a deferral of outfitting and a continuation of the 1991 Current Estimate recurring activities with a funding of support service contracts at anticipated wage rates.

2. Printing and Reproduction	8,944	8,742	9,030	9,528
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This category includes 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 include 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. The funds are also included for supplies and equipment associated with this function.

1990 <u>Actual</u>	1991		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)			

The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects the additional lease maintenance cost to support the OMI updating requirements for Shuttle flight readiness. The 1992 Budget Estimate provides for continuation of the 1991 activities adjusted for anticipated support contractor wage rates.

3. Transportation	6,471	6,850	6,756	7,339
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This category includes the transportation management function performed by the base operations contractor, which includes coordination, inspection, and document control of all shipments, delivery of in-bound shipments, and the operation of heavy transportation equipment. Funding also includes 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.

The 1991 Current Estimate is almost unchanged from the 1991 Budget Estimate. The 1992 Budget Estimate reflects the continuation of 1991 activities based on anticipated support contractor wage rates and provides for increased administrative aircraft maintenance to accommodate an engine replacement.

4. Installation Common Services	28,002	25,954	24,425	26,053
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These funds provide 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 provides a broad range of procurement and 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 and environmental health. Occupational medicine includes 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 consists of industrial hygiene, radiological health, and environmental sanitation program elements. This includes: 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 provides for environmental monitoring efforts which include 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 includes 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 provides 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.

The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects the deferral of inventory spares, equipment, supplies and reductions in the 1991 Appropriation. The 1992 Budget Estimate provides for continuation of the 1991 level of recurring activities, with funding of support services contracts at projected wage levels.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN F. KENNEDY SPACE CENTER

STAFFING SUMMARY

	No. of	FY92
SES	34	35
GM/GS-15	135	136
GM/GS-14	326	332
OTHER GM/GS	2013	2005
WG	5	5
TOTAL	2513	2513

CENTER DIRECTOR

	FY91	FY92
SES	3	3
GM/GS-15	1	1
GM/GS-14	1	1
OTHER GM/GS	3	3
TOTAL	8	8

EXECUTIVE MANAGEMENT OFFICE

	FY91	FY92
SES	1	1
GM/GS-15	3	3
GM/GS-14	10	10
OTHER GM/GS	35	35
WG	5	5
TOTAL	54	54

PUBLIC AFFAIRS OFFICER

	FY91	FY92
SES	1	1
GM/GS-15	1	1
GM/GS-14	3	3
OTHER GM/GS	27	27
TOTAL	32	32

CHIEF COUNSEL

	FY91	FY92
SES	1	1
WGS-15	1	1
GM/GS-14	2	2
OTHER GM/GS	3	3
TOTAL	7	7

EQUAL OPPORTUNITY PROGRAM OFFICE

	FY91	FY92
SES	-	-
GM/GS-15	-	-
GM/GS-14	1	1
OTHER GM/GS	5	5
TOTAL	6	6

PERSONNEL OFFICE

	FY91	FY92
WGS-15	1	1
GM/GS-14	4	4
OTHER GM/GS	31	37
TOTAL	42	42

PROCUREMENT OFFICE

	FY91	FY92
SES	1	1
GM/GS-15	4	4
GM/GS-14	8	8
OTHER GM/GS	99	99
TOTAL	112	112

COMPTROLLER

	FY91	FY92
SES	2	2
GM/GS-15	3	3
GM/GS-14	11	11
OTHER GM/GS	97	97
TOTAL	113	113

BIOMEDICAL OPERATIONS & RESEARCH OFFICE

	FY91	FY92
SES	1	1
GM/GS-15	3	3
GM/GS-14	5	5
OTHER GM/GS	20	20
TOTAL	29	29

TECHNOLOGY & ADVANCED PROJECTS OFFICE

	FY91	FY92
SES	1	1
GM/GS-15	5	5
GM/GS-14	11	11
OTHER GM/GS	12	12
TOTAL	29	29

SPACE STATION PROJECT OFFICE

	FY91	FY92
SES	1	1
GM/GS-15	7	7
GM/GS-14	16	16
OTHER GM/GS	17	17
TOTAL	41	41

DIRECTOR OF SHUTTLE MANAGEMENT & OPERATIONS

	FY91	FY92
SES	3	3
GM/GS-15	8	8
GM/GS-14	14	15
OTPLR GM/GS	40	39
TOTAL	65	65

DIRECTOR OF SAFETY RELIABILITY & QUALITY ASSURANCE

	FY91	FY92
SES	1	1
GM/GS-15	4	5
GM/GS-14	10	10
OTHER GM/GS	27	26
TOTAL	42	42

DIRECTOR OF ENGINEERING DEVELOPMENT

	FY91	FY92
SES	2	2
GM/GS-15	6	6
GM/GS-14	18	18
OTHER GM/GS	23	23
TOTAL	49	49

DIRECTOR OF CENTER SUPPORT OPERATIONS

	FY91	FY92
SES	2	2
GM/GS-15	8	8
GM/GS-14	16	16
OTHER GM/GS	149	149
TOTAL	175	175

DIRECTOR OF PAYLOAD MANAGEMENT & OPERATIONS

	FY91	FY92
SES	1	2
GM/GS-15	1	1
GM/GS-14	1	1
OTHER GM/GS	10	9
TOTAL	13	13

DIRECTOR, SHUTTLE OPERATIONS

	FY91	FY92
SES	1	1
GM/GS-15	7	7
GM/GS-14	20	20
OTPLR GM/GS	84	84
TOTAL	112	112

DIRECTOR, SHUTTLE LOGISTICS PROJECT MANAGEMENT

	FY91	FY92
SES	1	1
GM/GS-15	7	7
GM/GS-14	8	8
OTPLR WGS	59	59
TOTAL	75	75

DIRECTOR, SAFETY & RELIABILITY

	FY91	FY92
SES	1	1
GM/GS-15	2	2
GM/GS-14	6	7
OTHER GM/GS	81	80
TOTAL	90	90

DIRECTOR, QUALITY ASSURANCE

	FY91	FY92
SES	1	1
GM/GS-15	2	2
GM/GS-14	4	4
OTHER GM/GS	238	238
TOTAL	245	245

DIRECTOR, FACILITIES ENGINEERING

	FY91	FY92
SES	1	1
GM/GS-15	4	4
GM/GS-14	6	6
OTHER GM/GS	66	66
TOTAL	77	77

DIRECTOR, PAYLOAD PROJECTS MANAGEMENT

	FY91	FY92
SES	1	1
GM/GS-15	4	6
GM/GS-14	2	4
OTHER GM/GS	20	20
TOTAL	57	57

DIRECTOR, VEHICLE ENGINEERING

	FY91	FY92
SES	2	2
GM/GS-15	17	17
GM/GS-14	35	38
OTPLR GM/GS	312	309
TOTAL	366	366

DIRECTOR, GROUND ENGINEERING

	FY91	FY92
SES	1	1
GM/GS-15	9	9
GM/GS-14	16	16
OTPLR GM/GS	134	133
TOTAL	160	160

DIRECTOR, MECHANICAL ENGINEERING

	FY91	FY92
SES	1	1
GM/GS-15	5	5
GM/GS-14	12	12
OTPLR GM/GS	84	84
TOTAL	102	102

DIRECTOR, ELECTRONIC ENGINEERING

	FY91	FY92
SES	1	1
GM/GS-15	8	8
GM/GS-14	26	26
OTHER GM/GS	107	107
TOTAL	142	142

DIRECTOR, SHUTTLE PAYLOAD OPERATIONS

	FY91	FY92
SES	1	1
GM/GS-15	10	10
GM/GS-14	34	34
OTHER GM/GS	201	204
TOTAL	246	249

DIRECTOR, EXPENDABLE VEHICLES

	FY91	FY92
SES	1	1
GM/GS-15	2	2
GM/GS-14	4	4
OTHER GM/GS	23	20
TOTAL	30	27

MARSHALL
SPACE FLIGHT CENTER



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1992 ESTIMATES

GEORGE C. MARSHALL SPACE FLIGHT CENTER

DESCRIPTION

Operations at Marshall Space Flight Center (MSFC) are conducted at three primary locations:

The principal MSFC site is near Huntsville, Alabama, within the military reservation of the Redstone Arsenal. The Center occupies **1,841** acres under a Department of the Army non-revocable lease in a complex of science and engineering laboratories and special development and test facilities. The complex encompasses approximately **3.8** million gross square feet of building space at Redstone Arsenal Support Agency (RASA). The physical plant houses an average daily on-Center population of approximately 6,600 personnel. The Huntsville location is connected by deep water access to its component Michoud Assembly Facility (MAF) via the Tennessee, Ohio, and Mississippi Rivers.

The MAF, located 15 miles east of downtown New Orleans, Louisiana, is the site for manufacture of external tanks for the Space Shuttle and where activities for other Federal agencies are conducted. Advanced Solid Rocket Motors (ASRM) will also be fabricated at this site. The MAF occupies **832** acres and provides **3,727,717** gross square feet of space, including the main assembly plant. The facility is located on the Gulf Intracoastal Waterway and has deep water access via the Mississippi River.

The Solid Rocket Booster (**SRB**) Assembly and Refurbishment Facility is physically located within the Kennedy Space Center, but was constructed and is operated under the purview of the MSFC. It provides the capability for assembly, test and post-flight refurbishment of the structural, hydraulic and electronic components of the Forward and Aft assemblies of the SRB.

The Slidell Computer Complex, located at Slidell, Louisiana, **20** miles northeast of the MAF, occupies 14 acres and provides centralized computer services for MSFC, MAF, other NASA Centers, and associated contractors, **as** well as other government agencies.

The Yellow Creek Production Facility located near the town of Iuka in northeastern Mississippi, is under construction as the site for production of the Advanced Solid Rocket Motor. Located on 1,168 acres obtained from the Tennessee Valley Authority (TVA), the facility has deep water access via the Tennessee River. The facility also has 150 acres railway spur.

A number of individual facilities at MSFC and its component installations are unique within NASA, the Nation and the western world. The combined capabilities of the science and engineering laboratories, special development facilities and test facilities provide a unique national resource for designing, developing and testing large, complex space systems. The total capital investment of the MSFC and its installations in Louisiana and Mississippi including fixed assets in progress and contractor-held facilities at various locations was \$1,071,538,000 as of September 30, 1990.

CENTER ROLES AND MISSIONS

The MSFC is a development and multi-project center with primary emphasis on space transportation and propulsion systems development, manned space systems, space systems, payload mission management, selected science disciplines, technology, advanced development, and advanced studies as follows:

SPACE TRANSPORTATION AND PROPULSION SYSTEMS:

Launch Vehicles - MSFC is responsible for design, development, integration, and testing of launch vehicles and space transportation systems and for system definition for future manned and unmanned launch systems. Current focus is on the Space Shuttle and its propulsion elements; on definition and planning for an unmanned cargo version of the Space Shuttle; and on playing the lead-Center role in joint NASA-DoD activities to identify promising systems and to implement technologies and advanced development ensuring a vigorous national posture in an National Launch System (NLS).

Upper Stages - MSFC designs, develops, and procures upper stages such as the Inertial Upper Stage (in cooperation with the U. S. Air Force (USAF)) and directs commercial development and production of upper stages such as the Transfer Orbit Stage. In concert with other centers and the USAF, MSFC is continuing to lead in examining potential needs for new upper stages and concepts/plans to meet these needs.

Propulsion Svstems - MSFC designs, develops and procures propulsion-oriented systems and subsystems including Space Shuttle Main Engine (SSME), SRB, ASRM, and External Tank (ET). Through ground testing of SSME in the Technology Test Bed, MSFC is advancing the propulsion technology for improved SSME's and future rocket engine development. Advanced program efforts are focused on analysis and definition of propulsion/transportation systems to meet national needs for the next 30 to 40 years. These systems include propulsion/transportation systems for a next generation Space Shuttle, unmanned launch vehicles, heavy-lift launch vehicles and space transfer vehicles. The systems will incorporate liquid rocket boosters, LOX/HC and LOX/H₂ engines, and future high performance propulsion technologies.

MANNED SPACE SYSTEMS - MSFC undertakes design, development, and procurement of manned space systems as assigned.

Spacelab - The focus is on program management, systems engineering, development of related payload carriers, procurement, and, for this program, flight and ground operations sustaining engineering.

Space Station - MSFC have oversight of the 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 (ECLSS); the fluid management system; the internal audio/video system; the internal thermal control system; and the manned systems. MSFC is also responsible for the development and operation of the Payload Operations Integration Center and the Payload Training Center as well as for sustaining engineering and operational support during the Space Station Freedom operations period.

Payload Mission Manaeement - MSFC is responsible for design, development and testing of payload carriers; payload definition; integration of science and applications payloads for Spacelab and Space Station Freedom; and operation of the integrated payload carrier systems.

SPACE SYSTEMS - MSFC designs, develops, and procures large, complex, and/or specialized unmanned space systems as assigned.

Advanced X-Ray AstroDhysics Facility - MSFC is responsible for the design, development, integration, test, operations and servicing of the Advanced X-Ray Astrophysics Facility (AXAF), the third of four "Great Observatories" for astrophysics, including instrument development and system test. As a requirement of the

program, calibration and testing will be carried out through construction of an X-Ray Calibration Facility (XRCF) at MSFC.

Tethered Satellite System (TSS) - Is a 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.

Combined Release and Radiation Effects Satellite (CRRES) - MSFC will undertake science planning, mission support, communication, observation aircraft, observation and data analysis for CRRES/Geo Transfer Orbit High Altitude Releases, CRRES Caribbean Releases and five Puerto Rico Sounding Rocket release missions, FY 1992.

Aeroassist Flight Experiment (AFE) - MSFC is responsible for the design, development, integration and operation of this experiment to enhance understanding of aeroassist technology issues.

Small Expandable Deployer System - MSFC will develop and fly this secondary payload on a Delta II expandable launch vehicle to demonstrate feasibility of a low cost tether deployer system.

TECHNOLOGY:

Supporting Research and Technology - MSFC conducts research and develop technology with major emphasis in the following disciplines and subdisciplines: propulsion systems; structural systems and dynamic control of flexible structures; materials and manufacturing processes; environmental control/life support systems; physical, earth, and astronomical science systems; microgravity science systems; information and electronic systems; aerothermodynamics; power systems; automation; and guidance, navigation and control systems.

Advanced Development - MSFC develops promising technologies to a level of demonstration to warrant inclusion in applicable flight programs. The focus is on point solutions rather than multi-parameter developments associated with technology programs, and this permits the program office to using the promising technologies to demonstrate them a level that meets its needs.

Advanced Studies - MSFC will continue to study and define future space systems including: launch vehicles and space transportation systems; lunar and mars exploration mission systems; geostationary platforms and earth sciences payloads; Space Station evolution; large space structures; space processing; large astrophysical

observatories; and solar terrestrial systems. MSFC will also identify requirements for research and technology/advanced developments in support of the applicable space systems.

SCIENCE - MSFC defines and develops science and applications investigations, experiments and payloads, and acts as a focal point for interaction with the scientific community in programs of interest such as experiments and payloads for the Spacelab, Space Station Freedom, and large astronomical observatories including:

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

Astrophysics including high energy and optical astronomy.

Microgravity 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.

DISTRIBUTION OF FULL TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

MARSHALL SPACE FLIGHT CENTER	1990 ACTUAL	1991		1992 BUDGET ESTIMATE
		BUDGET ESTIMATE	CURRENT ESTIMATE	
SPACE STATION.....	450	564	570	570
SPACE FLIGHT PROGRAMS.....	1,430	1,480	1,515	1,563
SPACE TRANSPORTATION CAPABILITY DEV....	403	570	523	565
SPACE SHUTTLE.....	947	910	992	1,000
SPACE SCIENCE AND APPLICATIONS.....	047	856	752	739
PHYSICS AND ASTRONOMY.....	637	670	554	548
LIFE SCIENCES.....	0	0	0	0
PLANETARY EXPLORATION.....	0	0	0	0
SPACE APPLICATIONS.....	190	186	198	191
AERONAUTICS EXPLORATION AND TECHNOLOGY..	350	240	200	251
AERONAUTICAL RESEARCH AND TECHNOLOGY..	0	0	0	0
SPACE RESEARCH AND TECHNOLOGY.....	350	240	200	251
TRANSATMOSPHERIC RESEARCH AND TECH....	0	0	0	0
COMMERCIAL PROORAMS.....	14	14	18	18
SAFETY, RELIABILITY & QUALITY ASSURANCE.	0	0	0	0
ACADEMIC PROORAMS.....	0	0	0	0
TRACKING AND DATA PROORAMS.....	16	17	16	16
SUBTOTAL - DIRECT FULL-TIME PERM FTE'S	3,115	3,179	3,159	3,139
CENTER MANAGEMENT AND OPERATIONS.....	479	475	491	491
SUBTOTAL - FULL-TIME PERM FTE'S.....	3,594	3,654	3,650	3,650
OTHER FTE'S.....	101	100	11	11
SUBTOTAL - FULL-TIME EQUIVALENTS.....	3,695	3,754	3,681	3,861
PROJECT CORE.....				52
GRAND TOTAL - FULL-TIME EQUIVALENTS..	3,695	3,754	3,661	3,713

PROGRAM DESCRIPTION

Permanent Civil
Service Workyears

RESEARCH AND DEVELOPMENT

SPACE STATION.....

570

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 nodes. 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.....

1.565

SPACE TRANSPORTATION CAPABILITY DEVELOPMENT.....

565

Spacelab

1992 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 1992, 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.

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 post-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 Proerams

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 1992 advanced study activities include: (1) Heavy Lift Launch Vehicle; (2) advanced transportation including reusable evolutionary upper stages, launch vehicle systems, new engines, and advanced recovery systems; (3) personnel launch system booster; (4) orbital platforms and facilities such as tethered satellite system and their applications; (5) orbital services such as satellite servicing applications and in-orbit assembly, maintenance and repair; and (6) flight demonstration studies.

National Launch System (NLS)

NASA and the Air Force are conducting studies of engines and vehicles applicable to the Advanced Transportation Technology System including the NLS. The NLS has the overall goal of reducing the cost of placing payloads in orbit by an order of magnitude. This goal will require a substantial reduction of life cycle cost with significant emphasis on recurring costs compared to current launch vehicles. The NLS propulsion activities at MSFC include definitions studies and advanced development. Based on the NLS goal, definition studies have baselined engine concepts and established the importance of a low cost engine, i.e., low acquisition cost, low operational cost, high reliability, and low life cycle cost for the Space Transportation Main Engine (STME). These systems will be further defined in the Space Transportation Engine Program (STEP) Phase B effort which began in 1989. The emphasis toward low cost requires component/subsystem designs that utilize low cost fabrication techniques. The Advanced Development Program will provide full scale major components/subsystem design, fabrication and test to verify low cost design approaches. This activity includes turbopumps, thrust chambers, injectors, nozzles, gas generators, engine controllers, and engine valve/actuators. The results of this advanced development effort will provide data to be used in the STEP Phase B program.

Permanent Civil
Service Workyears

SPACE SHUTTLE.....

1,000

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. Development activity for the ASRM will continue in 1992 as will the construction of the Yellow Creek Production Facility.

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.

Permanent Civil
Service Workyears

SPACE SCIENCE AND APPLICATIONS.....

739

PHYSICS AND ASTRONOMY.....

548

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 Ray Observatory

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 will be 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 1992.

Advanced X-Ray 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.

Payload Mission Management

In 1992, 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 1992, 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 1992 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

SPACE APPLICATIONS

191

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 1992, 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.

Combined Release and Radiation Effects Satellite (CRRES)

The CRRES satellite consists of active experiments in geosynchronous orbit to further understand the Earth's upper atmosphere and ionosphere.

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. EXPLORATION AND CHNOI

251

SPACE RESEARCH AND TECHNOLOGY... ..

251

The space research and technology activities are in propulsion, controls and guidance, systems analysis, in-space technology experiments, telerobotics, artificial intelligence, science sensor technology, control of flexible structures, physical-chemical life support and flight experiments, including the Aeroassist Flight Experiment. The primary effort in 1992 will be on developing and extending the technology base in support of space transportation systems for human exploration and large space systems.

The Aeroassist Flight Experiment (AFE) provides technical direction and management of the design, production, integration and launch support of the AFE payload which requires: (1) providing the Level II management role for AFE; (2) development of the carrier and airborne support equipment; (3) assurance of flight readiness of the AFE prior to launch; and (4) launch and flight operations support.

COMMERCIAL PROGRAMS AND TECHNOLOGY UTILIZATION... ..

18

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.....

16

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.....

491

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.

Mananement 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

	1990	1991		1992
		Actual	Budget Estimate	Current Estimate
I. PERSONNEL AND RELATED COSTS	189,973	198,292	203,942	219,474
II. TRAVEL	6,771	7,066	7,333	7,615
III. OPERATION OF INSTALLATION	72,523	76,500	74,636	97,393
A. Facilities Services	27,173	32,474	28,775	31,973
B. Technical Services	13,020	12,653	13,187	13,782
C. Management and Operations	32,330	31,373	32,674	47,504
D. Implementation of Project CORE	0	0	0	4,134
Total, Fund Requirement	269,267	281,858	285,911	324,482

1990 <u>Actual</u>	1991		1992
	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>

(Thousands of Dollars)

RESOURCES REQUIREMENTS BY FUNCTION

I.	PERSONNEL AND RELATED COSTS	189,973	198,292	203,942	219,474
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Summary of Fund Requirements

A. Compensation and Benefits

1. Compensation

a.	Full-time permanent	154,306	157,115	165,396	174 8 6
b.	Other than full-time permanent	2,221	2,351	2,518	2 498
c.	Reimbursable detailees	0	0	0	0
d.	Overtime and other compensation	1.994	2,731	2,142	2 292
	Subtotal, Compensation	158,521	162,197	170,056	179,606

2. Benefits

	Benefits	28,557	31,395	32,498	35.668
	Subtotal, Compensation and Benefits	187,078	193,592	202,554	215,274

	1990 <i>Actual</i>	1991		1992
		Budget Estimate	Current <u>Estimate</u>	Budget <u>Estimate</u>
(Thousands of Dollars)				
B. Supporting Costs				
1. Transfer of personnel	897	1,436	490	1,200
2. OPM Services	0	0	0	0
3. Personnel training	1,998	3,264	898	3,000
Subtotal, Supporting Costs	2,895	4,700	1,388	4,200
Total, Personnel and Related Costs	189,973	198,292	203,942	219,474

Explanation of Fund Requirements

A. Compensation and Benefits

1. Compensation

a. Full-time permanent	154,306	157,115	165,396	174,816
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The increase in the 1991 Current Estimate from the 1991 Budget Estimate reflects the increase in the additional January pay raise from 3.6 percent to 4.1 percent and the additional 4.1 percent pay raise for Senior Executive Service personnel. Also included in the increase is a re-estimate of costs due to less attritions achieved in 1990 and higher salaried new hires than previously planned. This contributes to a higher base at the beginning of 1991. The 1992 Estimate includes funding for a full year of the 1991 pay raise, the anticipated 1992 pay raise, one additional day and full year funding for promotions, within grade increases and other personnel actions.

Basis of Cost for Permanent Workyears.

In 1992. the cost of full-time workyears will be \$174.816.000. The increase from 1991 is calculated as follows:

Cost of full-time permanent workyears in 1991.....		\$165.396
Cost of increases in 1992.....		12.809
Within grade and career advances:		
Full year effect of 1991 actions.....	2.391	
Partial year effect of 1992 actions.....	3.023	
Full year cost of 1991 pay raise.....	1.972	
Partial year cost of 1992 pay raise.....	4.835	
Extra Day.....	588	
Cost Decreases in 1992.....		- 3.389
Turnover Effects:		
Full year effect of 1991 actions.....	- 111	
Partial year effect of 1992 actions.....	.3. 278	
Cost of full-time permanent workyears in 1992.....		\$174.816

1990 <u>Actual</u>	<u>1991</u>		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

b.	Other than full-time permanent				
	(1) cost	2,221	2,351	2,518	2,498
	(2) Workyears	101	100	11	11

Distribution of Other Than Full Time Permanent Workyears

The distribution of 1992 workyears is as follows:

<u>Program</u>	<u>Workyears</u>
Temporary programs	<u>11</u>
Total	11

The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects the additional 1/2 percent pay raise for 1991 and higher salaried temporary positions than planned. The 1992 decrease reflects a return to our normal temporary program, with full year funding of the 1991 pay raise and the cost of the anticipated pay raise in January 1992. The reduction in workyears in the 1991 Current Estimate and the 1992 Budget Estimate is the result of the Office of Management and Budget excluding Co-ops from the Agency FTE ceiling.

c.	Reimbursable detailees	0	0	0	0
d.	Overtime and other compensation	1,994	2,731	2,142	2,292

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 1991 Budget Estimate to the 1991 Current Estimate results from less launches than planned and the decision to divert the overtime funding

<u>1990</u> <u>Actual</u>	<u>1991</u>		<u>1992</u>
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

to pay for the current approved FTE. The increase in the 1992 Budget Estimate reflects expected overtime as a result of an additional launch in 1992, full year funding of the 1991 pay raise, and the anticipated 1992 pay raise.

2. Benefits	28,557	31,395	32,498	35,668
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The distribution of these costs by major categories is as follows:

Retirement Fund and Thrift Plan.....	14,341	14,738	16,035	16,761
Employee life insurance.....	315	324	336	354
Employee health insurance.....	7,307	8,954	8,508	10,345
FICA.....	3,322	3,771	4,367	4,819
Unemployment Compensation/Severance.....	11	10	9	0
Workers' Compensation.....	1,746	2,000	1,831	2,044
Medicare.....	<u>1,515</u>	<u>1,598</u>	<u>1,412</u>	<u>1,345</u>
Total.....	<u>28.557</u>	<u>31.395</u>	<u>32.498</u>	<u>35.668</u>

The increase from the 1991 Budget Estimate to the 1991 Current Estimate is due to expected increases in retirement and thrift and FICA due to greater FERS participation for new hires, the additional 1/2 percent pay raise in 1991, offset by decreases in the medicare estimate, health insurance, and worker's compensation which is based on recent experience. The 1992 increase reflects the full year effect of the 1991 pay raise, the anticipated 1992 pay raise and expected increases above the pay raise in health insurance, worker's compensation, retirement programs and FICA.

1990 <u>Actual</u>	1991		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

B. Supporting Costs

1. Transfer of Personnel	897	1,436	490	1,200
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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 1991 Budget Estimate to the 1991 Current Estimate reflects a reduction in the number and mix of planned new hires and an effort to control relocation costs. The increase in the 1992 Budget Estimate reflects an anticipated increase in the number of hires eligible for relocation benefits.

2. OPM Services	0	0	0	0
3. Personnel Training	1,998	3,264	898	3,000

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 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 decrease from the 1991 Budget Estimate to the 1991 Current Estimate results in reducing these training programs in order to adequately fund the current level of FTE's. The 1991 Budget Estimate reflects an increase of training over the 1991 level to restore some of the delayed training and pay for increased tuition and associated costs.

	1990 <u>Actual</u>	<u>1991</u>		1992
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
II. TRAVEL	6,771	7,066	7,333	7,615

(Thousands of Dollars)

Summary of Fund Requirements

A. Program Travel	5,734	6,054	6,211	6,448
B. Scientific and Technical Development Travel	241	274	261	271
C. Management and Operations Travel	796	738	861	896
Total. Travel	6,771	7,066	7,333	7,615

Explanation of Fund Requirements

A. Program Travel	5,734	6,054	6,211	6,448
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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 1991 Current Estimate and 1992 Budget Estimate increases are due to increased requirements in support of Space Shuttle payloads, Space Station activities and flight rate, in addition to projected growth in transportation costs.

1990 <u>Actual</u>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

B. Scientific and Technical Development Travel	241	274	261	271
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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 1991 Budget Estimate to the 1991 Current Estimate is a result of reallocation of funds to accommodate center priorities. The change in the 1992 Budget Estimate is due to projected inflationary increases.

C. Management and Operations Travel	796	738	861	896
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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. Non-NASA travel includes transportation of persons, per diem, and other incidental expenses for all non-NASA employees, such as unpaid members of research advisory committees and pre-employment interviews. The anticipated increases in 1991 and 1992 travel are due to higher costs in transportation and per diem and an increase in the number of trips.

	1990 <u>Actual</u>	1991		1992
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
III. OPERATION OF INSTALLATION	72,523	76,500	74,636	97,393
Summary of Fund Requirements				
A. Facilities Services				
1. Rental of Real Property	103	98	105	110
2. Maintenance and Related Services	8,798	8,770	8,143	9,844
3. Custodial Services	5,751	6,251	5,554	5,805
4. Utility Services	12,521	17,355	14,973	16,214
Total, Facilities Services	27,173	32,474	28,775	31,973
B. Technical Services				
1. Automatic Data Processing	8,063	7,912	7,903	8,256
2. Scientific and Technical Information	2,296	2,158	2,262	2,366
3. Shop and Support Services	2,661	2,583	3,022	3,160
Total, Technical Services	13,020	12,653	13,187	13,782

	<u>1990</u> <u>Actual</u>	<u>1991</u>		<u>1992</u> <u>Budget</u> <u>Estimate</u>
		Budget Estimate	Current Estimate	Budget Estimate
		(Thousands of Dollars)		
C. Management and Operations				
1. Administrative Communications	15,385	16,775	15,078	15,756
2. Printing and Reproduction	1,179	852	919	964
3. Transportation	3,928	3,536	4,373	17,884
4. Installation Common Services	11,838	10,210	12,304	12,900
Total, Management and Operations	<u>32,330</u>	<u>31,373</u>	<u>32,674</u>	<u>47,504</u>
D. Project CORE	0	0	0	4,134
Total, Operation of Installation	<u>72,523</u>	<u>76,500</u>	<u>74,636</u>	<u>97,393</u>

Explanation of Fund Requirements

Operation of Installation provides 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 includes funding for the implementation of Project CORE, which will convert certain functions from contractors to civil servants.

1990 <u>Actual</u>	1991		1992 <u>Budget Estimate</u>
	<u>Budget Estimate</u>	<u>Current Estimate</u>	

(Thousands of Dollars)

The decrease in the 1991 Current Estimate over the 1991 Budget Estimate is due to the deferral of planned maintenance, supplies, and equipment due to budget constraints. The increased FY 1992 Budget Estimate provides for the replacement of NASA aircraft as part of NASA's planned aircraft replacement program and for anticipated RASA rate increases for steam and electricity, and for new facility consumption.

A. Facilities Services

1. Rental of Real Property	103	98	105	110
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Provides for lease of off-site space for source evaluation boards (SEBs). The increase from the 1991 Budget Estimate to the 1991 Current Estimate is based on identification of space required for additional large-scale procurements. The 1992 Budget Estimate provides for leased space for SEB requirements at anticipated rental rates.

2. Maintenance and Related Services	8,798	8,770	8,143	9,844
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This activity involves maintenance and operation of a total of 234 facilities (buildings, structures, and trailers) many of which are aging. The decrease in the 1991 Current Estimate from the 1991 Budget Estimate reflects deferred maintenance. The 1992 Budget Estimate reflects an increase for the restoration of deferred maintenance and repair from prior years.

3. Custodial Services	5,751	6,251	5,554	5,805
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Custodial services include janitorial services, security services, fire protection, trash removal, sanitary landfill operations, and related supplies and materials. Janitorial services are provided to about 3.5 million square feet of facility space and trash removal for approximately 130 separate locations. Security and fire protection services include 24-hour coverage of MSFC property, law enforcement, and motor vehicle registration and control. The decrease in the 1991 Current Estimate from the 1991 Budget Estimate is due to

1990 <u>Actual</u>	<u>1991</u>		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

the award of a new contract in November 1990, at a lower wage rate than was experienced in 1990. The 1992 Budget Estimate reflects essentially the continuation of previous levels of effort.

4. Utility Services	12,521	17,355	14,973	16,214
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This function provides for the cost of electricity, steam, natural gas, water, and sewage disposal services provided by RASA on a reimbursable basis. It also provides for the propane and burner fuel to generate steam for heating of water in support of experiments/tests at the MSFC test area when RASA steam is off line. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is based on expected rates associated with RASA rising less rapidly than previously planned. The increase in the 1992 Budget Estimate reflects increased utility rates and increased consumption due to the advanced Liquid Oxygen/Hydrocarbon engine system and component tests in Test Stand 4670, as well as increased center activity associated with the Huntsville Operations Support Center and Shuttle launches. The increase in the utility estimate is primarily attributed to the new Huntsville/RASA waste burning plant coming on line beginning in 1992.

B. Technical Services

1. Automatic Data Processing	8,063	7,912	7,903	8,256
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This activity provides centralized computational systems analysis, systems and applications, operations, and related computational services to meet the management and administrative computing requirements. This category also includes 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 system and administrative/institutional application software development. This activity directly supports program management in terms of response planning and tracking, including procurements, resources, and contract status.

1990 <u>Actual</u>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

The 1992 Budget Estimate reflects essentially the continuation of previous levels of service.

2. Scientific and Technical Information	2,296	2,158	2,262	2,366
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This activity provides 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. The RSIC serves 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. These funds also provide for MSFC's share of the operation of the MSFC Visitor Information Center located at the Alabama Space and Rocket Center. The increase in the 1991 Current Estimate and the 1992 Budget Estimate provides a consistent level of effort based on FY 1990 experience.

3. Shop and Support Services	2,661	2,583	3,022	3,160
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These funds provide the Center with support in the areas of graphics, photographic services, and related supplies, materials, and equipment. The increase from the 1991 Budget Estimate to the 1991 Current Estimate is due to additional photographic personnel on the Consolidated Institutional Contract and additional supplies and materials. The 1992 estimate continues the 1991 level of effort.

C. Management and Operations

1. Administrative Communications	15,385	16,775	15,078	15,756
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Communications support for MSFC consists of 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);

1990 <u>Actual</u>	<u>1991</u>		1992
	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>

(Thousands of Dollars)

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. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects the adjusted price levels for PSCN and local phone charges based on previous trends. The 1992 estimate provides funding at the current level with anticipated escalation.

2. Printing and Reproduction	1,179	852	919	964
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A portion of the MSFC's printing and reproduction requirements are met by a contractor operated on-site reproduction plant. MSFC also purchases 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. The 1992 Budget Estimate reflects essentially the continuation of the level of funding contained in the 1991 Current Estimate.

3. Transportation	3,928	3,536	4,373	17,884
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Transportation includes 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 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. The increase in the 1991 Current Estimate from the 1991 Budget Estimate is due to more off-site aircraft maintenance and repair on NASA 3 and NASA 9 aircraft. The 1992 Budget Estimate increase is for the replacement of NASA aircraft as part of NASA's planned aircraft replacement program.

4. Installation Common Services	11,838	10,210	12,304	12,900
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This activity provides administrative support to Center management and staff activities, medical services, and various other installation support services. Installation support services include maintenance

1990 <u>Actual</u>	1991		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

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 include patent counsel services, tort claims, and equal opportunity activities. Medical services provide 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. The increase from the 1991 Budget Estimate to the Current Estimate is due to partial reinstatement of past deferred non-capital office furnishings to support the MSFC 5-year plan for Center refurbishment. The 1992 Budget Estimate reflects continued 1991 level of effort.

D. Implementation of Project CORE	0	0	0	4,134
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During 1992, the Marshall Space Flight Center plans to convert 249 positions (estimated to consume 52 FTE in 1992) from contractors to civil servants. These funds will be transferred into Personnel and Related Costs to cover the actual civil service salaries when the contractors, or their replacements, come on board as civil servants. They will also be transferred to Travel and Operation of Installation to cover the travel expense of these positions and to provide the necessary accommodations -- desks, supplies, personal computers, etc. -- needed to bring them into the Center workforce. In the event that circumstances beyond our control prevent us from having the full civil service complement in place at the date of the planned termination of the contracted functions, some of these funds will be used to provide for a continuation of the contractor support until the civil service transition can be completed.

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

OFFICE OF DIRECTOR			ASSOCIATE DIRECTOR FOR SCIENCE			EXECUTIVE STAFF			MSFC SUMMARY											
	FY91	FY92		FY91	FY92		FY91	FY92		FY91	FY92									
SES			SES	1	1	SES			SES	59	63									
GS-16	4	4	GS-16			GS-16			GS-16											
GS-15			GS-15	1	1	GS-15			GS-15	214	214									
GS-14	1	1	GS-14			GS-14			GS-14	595	590									
ALL OTHER GS	5	5	ALL OTHER GS	1	1	ALL OTHER GS			ALL OTHER GS	2049	2011									
AD POS.			AD POS.			AD POS.			AD POS.	4	4									
TOTAL PERM.	10	10	TOTAL PERM.	3	3	TOTAL PERM.			TOTAL PERM.	3721	3682									
SAFETY & MISSION ASSURANCE OFFICE			PUBLIC AFFAIRS OFFICE			CHIEF COUNSEL			CENTER CONTROLLER			ADMINISTRATIVE OPERATIONS OFFICE			EQUAL OPPORTUNITY OFFICE					
	FY91	FY92		FY91	FY92		FY91	FY92		FY91	FY92		FY91	FY92		FY91	FY92			
SES	3	3	SES			SES	1	1	SES	1	1	SES	1	1	SES					
GS-16			GS-16			GS-16			GS-16			GS-16			GS-16					
GS-15	9	9	GS-15	1	1				GS-15	4	4	GS-15	2	2	GS-15	1	1			
GS-14	27	27	GS-14	2	2				GS-14	12	12	GS-14	13	13	GS-14					
ALL OTHER GS	151	151	ALL OTHER GS	19	19				ALL OTHER GS	108	108	ALL OTHER GS	167	167	ALL OTHER GS	6	6			
AD POS.			AD POS.						AD POS.			AD POS.			AD POS.					
TOTAL PERM.	190	190	TOTAL PERM.	22	22				TOTAL PERM.	125	125	TOTAL PERM.	183	183	TOTAL PERM.	7	7			
SPACE SHUTTLE PROJECTS OFFICE			SPACE SYSTEMS PROJECT OFFICE			OBSERVATORY PROJECTS OFFICE			PAYLOAD PROJECTS OFFICE			SPACE STATION PROJECTS OFFICE			HEAVY LIFT LAUNCH VEHICLE DEFINITION OFF.			SPC STATION FREEDOM PROGRAM INTEG. OFF.		
	FY91	FY92		FY91	FY92		FY91	FY92		FY91	FY92		FY91	FY92		FY91	FY92			
SES	3	3	SES	2	2	SES	3	3	SES	3	3	SES	2	2	SES	1	1			
GS-16			GS-16			GS-16			GS-16			GS-16			GS-16					
GS-15	18	18	GS-15	6	6	GS-15	6	6	GS-15	16	16	GS-15	3	3	GS-15	3	3			
GS-14	26	26	GS-14	8	8	GS-14	20	20	GS-14	31	31	GS-14	20	20	GS-14	3	3			
ALL OTHER GS	101	101	ALL OTHER GS	16	16	ALL OTHER GS	23	23	ALL OTHER GS	54	54	ALL OTHER GS	37	37	ALL OTHER GS	9	9			
AD POS.			AD POS.			AD POS.			AD POS.			AD POS.			AD POS.					
TOTAL PERM.	150	150	TOTAL PERM.	32	32	TOTAL PERM.	52	52	TOTAL PERM.	104	104	TOTAL PERM.	62	62	TOTAL PERM.	19	19			
PROGRAM DEVELOPMENT			SCIENCE AND ENGINEERING			INSTITUTIONAL AND PROGRAM SUPPORT			COO2											
	FY91	FY92		FY91	FY92		FY91	FY92	NOTE: ALL MANPOWER SHOWN IN EDT											
SES	4	4	SES	23	27	SES	5	5	12-28-90											
GS-16			GS-16			GS-16														
GS-15	18	18	GS-15	105	105	GS-15	15	15												
GS-14	41	38	GS-14	343	341	GS-14	42	42												
ALL OTHER GS	106	105	ALL OTHER GS	1670	1643	ALL OTHER GS	348	338												
AD POS.			AD POS.	1	1	AD POS.														
TOTAL PERM.	169	165	TOTAL PERM.	2142	2117	TOTAL PERM.	410	400												

STENNIS
SPACE CENTER

1

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1992 ESTIMATES

JOHN C. STENNIS SPACE CENTERDESCRIPTION

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, 1990, was \$387,497,471.

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 National 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 National Launch Systems (NLS) and Advanced Solid Rocket Motor (ASRM). 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 colocated 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.

National Launch System - SSC responsibilities include, but are not limited to, the following: Management oversight of NLS Advanced Development Program (ADP) Propulsion Test Facility modifications and construction at SSC, MSFC, Air Force Avionics Laboratory (AFAL), and NLS ADP Test Operations at these three government laboratories. Design, construction, and activation of the SSC Component Test Facility (CTF) for turbomachinery testing. SSC is also assigned project responsibility for implementing the test activities of the NLS propulsion advanced development program project requirements. This activity includes testing of three turbomachinery assemblies (two liquid hydrogen and one liquid oxygen).

Advanced Solid Rocket Motor - The SSC Advanced Solid Rocket Motor (ASRM) Project Office is responsible for managing the activities of the on-site ASRM contractors team who will design and build the ASRM facilities at SSC. These facilities include a test stand, test control center, dock, roads, grounds, utilities, water and sewage facilities, the equipment storage building, and the engineering operations building. SSC is also responsible for conducting the testing of the motors.

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) WOAKYEARS BY PROGRAM

STENNIS SPACE CENTER	1991			1992
	1990 ACTUAL	BUDGET ESTIMATE	CURRENT ESTIMATE	BUDGET ESTIMATE
SPACE STATION.....	2	7	1	2
SPACE FLIGHT PROGRAMS.....	91	132	139	138
SPACE TRANSPORTATION CAPABILITY DEV....	50	62	65	67
SPACE SHUTTLE.....	41	70	74	71
SPACE SCIENCE AND APPLICATIONS.....	16	11	11	11
PHYSICS AND ASTRONOMY.....	0	0	0	0
LIFE SCIENCES.....	1	1	1	1
PLANETARY EXPLORATION.....	0	0	5	5
SPACE APPLICATIONS.....	15	10	5	5
AERONAUTICS EXPLORATION AND 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
COMMERCIAL PROQRAMS.....	16	12	12	12
SAFETY, RELIABILITY & QUALITY ASSURANCE.	0	0	0	0
ACADEMIC PROGRAMS.....	0	0	0	0
TRACKING AND DATA PROQRAMS.....	0	0	0	0
SUBTOTAL • DIRECT FULL-TIME PERM FTE'S	125	162	163	163
CENTER MANAQEWENT AND OPERATIONS.....	57	53	53	53
SUBTOTAL • FULL-TIME PERM FTE'S.....	182	215	216	216
OTHER FTE'S.....	13	13	6	8
SUBTOTAL " FULL-TIME EQUIVALENTS.....	195	228	222	222
PROJECT CORE.....				20
GRAND TOTAL • FULL-TIME EQUIVALENTS..	195	228	222	242

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.....

12

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.....

53

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:

Permanent Civil
Service Workyears

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

	1990 Actual	1991		1992
		Budget Estimate	Current Estimate	Budget Estimate
I. PERSONNEL AND RELATED COSTS	10,025	12,094	12,755	13,351
II. TRAVEL	517	646	649	674
III. OPERATION OF INSTALLATION	14,595	15,600	15,138	16,608
A. Facilities Services	6,044	6,859	6,278	6,384
B. Technical Services	4,461	4,380	4,187	4,295
C. Management and Operations	4,090	4,361	4,673	4,979
D. Implementation of Project CORE	0	0	0	950
Total, Fund Requirement	25.137	28.340	28.542	30.633

1990 <u>Actual</u>	1991		1992
	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>

(Thousands of Dollars)

RESOURCES REQUIREMENTS BY FUNCTION

I.	PERSONNEL AND RELATED COSTS	10,025	12,094	12,755	13,351
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Summary of Fund Requirements

A. Compensation and Benefits

1. Compensation

a.	Full-time permanent	7,717	9,062	9,661	10,307
b.	Other than full-time permanent	317	277	305	318
c.	Reimbursable detailees	0	0	0	0
d.	Overtime and other compensation	54	76	62	70
	Subtotal, Compensation	2,088	9,415	10,028	10,695

2. Benefits

	Benefits	1,641	2,083	2,124	2,388
	Subtotal, Compensation and Benefits	9,729	11,498	12,152	13,083

	1990	1991		1992
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
	(Thousands of Dollars)			
B. Supporting Costs				
1. Transfer of personnel	177	421	435	100
2. OPM Services	0	0	0	0
3. Personnel training	119	175	168	168
Subtotal, Supporting Costs	296	596	603	268
Total, Personnel and Related Costs	10,025	12,094	12,755	13,351

Explanation of Fund Requirements

A. Compensation and Benefits

1. Compensation

a. fill-time permanent	7,717	9,062	9,661	10,307
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The increase in the 1991 Current Estimate from the 1991 Budget Estimate reflects the increase in the additional January pay raise from 3.6 percent to 4.1 percent and the additional 4.1 percent pay raise for Senior Executive Service personnel. Also included in the increase is a reestimate of costs due to less attritions achieved in 1990 and higher salaried new hires than previously planned. This contributes to a higher base at the beginning of 1991. The 1992 Estimates includes funding for a full year of the 1991 pay raise, the anticipated 1992 pay raise, one additional day and full year funding for promotions, within grade increases and other personnel actions.

Basis of Cost for Permanent Positions

In 1992. the cost of full-time workyears will be \$10.307.000 . The increase from 1991 is calculated as follows:

Cost of full-time permanent workyears in 1991.....		\$ 9.6 1
Cost of increases in 1992.....		638
Within grade and career advances:		
Full year effect of 1991 actions.....	83	
Partial year effect of 1992 actions.....	159	
Full year cost of 1990 pay raise.....	118	
Partial year cost of 1992 pay raise.....	235	
Extra Day.....	43	
Cost changes in 1992.....		+ 8
Full year effect of 1991 actions.....	+384	
Partial year effect of 1992 actions.....	-103	
Decrease to attain approved FTE ceiling.....	-273	
Cost of full-time permanent workyears in 1992.....		\$10.307

1990 <u>Actual</u>	<u>1991</u>		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

b.	Other than full-time permanent				
	(1) cost	317	277	305	318
	(2) Workyears	13	13	6	6

The distribution of 1992 workyears is as follows:

Distribution of Other than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Other temporary programs.....	6
Total.....	4

The increase from the 1991 Budget Estimate to the 1991 Current Estimates reflects the additional 1/2 percent pay raise for 1991 and higher salaried temporary positions than planned. The 1992 increase reflects full year funding of the 1991 pay raise and the cost of the anticipated pay raise in January 1992. The reduction in workyears in the 1991 Current Estimate and the 1992 Budget Estimate is the result of the Office of Management and Budget (OMB) excluding Co-ops from the Agency FTE ceiling.

c.	Reimbursable detailees	0	0	0	0
d.	Overtime and other compensation	54	76	62	70

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 1991 Budget Estimate to the 1991 Current Estimate results from less launches than planned and the decision to divert the overtime funding to pay for

1990 <u>Actual</u>	<u>1991</u>		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

the current approved FTE. The increase in the 1992 Budget Estimate reflects full year funding of the 1991 pay raise, and the anticipated 1992 pay raise.

2. Benefits	1,641	2,083	2,124	2,388
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Following are the amounts of contribution by category:

Retirement Fund	896	1,164	1,164	1,232
Employee Life Insurance.....	16	20	22	25
Employee Health Insurance.....	389	470	504	661
FICA.....	282	349	375	407
Medicare.....	58	80	59	63
Annuitant & Other Benefits.....	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total....	<u>1.641</u>	<u>2.083</u>	<u>2.124</u>	<u>2.388</u>

The increase from the 1991 Budget Estimate to the 1991 Current Estimate is due to increases in FICA, health insurance and the additional 1/2 percent pay raise in 1991. The 1992 increase reflects the full year effect of the 1991 pay raise, the anticipated 1992 pay raise and expected increases above the pay raise in health insurance, retirement programs and FICA.

B. Supporting Costs

1. Transfer of Personnel	177	421	435	100
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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 reflects an anticipated decrease in the number of hires eligible for relocation benefits.

	1990	1991		1992
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
2. OPM Services	0	0	0	0
3. Personnel Training	119	175	168	168

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 1991 Budget and the 1991 Current Estimates and to the 1992 Budget Estimate are not significant.

	1990 <i>Actual</i>	1991		1992
		Budget Estimate	Current <u>Estimate</u>	Budget <u>Estimate</u>
II. TRAVEL	517	646	649	674

(Thousands of Dollars)

Summary of Fund Requirements

A. Program Travel	212	225	266	254
B. Scientific and Technical Development Travel	140	107	175	192
C. Management and Operations Travel	165	314	208	228
Total, Travel	517	646	649	674

Explanation of Fund Requirements

A. Program Travel	212	225	266	254
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Program travel requirements are directly related to the accomplishments of the Center's mission, and will primarily be in support of Space Science and Applications Programs and NLS/ASRM activities. The increase from the 1991 Budget Estimate to the 1991 Current Estimate is due to reevaluation of NLS/ASRM Program requirements based on reallocation of funds to meet center requirements. The decrease from the 1991 Current Estimate to the 1992 Budget Estimate is the result of reducing program travel requirements associated with a reduction in 1992 civil service support for the NLS Program.

1990 <u>Actual</u>	1991		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

B. Scientific and Technical Development Travel	140	107	175	192
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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 increase from 1991 Budget Estimate to the 1991 Current Estimate is a re-evaluation of requirements based on center priorities and an increase in the number of trips. The increase from 1991 Current Estimate to 1992 Budget Estimate primarily includes price escalation.

C. Management and Operations Travel	165	314	208	228
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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 1991 Budget Estimate to the 1991 Current Estimate reflects re-evaluation of requirements based on a decrease in the number of anticipated trips. The increase from 1991 Current Estimate to 1992 Budget Estimate includes expected price escalation.

	1990 <i>Actual</i>	1991		1992
		Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
(Thousands of Dollars)				
III. OPERATION OF INSTALLATION	14,595	15,600	15,138	16,608
Summary of Fund Requirements				
A. Facilities Services				
1. Rental of Real Property	33	33	34	36
2. Maintenance and Related Services	2,188	2,342	1,954	1,815
3. Custodial Services	2,087	2,015	2,041	2,146
4. Utility Services	1,736	2,469	2,249	2,387
Total, Facilities Services	6,044	6,859	6,278	6,384
B. Technical Services				
1. Automatic Data Processing	1,661	2,102	2,059	2,216
2. Scientific and Technical Information	454	401	374	225
3. Shop and Support Services	2,346	1,877	1,754	1,854
Total, Technical Services	4,461	4,380	4,187	4,295

	<u>1990</u> <u>Actual</u>	<u>1991</u>		<u>1992</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
C. Management and Operations				
1. Administrative Communications	2,689	2,973	3,157	3,351
2. Printing and Reproduction	28	112	32	33
3. Transportation	825	819	903	966
4. Installation Common Services	548	457	581	629
Total, Management and Operations	<u>4,090</u>	<u>4,361</u>	<u>4,673</u>	<u>4,979</u>
D. Project CORE	0	0	0	950
Total, Operation of Installation	<u>14,595</u>	<u>15,600</u>	<u>15,138</u>	<u>16,608</u>

Explanation of Fund Requirements

Operation of Installation provides 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 FY 1992 Operation of Installation includes funding for the implementation of Project CORE, which will convert certain functions from contractors to civil servants.

1990 <i>Actual</i>	1991		1992
	Budget <u>Estimate</u>	Current Estimate	Budget <u>Estimate</u>

(Thousands of Dollars)

The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects budget constraints. The 1992 increase reflects normal escalation and additional costs associated with increase of programmatic and institutional facilities, such as, the National Launch System (NLS) and the Advanced Solid Rocket Motor (ASRM) facilities.

A. Facilities Services

1. Rental of Real Property	33	33	34	36
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Provides for lease of hangar space for the Science and Technology Laboratory. This increase is due to normal escalation.

2. Maintenance and Related Services	2,188	2,342	1,954	1,815
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This activity provides for the management of modifications, alterations and operation and maintenance of installation facilities. It also provides various facility engineering activities, such as master planning and physical space management which involves movement of personnel and equipment. The decrease from the 1991 Budget Estimates and the 1991 Current Estimate results deferrals required by budget constraints. The decrease in the 1992 Budget Estimate is due to a decrease in building modifications and maintenance of roads and grounds and realignment due to Project CORE.

3. Custodial Services	2,087	2,015	2,041	2,146
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This category includes NASA's share of janitorial services and fire protection, provided by the SSC institutional support services contractor. The increase in the 1992 Budget Estimate reflects escalation.

4. Utility Services	1,736	2,469	2,249	2,387
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Provides 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.

1990 <u>Actual</u>	1991		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

Also provided is NASA's share of the operation and maintenance of the utility distribution and control systems, water wells, and sewage systems. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is the result of lower than anticipated utility rates and conversion to decentralized boilers which lowered natural gas consumption. The increase in the 1992 Budget Estimate provides for anticipated rate increases.

B. Technical Services

1. Automatic Data Processing	1,661	2,102	2,059	2,216
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Automated data processing (ADP) funds provide 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. The 1992 Budget Estimate reflects modest replacement and upgrade of ADP equipment and ADP enhancements of the institutional and management system, as well as escalation.

2. Scientific and Technical Information	454	401	374	225
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Scientific and Technical Information funds provide 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). The decrease from 1991 Budget Estimate to 1991 Current Estimate reflects budget restrictions. The 1992 Budget Estimate eliminates the off-site space educational programs and reflects realignment of Project CORE.

3. Shop and Support Services	2,346	1,877	1,754	1,854
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This function provides 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

1990 <u>Actual</u>	<u>1991</u>		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

long-range work plans, schedules in support of SSC base operations, emergency plans, and the institutional portion of the mishap reporting system. The 1991 Current Estimate decrease from 1991 Budget Estimate reduces the support effort associated with the NLS/ASRM programs in all areas of support services. The 1992 Budget Estimate reflects the same level of effort.

C. Management and Operations

1. Administrative Communications	2,689	2,973	3,157	3,351
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Provides for NASA's share of the local telephone service, long distance, and operation and maintenance of the on-site communications equipment and switchboard and Institutional Telephone System. This function includes all administrative communication systems, supplies, and equipment for outfitting new and existing SSC facilities. The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects purchase of wiring and cabling for administrative communication deferred from the prior year. The 1992 Budget Estimate reflects expected cost escalation and communications support for new programs, such as, NLS/ASRM.

2. Printing and Reproduction	28	112	32	33
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Provides for printing and reproduction services in support of the Science and Technology Laboratory and the SSC organization. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to realignment of support services associated with printing and reproduction, whereby the 1991 Current Estimate corrects the 1991 Budget estimate anomaly and properly only reflects Purchased Goods and Services (PG&S). The 1992 Budget Estimate maintains the same level of service.

3. Transportation	825	819	903	966
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This estimate includes local transportation for the SSC staff and the support contractors, as well as, freight costs, government bills of lading, air freight, other general shipments and related transportation costs. The increase from the 1991 Budget Estimate to the 1991 Current Estimate is due to additional support to programs. The 1992 Budget Estimate provides for increase due to new programs, such as NLS/ASRM.

	<u>1990</u>	<u>1991</u>		<u>1992</u>
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>

(Thousands of Dollars)

4. Installation Common Services	548	457	581	629
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Provides medical services, mail distribution services, supplies, materials and equipment for the Center. The increase from the 1991 Budget Estimate to the 1991 Current Estimate is due to additional program support for new programs. This includes the provision of furniture, environmental health and occupational medicine, lease, maintenance and acquisition of small value administrative purchases, such as typewriters, and calculators. The 1991 Budget Estimate allows for completing the outfitting of new facility projects started in 1990. The increase from the 1991 Current Estimate to the 1992 Budget Estimate is required for additional facilities. The 1992 Budget Estimate reflects increase for equipment and supplies for trailers and temporary buildings for NLS/ASRM support.

D. Implementation of Project CORE	0	0	0	950
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During 1992, the Stennis Space Center plans to convert 24 positions (estimated to consume 20 FTE in 1992) from contractors to civil servants. These funds will be transferred into Personnel and Related Costs to cover the actual civil service salaries when the contractors, or their replacements, come on board as civil servants. They will also be transferred to Travel and Operation of Installation to cover the travel expense of these positions and to provide the necessary accommodations -- desks, supplies, personal computers, etc. -- needed to bring them into the Center workforce. In the event that circumstances beyond our control prevent us from having the full civil service complement in place at the planned date of the planned termination of the contracted functions, some of these funds will be used to provide for a continuation of the contractor support until the civil service transition can be completed.

ORGANIZATION CHART

FY 1992 CONGRESSIONAL BUDGET
 NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
 JOHN C. STENNIS SPACE CENTER

SSC SUMMARY STAFFING			OFFICE OF THE DIRECTOR								
	FY91	FY92		FY91	FY92						
SES	6	6	SES	3	3						
GS/GM-15	10	10	GS/GM-15								
GS/GM-14	29	29	GS/GM-14								
All Other GS/GM	183	183	All Other GS/GM								
Total Permanent	228	228	Total Permanent	0	0						
ASRM PROJECT OFFICE			ALS PROJECT OFFICE								
	FY91	FY92		FY91	FY92						
GS/GM-15	1	1	GS/GM-15	1	1						
GS/GM-14	2	2	GS/GM-14	0	0						
All Other GS/GM	3	3	All Other GS/GM	5	5						
Total Permanent	6	6	Total Permanent	6	6						
CHIEF COUNSEL			PUBLIC AFFAIRS OFFICE			PERSONNEL OFFICE			SAFETY/QUALITY AND HEALTH		
	FY91	FY92		FY91	FY92		FY91	FY92		FY91	FY92
GS/GM-15	1	1	GS/GM-14	1	1	GS/GM-14	1	1	GS/GM-14		
GS/GM-14	0	0	All Other GS/GM	3	3	All Other GS/GM	5	5	Total Permanent	12	12
All Other GS/GM	3	9	Total Permanent	4	4	Total Permanent	6	6			
Total Permanent	4	4									
COMPTROLLER			PROCUREMENT OFFICE								
	FY91	FY92		FY91	FY92						
GS/GM-15	1	1	GS/GM-15	1	1						
GS/GM-14	3	3	GS/GM-14	3	3						
All Other GS/GM	25	25	All Other GS/GM	14	14						
Total Permanent	29	29	Total Permanent	18	18						
PROPULSION TEST OPERATIONS			SCIENCE AND TECHNOLOGY LAB.			CENTER OPERATIONS OFFICE					
	FY91	FY92		FY91	FY92		FY91	FY92			
SES	1	1	SES	1	1	SES	1	1			
GS/GM-15	2	2	GWGM-15	2	2	GS/GM-15	1	1			
GS/GM-14	3	3	GS/GM-14	6	6	GS/GM-14	6	6			
All Other GS/GM	39	39	All Other GS/GM	34	34	All Other GS/GM	38	38			
Total Permanent	45	45	Total Permanent	43	43	Total Permanent	46	46			

M19129

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1992 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 marshlands. The total capital investment for the GSFC, including tracking stations, work in progress, contractor-held facilities at various locations, and the Wallops facility, as of September 30, 1990, was approximately \$851,354,000.

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 FUNCTIONS

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 (EOS) 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.

SPACE STATION FREEDOM - Includes management of Work Package 3 development.

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 Department 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 or solar 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, Get Away Special (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, university, 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 Office of Space Science and Applications (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.

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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 SPACE FLIGHT CENTER	1990 ACTUAL	1991		1992 BUDGET ESTIMATE
		BUDGET ESTIMATE	CURRENT ESTIMATE	
SPACE STATION	122	101	20	26
SPACE FLIGHT PROGRAMS.....	126	124	126	121
SPACE TRANSPORTATION CAPABILITY DEV...	57	40	49	40
SPACE SHUTTLE.....	69	84	77	81
SPACE SCIENCE AND APPLICATIONS.....	2,058	2,165	2,221	2,343
PHYSICS AND ASTRONOMY.....	1210	1172	1239	1259
LIFE SCIENCES.....	1	1	1	1
PLANETARY EXPLORATION.....	109	110	95	95
SPACE APPLICATIONS.....	738	882	886	988
AERONAUTICS EXPLORATION AND TECHNOLOGY..	95	108	149	137
AERONAUTICAL RESEARCH AND TECHNOLOGY..	8	9	11	13
SPACE RESEARCH AND TECHNOLOGY.....	87	99	138	124
TRANSATMOSPHERIC RESEARCH AND TECH....	0	0	0	0
COMMERCIAL PROGRAMS.....	13	11	13	13
SAFETY, RELIABILITY & QUALITY ASSURANCE.	10	10	9	8
ACADEMIC PROGRAMS.....	0	0	0	0
TRACKING AND DATA PROGRAMS.....	602	613	606	610
SUBTOTAL - DIRECT FULL-TIME PERM FTE'S	3,026	3,132	3,144	3,258
CENTER MANAGEMENT AND OPERATIONS.....	704	723	716	717
SUBTOTAL - FULL-TIME PERM FTE'S.....	3,730	3,855	3,860	3,975
OTHER FTE'S.....	92	90	32	42
SUBTOTAL - FULL-TIME EQUIVALENTS.....	3,822	3,945	3,892	4,017
PROJECT CORE.....				125
GRAND TOTAL - FULL-TIME EQUIVALENTS..	3,822	3,945	3,892	4,142

PROGRAM DESCRIPTION

Permanent Civil
Service Workyears

RESEARCH AND DEVELOPMENT

SPACE STATION FREEDOM..... 26

Space Station Freedom activities, although currently being assessed by agency management, include management of the major work package for development. In addition, systems engineering and integration efforts will be performed in direct support of the Space Station Freedom Program Office.

SPACE FLIGHT PROGRAMS..... 121

SPACE TRANSPORTATION CAPABILITY DEVELOPMENT..... 40

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

SPACE SHUTTLE (SPACE TRANSPORTATION OPERATIONS). . 81

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.

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 (ELV) 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 Extreme Ultraviolet Explorer (EUE) spacecraft. Additional requirements for Medium Class Launches will be procured via a competitive procurement for launch services.

Goddard has management responsibility for the small class launch vehicle program. Activities include management of spacecraft development, test and integration and procurement of launch services including all aspects of launch operations. A Scout launch capability is maintained by the Wallops Flight Facility.

Permanent Civil
Service Workyears

SPACE SCIENCE AND APPLICATIONS

2,343

PHYSICS AND ASTRONOMY

1,259

Astrophysics 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 astrophysics missions. GSFC manages activities in the pursuit of scientific progress in all of the following discipline areas of astrophysics: gamma ray astronomy, X-ray astronomy, ultraviolet and optical astronomy, infrared and radio astronomy, particle astrophysics, solar physics, interplanetary physics, planetary magnetospheres, and astrochemistry.

In April 1990, the Hubble Space Telescope was launched, 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 Gamma Ray Observatory (GRO) will be launched in 1991. Gamma ray measurements returned from GRO will provide unique information on phenomena occurring in quasars, active galaxies, black holes, neutron stars, supernovae, and the mysterious gamma ray bursts.

Development activities will continue on the EUVE leading to a launch in 1991 and various Shuttle/Spacelab Payloads and integrated rocket experiments. 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: Cosmic Background Explorer (COBE), Hubble Space Telescope (HST), and Astro-1, which contains the Broad Band X-Ray Telescope (BBXRT) payload.

Goddard was responsible for the delivery and integration of a U.S. supplied focal plane High Resolution Imaging (HRI) Instrument flown on the German Roentgen Satellite which was launched 1990 on an Expendable Launch Vehicle (Delta 11). The Roentgen Satellite, another NASA international cooperative project with the Federal Republic of Germany, is performing the first all sky survey of X-ray sources and will point to and study specific X-ray sources for extended periods of time.

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 and Polar) provided by the U.S., one (Geotail), by ISAS, and five Solar Heliospheric Observatory (SOHO) and Cluster 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 include the development of 17 instruments and the Wind and Polar spacecraft, development of 11 instruments to be flown on SOHO and Cluster, and development of the four 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 and 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 Explorer (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. A continuing thrust is definition phase activity for the Orbiting Solar Laboratory (OSL): a free flying science mission that would enable quantum leaps in our understanding of solar phenomena through high resolution, coordinated observations in visible light, UV and X-ray/EUV spectral ranges over extended periods of time. Definition of the visible light instrument, and the ultraviolet and EUV/X-ray instruments will continue.

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.

Permanent Civil

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.....

95

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 Comet

Rendezvous Asteroid Flyby (CRAF)/Cassini instrument development and mission operations and data analysis activity.

Permanent Civil
Service Workyears

SPACE APPLICATIONS.....

988

The 1992 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:

- o The global circulation of the Earth's atmosphere for better weather and climate predictions, including extensive ozone studies;
- o The geopotential fields (gravity and magnetic) of the Earth to provide a better understanding of the structure and evolution of the Earth;
- o The processes of the oceans such as surface winds, waves, temperature, currents, and circulation to support of the ongoing weather and climate studies and the ocean research program;
- o The physical characteristics of the Earth's vegetation cover, water resources, and land use which can be remotely sensed; and
- o 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:

- o Operational weather satellite missions for the National Oceanic and Atmospheric Administration (NOAA), including launch of NOAA-D in 1991 and Geostationary Operational Environmental Satellites (GOES)-I in 1992;
- o Conducting correlation measurements from balloons, sounding rockets, aircraft, and ground installations;
- o Development activities will continue on the Upper Atmospheric Research Satellite (UARS) instruments and the spacecraft, leading to a launch in late 1991;
- o A major thrust is the initiation of the EOS Development phase. Significant activities in 1991 include initiation of contract activities in implementing the 1991 new start. All contracts to support the EOS-A mission will be awarded during FY 1991 and FY 1992.

- 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, polar regions, and solid Earth. 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 space elements (platforms - two U.S. series, two ESA series, and one Japanese) 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 worldwide community.

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 platform. As part of the Earth Probes program, GSFC will manage the development of the Total

Ozone Mapping Spectrometer, scheduled for launch in 1993. Follow-on Earth Probes include the Tropical Rainfall Measuring Mission (TRMM), which will enter the development phase in 1992.

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. 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 information.

Permanent Civil
Service Workyears

AERONAUTICS, EXPLORATION AND TECHNOLOGY.....

137

AERONAUTICAL RESEARCH AND TECHNOLOGY.....

13

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.

Permanent Civil
Service Workvears

SPACE RESEARCH AND TECHNOLOGY.....

124

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 experiments and 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 Space Transportation System (STS) and ELV carrier systems.

Goddard will continue to place emphasis in robotics, cryogenics, thermal management, contamination control, high rate communication systems--including laser communication, information systems technology, and the Office of Aeronautics, Explorations and Technology (OAE) space-flight experiments program. The technology demonstration elements of the Flight Telerobotic Servicer program (previously conducted as part of the Space Station Freedom program) will be continued as part of the newly created Space Automation and Telerobotics program under Space Research and Technology.

SAFETY, RELIABILITY AND QUALITY ASSURANCE.....

8

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 are aimed at correlating on-orbit and laboratory

induced radiation effects damage in electronic parts in order to develop ground test methods that accurately simulate the radiation damage induced on-orbit.

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 1991 and 1992 are the cerebrospinal fluid control 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 sector 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.

TRACKING AND DATA PROGRAMS.....

610

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 radio frequency (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 Flight Tracking and Data Network (STDN); the NASA Communications (NASCOM) Network, and the Aeronautics, Balloons and Sounding Rocket (AB&SR) Program.

The Space Network (TDRSS), through the White Sands Ground Terminal (WSGT), is operational with three TDRS spacecraft which provide routine telemetry, tracking, and command support. The System employs both S-band and 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.

Assembly and test activities continue on TDRS-5 in preparation for launch in late 1991. Assembly and test also continues on TDRS-6 and TDRS-7. Additionally, funding is included for definition studies for the next generation of TDRS spacecraft.

Work will continue on the Second TDRS Ground Terminal (STGT), with initial operations scheduled during 1993. The STGT will, when fully operational, 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 stations have been closed. The remaining stations provide launch, landing, range safety, and STS contingency support.

The NASA Communications Network (NASCOM) 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 center, thereby, making it possible for all participants to operate as a network.

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

In data processing, emphasis will continue to be placed on the operation of data processing facilities. Science data processing development will be completed to support the world wide scientific community and flight operation of the UARS. Development of a similar system to process and deliver science data from the International Solar Terrestrial Program (ISTP) will continue.

In the area of mission control, the operations control centers for GRO, UARS, and EWE will be completed to support launch and early spacecraft operations in 1991. Development of operations control centers for the ISTEP Wind and Polar missions and for the SAMPEX will continue. In 1992 development of operations control centers for Total Ozone Mapping Spectrometer (TOMS), Fast Auroral Snapshot Explorer (FAST), and TRMM will start and the operations control center for SAMPEX will be completed to support launch and early operations planned for the 3rd quarter of 1992.

Flight dynamics development and testing will continue in support of the UARS, EWE, SAMPEX, and ISTEP (Wind/Polar and SOHO). Mission readiness has been achieved for GRO and launch and operations support will be provided. Mission readiness will be achieved for UARS and EWE with support provided for launch and early operations. Flight Dynamics Facility mainframe central processing units are scheduled to be replaced in 1992.

The procurement Request for Proposal (RFP) for the Customer Data and Operations System (CDOS) will be released in 1991. Contract award will occur in 1992. When implemented, CDOS will provide the data capture and processing, data delivery and archiving ground system for space science payloads on-board the EOS, Space Station Freedom, and all future spacecraft.

Permanent Civil
Service Workyears

CENTER MANAGEMENT AND OPERATIONS SUPPORT.....

717

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, and Directors of 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

	1990 Actual	1991		1992
		Budget Estimate	Current Estimate	Budget Estimate
I. PERSONNEL AND RELATED COSTS	201,192	220,542	221,745	240,638
II. TRAVEL	6,144	7,100	6,837	7,100
III. OPERATION OF INSTALLATION	57,341	76,958	74,449	90,473
A. Facilities Services	23,500	32,174	29,344	32,253
B. Technical Services	12,588	20,217	19,341	20,847
C. Management and Operations	21,253	24,567	25,764	28,473
D. Implementation of Project CORE	0	0	0	8,900
Total, Fund Requirement	264.677	304.600	303.031	338.211

1990 <i>Actual</i>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

RESOURCES REQUIREMENTS BY FUNCTION

I. PERSONNEL AND RELATED COSTS	201,192	220,542	221,745	240,638
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Summary of Fund Requirements

A. Compensation and Benefits				
1. Compensation				
a. Full-time permanent	164,951	179,832	180,070	194,691
b. Other than full-time permanent	2,439	2,590	3,036	3,202
c. Reimbursable detailees	0	0	0	0
d. Overtime and other compensation	2,614	3,333	2,932	3,111
Subtotal, Compensation	170,004	185,755	186,038	201,004
2. Benefits	27,625	30,819	31,739	35,667
Subtotal, Compensation and Benefits	197,629	216,574	217,777	236,671

	1990 <u>Actual</u>	1991		1992
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
(Thousands of Dollars)				
B. Supporting Costs				
1. Transfer of personnel	934	800	800	641
2. OPM Services	0	0	0	0
3. Personnel training	2,629	3,168	3,168	3,326
Subtotal, Supporting Costs	3,563	3,968	3,968	3,967
Total, Personnel and Related Costs	201,192	220,542	221,745	240,638

Explanation of Fund Requirements

A. Compensation and Benefits

1. Compensation

a. Full-time permanent	164,951	179,832	180,070	194,691
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The increase in the 1991 Current Estimate from the 1991 Budget Estimate reflects the increase in the additional 1991 January pay raise from 3.6 percent to 4.1 and the additional 4.1 percent pay raise for Senior Executive Service personnel, offset by a re-estimate decreasing funding requirements because lower salaried personnel were hired in 1990 than planned. The 1992 Estimate includes funding for a full year of the 1991 pay raise, the anticipated 1992 pay raise, one additional day and full year funding for promotions, additional FTE's and within grade increases and other personnel actions.

A OF COST FOR PERMANENT WORKYEARS

In 1992. the cost of full-time workyears will be \$194.691.000 . The increase from 1991 is calculated as follows :

Cost of full-time permanent workyears in 1991.....		\$180.070
Cost of increases in 1992.....		14.874
Within-grade and career advances:		
Full year cost of 1991 actions.....	2.304	
Part year cost of 1992 actions.....	3.195	
Full year effect of 1991 pay raise.....	2.257	
Full year effect of 1992 pay raise.....	5.739	
Extra Day.....	826	
Additional FTE.....	553	
Cost changes in 1992.....		- 253
Turnover Effects:		
Full year 1991 effect.....		1.635
Partial year 1992 effect.....	.1.888	
Cost of full-time permanent workyears in 1992.....		\$194.691

1990 <i>Actual</i>	<u>1991</u>		1992
	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>

(Thousands of Dollars)

b.	Other than full-time permanent				
	(1) cost	2,439	2,590	3,036	3,202
	(2) Workyears	92	90	32	42

The distribution of 1992 workyears is as follows:

Distribution of Other than Full-Time Workyears

<u>Proeram</u>	<u>Workyears</u>
Developmental programs.....	10
Other temporary.....	26
Summer programs.....	4
Total.....	42

The increase from the 1992 Budget Estimate to the 1991 Current Estimate reflects the additional 1/2 percent pay raise for 1991, higher salaried temporary positions than planned and an increase in the part time permanent program. The 1992 increase reflects a continuation of the 1991 program with full year funding of the 1991 pay raise and the cost of the anticipated pay raise in January 1992. The reduction in workyears in the 1991 Current Estimate and the 1992 Budget Estimate is the result of the Office of Management and Budget excluding Co-ops from the Agency FTE ceiling.

1990 <u>Actual</u>	<u>1991</u>		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

c. Reimbursable detailees	0	0	0	0
d. Overtime and other compensation	2,614	3,333	2,932	3,111

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 decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to eight launches in 1991 versus the ten planned in the 1991 Budget Estimate. The increase in the 1992 Budget reflects the full year effect of the 1991 pay raise and the anticipated 1992 pay raise and an increase in the nonsupervisory award program.

2. Benefits	27,625	30,819	31,739	35,667
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The following are the amounts of contribution by category:

Retirement and Thrift Plan Costs Fund.....	15,018	16,305	17,149	18,743
Employee Life Insurance.....	300	318	330	372
Employee Health Insurance.....	6,853	7,429	8,045	9,321
Workers' Compensation.....	431	482	279	302
FICA.....	3,453	4,784	4,308	5,151
Medicare.....	1,564	1,501	1,628	1,778
Other.....	<u>6</u>	<u>-0-</u>	<u>-0-</u>	<u>-0-</u>
Total.....	27,625	30,819	31,739	35,667

The increase in benefits from the 1991 Budget Estimate to the 1991 Current Estimate is due to revised estimates for retirement costs resulting from increasing enrollment in the Federal Employee Retirement System and Thrift, raising the cap on Medicare, increased health benefits, and an increase resulting from the revised

1990 <u>Actual</u>	<u>1991</u>		1992
	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>

(Thousands of Dollars)

1991 pay raise. The additional 125 FTE in 1992 and the increased pay raise results in increases to all areas of personnel benefits.

B. Supporting Costs

1. Transfer of Personnel	934	800	800	641
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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 Budget decrease results from a plan to hire less personnel eligible for relocation benefits.

2. OPM Services	0	0	0	0
3. Personnel Training	2,629	3,168	3,168	3,326

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 force; development of needed skills and knowledge required in center mission activities; extending our minorities and Equal Opportunity seminars.

The 1992 Budget Estimate reflects an increase to provide essential training to planned new freshout college graduate hires in 1991 and 1992.

	1990 <u>Actual</u>	1991		1992
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
II. TRAVEL	6,144	7,100	6,837	7,100

Summary of Fund Requirements

A. Program Travel	5,013	5,830	5,563	5,775
B. Scientific and Technical Development Travel	592	630	678	705
C. Management and Operations Travel	539	640	596	620
Total, Travel	<u>6,144</u>	<u>7,100</u>	<u>6,837</u>	<u>7,100</u>

Explanation of Fund Requirements

A. Program Travel	5,013	5,830	5,563	5,775
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Program travel is essential to the accomplishment of the Center's mission, particularly with regard to the Space Science and Applications, Space Station, Tracking and Data Programs, Space Transportation System, and Aeronautics and Space Technology. In these 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 decrease from the 1991 Budget Estimate to the 1991 Current Estimate is a result of the reevaluation of available funds to meet Center priorities.

<u>1990</u> <u>Actual</u>	<u>1991</u>		<u>1992</u>
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

The increase the in **1992** Budget Estimate is due to requirements for the major on-going flight programs and travel for the additional civil service personnel.

B. Scientific and Technical Development Travel	592	630	678	705
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Scientific and technical development travel permits employees to participate in meetings and technical 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 **1991** Current Estimate and **1992** Budget Estimate reflects desirable levels for scientific meeting trips.

C. Management and Operations Travel	539	640	596	620
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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 **1991** Current Estimate to the **1991** Budget Estimate is a result of the reevaluation of Center funds to meet priorities. The increase in the **1992** Budget Estimate is due to requirements placed on top management and selected support areas associated with program and institutional planning.

	<u>1990</u> <u>Actual</u>	<u>1991</u>		<u>1992</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
(Thousands of Dollars)				
III. OPERATION OF INSTALLATION	<u>57,341</u>	<u>76,958</u>	<u>74,449</u>	<u>90,473</u>
Summary of Fund Requirements				
A. Facilities Services				
1. Rental of Real Property	1,450	1,992	1,328	1,574
2. Maintenance and Related Services	5,707	9,503	8,713	10,703
3. Custodial Services	6,274	8,221	7,231	7,593
4. Utility Services	10,069	12,458	12,072	12,383
Total, Facilities Services	<u>23,500</u>	<u>32,174</u>	<u>29,344</u>	<u>32,253</u>
B. Technical Services				
1. Automatic Data Processing	9,798	15,802	13,972	15,210
2. Scientific and Technical Information	1,861	2,953	2,853	2,995
3. Shop and Support Services	929	1,462	2,516	2,642
Total, Technical Services	<u>12,588</u>	<u>20,217</u>	<u>19,341</u>	<u>20,847</u>

	1990 <u>Actual</u>	<u>1991</u>		1992
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
C. Management and Operations				
1. Administrative Communications	7,628	3,973	5,145	5,203
2. Printing and Reproduction	895	1,296	1,236	1,282
3. Transportation	1,444	1,331	1,636	2,354
4. Installation Common Services	11,286	17,967	17,747	19,634
Total, Management and Operations	21,253	24,567	25,764	28,473
D. Project CORE	0	0	0	8,900
Total, Operation of Installation	57,341	76,958	74,449	90,473

Explanation of Fund Requirements

Operation of Installation provides 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 includes funding for the implementation of Project CORE, which will convert certain functions from contractors to civil servants.

1990 <u>Actual</u>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
(Thousands of Dollars)			

The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to across-the-board deferrals due to budget reductions. The 1992 Budget Estimate provides funding to (1) prevent further deterioration of the aging GSFC and Wallops complexes; (2) allow for improved ADP operations; and, (3) cover purchases deferred from 1990 and 1991 due to strict budget limitations.

A. Facilities Services

1. Rental of Real Property	1,450	1,992	1,328	1,574
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Provides space for personnel at tracking stations and the Goddard Institute for Space Studies (GISS) in New York. Funding also provides 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. The decrease between the 1991 Current Estimate and the 1991 Budget Estimate is due to the move of some personnel into Center space. The increase over inflation between 1991 and 1992 reflects the need for additional on-site trailers to house personnel and for lease of off-site classrooms.

2. Maintenance and Related Services	5,707	9,503	8,713	10,703
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This activity includes: general building maintenance such as painting, inspection, mechanical and electrical maintenance, rehabilitation and modification projects in office buildings with estimated project cost of less than \$200,000, and road and grounds maintenance. Funding also provides supplies, materials, and equipment associated with maintenance and related services. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate represents deferral of some building modification projects to cover increased funding in benefit costs. The increase from the 1991 Current Estimate to the 1992 Budget Estimate reflects a resumption of the building modification schedule, as well as increased emphasis in facility maintenance.

1990 <u>Actual</u>	1991		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

3. Custodial Services	6,274	8,221	7,231	7,593
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Provides for janitorial, plant security, fire fighting, and ambulance services. These services include 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. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to the deferral of purchasing security and safety supplies and equipment due to budget reductions. The 1992 Budget Estimate increase reflects inflation.

4. Utility Services	10,069	12,458	12,072	12,383
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This activity includes: maintenance of the utility plant and distribution systems and provides 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. The slight decrease in the 1991 Current Estimate is a result of anticipated rate increases that did not materialize. The increase in the 1992 Budget Estimate is due to a small projected increase in utility rates and usage.

B. Technical Services

1. Automatic Data Processing	9,798	15,802	13,972	15,210
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This funding provides 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

1990 <u>Actual</u>	<u>1991</u>		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

supported including: finance and accounting, payroll, budget, procurement, personnel management, and supply management.

The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to budget constraints and internal reallocations and is accomplished by deferral of initiatives to enhance the Management Information System and deferral of the provision of contractor support for ADP system users. The increase to the 1992 Budget Estimate is the result of further enhancements required for the administrative computer to keep pace with new systems development and on-line capabilities needed to be more responsive to current users and allow addition of more users, as well as accommodate new NASA-wide systems implementation. ADP programming support will be used for the development of such systems as on-line small purchases, on-line time and attendance recording, and on-line travel systems. In addition, most software and hardware purchases were deferred into 1992 due to the budget reductions in prior years. The 1992 Budget Estimate growth includes Security System Engineering and analysis to provide automated system security risk analysis to maintain certification as mandated by the Computer Security Act of 1987 (Public Law 100-235). This service was formerly provided by the Air Force.

2. Scientific and Technical Information	1,861	2,953	2,853	2,995
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Reflects the anticipated cost of maintaining the GSFC library, including operations support, information systems, as well as book and subscription purchases. These funds also provide for a public affairs educational and information program and also support the Center by providing various scientific and technical information services. Costs include exhibit management and refurbishment, demonstration models, workshops and symposia, and education and information materials. The Center is making a concerted effort to vitalize its outreach to the community and to provide a comprehensive and participative view of the space program. Replacement and continued maintenance and upgrade of the existing exhibits in the Visitors Center, as well as an increase in distribution of literature and films, is provided for in 1991 and 1992. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects the deferral of purchasing books, subscriptions, and library systems due to budget constraints.

1990 <u>Actual</u>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

3. Shop and Support Services	929	1,462	2,516	2,642
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Support is given in the areas of safety, fire protection, fire protection system maintenance, and related supplies and equipment. Also included is funding for nontechnical photographic and chart and art support for all Center organizations. The increase from the 1991 Budget Estimate to the 1991 Current Estimate provides funding to perform unanticipated environmental studies necessary to ensure compliance with Environmental Protection Agency regulations. Also included are funds needed to correct deficiencies already identified such as replacing underground storage tanks; performing site investigations; and sampling waste disposal and performing related data collection for analysis. Support at this level is anticipated in 1992.

C. Management and Operations

1. Administrative Communications	7,628	3,973	5,145	5,203
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These funds support local telephone service, long distance service, and other administrative communications. The one-time purchase of the **ROLM** Interconnect Phone System was completed in 1990 and accounts for the substantial decrease in the 1991 Budget Estimate. The increase from the 1991 Budget Estimate to the 1991 Current Estimate will support installation of an electronic mail gateway and other enhancements needed to support added users. The increase continues into 1992 to support the initial costs for the administrative communications for the Earth Observing Systems (EOS) complex.

2. Printing and Reproduction	895	1,296	1,236	1,282
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These funds cover 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. The level of 1990 expenditures represents a deviation from normal experience due

1990 <u>Actual</u>	1991		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)			

to less printing requirements than usual occurring in a comparable period. Growth in 1991 costs shown in the Current Estimate reflects increased printing requirements due to expanding programmatic activity, but at a lower level than initially projected in the Budget Estimate. The increase in 1992 represents inflationary increases in printing costs.

3.	Transportation	1,444	1,331	1,636	2,354
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This funding supports: 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. The 1991 Current Estimate and the 1992 Budget Estimate provide much needed funding to begin upgrading the Center's transportation fleet to meet Government standards. Current vehicles far exceed the age and mileage replacement criteria typically used to provide safe and reliable transportation.

4.	Installation Common Services	11,286	17,967	17,747	19,634
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This activity supports Center management and staff activities, provides medical services, and covers various installation support services, including operation of the transportation system. Funding supports: 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 Goddard 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 are also included. This category also provides funding for institutional supply management activities including storage and warehousing.

The slight decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to the deferral of supplies and equipment purchases due to budget constraints. The increase in 1992 is for the purchase of

1990	1991		1992
	Budget	Current	Budget
<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	Estimate

(Thousands of Dollars)

equipment, equipment maintenance, and supplies that have been continually deferred from prior years due to budget reductions. Lack of funding in prior years has impacted the maintenance and replacement of office equipment. The increase in 1992 insures that all equipment maintenance is covered and provides funds to replace obsolete equipment.

D. Implementation of Project CORE	0	0	0	8,900
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During 1992, the Goddard Space Flight Center plans to convert 240 positions (estimated to consume 125 FTE in 1992) from contractors to civil servants. These funds will be transferred into Personnel and Related costs to cover the actual civil service salaries when the contractors, or their replacements, come on board as civil servants. They will also be transferred to Travel and Operation of Installation to cover the travel expense of these positions and to provide the necessary accommodations -- desks, supplies, personal computers, etc. -- needed to bring them into the Center workforce. In the event that circumstances beyond our control prevent us from having the full civil service complement in place at the date of the planned termination of the contracted functions, some of these funds will be used to provide for a continuation of the contractor support until the civil service transition can be completed.

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

DIRECTOR ASSOCIATE DIRECTORS			
	20	21	22
SES	2	3	3
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	0	1	1
GS/GM 14	0	0	0
OTHER GS/GM	3	3	4
WAGE GRADE	0	0	0
TOTAL	5	7	8

TOTAL			
	20	21	22
SES	45	56	56
EXCEPTED/ST	2	3	4
GS/GM 16	0	0	0
GS/GM 15	441	457	460
GS/GM 14	678	693	701
OTHER GS/GM	2630	2702	2737
WAGE GRADE	75	64	62
TOTAL	3872	3975	4020

NASA OFFICE OF
 INSPECTOR GENERAL
 GSFC FIELD OFFICE

CHIEF COUNSEL			
	20	21	22
SES	1	1	1
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	1	1	1
GS/GM 14	3	4	4
OTHER GS/GM	2	4	4
WAGE GRADE	0	0	0
TOTAL	7	10	10

EQUAL OPPORTUNITY PROGRAMS OFFICE			
	20	21	22
SES	0	0	0
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	4	4	4
WAGE GRADE	0	0	0
TOTAL	5	5	5

OFFICE OF PUBLIC AFFAIRS			
	20	21	22
SES	0	0	0
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	1	1	1
GS/GM 14	2	2	2
OTHER GS/GM	16	21	22
WAGE GRADE	0	0	0
TOTAL	19	24	25

OFFICE OF UNIVERSITY PROGRAMS			
	20	21	22
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	0	1	1
WAGE GRADE	0	0	0
TOTAL	2	3	3

DIRECTOR OF FLIGHT PROJECTS			
	20	21	22
SES	9	12	12
EXCEPTED/ST	1	0	0
GS/GM 16	0	0	0
GS/GM 15	130	132	134
GS/GM 14	134	138	140
OTHER GS/GM	157	208	224
WAGE GRADE	0	0	0
TOTAL	431	490	510

COMPTROLLER			
	20	21	22
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	1	1
OTHER GS/GM	16	17	17
TOTAL	21	22	22

DIRECTOR OF FLIGHT ASSURANCE			
	20	21	22
SES	2	2	2
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	21	22	22
GS/GM 14	37	37	38
OTHER GS/GM	92	89	90
WAGE GRADE	0	0	0
TOTAL	152	150	152

OFFICE OF HUMAN RESOURCES			
	20	21	22
SES	1	1	1
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	0	0	0
GS/GM 14	4	4	4
OTHER GS/GM	69	11	72
WAGE CMDL	0	0	0
TOTAL	14	16	17

DIRECTOR OF MANAGEMENT OPERATIONS			
	20	21	22
SES	3	3	3
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	19	20	20
GS/GM 14	47	49	50
OTHER GS/GM	538	544	550
WAGE GRADE	75	64	62
TOTAL	682	680	685

DIRECTOR OF MISSION OPERATIONS AND DATA SYSTEMS			
	20	21	22
SES	4	6	6
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	62	63	63
GS/GM 14	102	103	103
OTHER GS/GM	460	488	488
WAGE GRADE	0	0	0
TOTAL	628	660	660

DIRECTOR OF SPACE SCIENCES			
	20	21	22
SES	4	5	5
EXCEPTED/ST	0	2	1
GS/GM 16	0	0	0
GS/GM 15	57	59	59
GS/GM 14	73	74	75
OTHER GS/GM	161	152	153
WAGE GRADE	0	0	0
TOTAL	295	292	294

DIRECTOR OF ENGINEERING			
	20	21	22
SES	7	8	8
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	62	67	68
GS/GM 14	127	127	128
OTHER GS/GM	665	663	666
WAGE GRADE	0	0	0
TOTAL	861	865	870

DIRECTOR OF SUBORBITAL PROJECTS AND OPERATIONS			
	20	21	22
SES	4	4	4
EXCEPTED/ST	0	0	0
GS/GM 16	0	0	0
GS/GM 15	13	12	12
GS/GM 14	38	40	40
OTHER GS/GM	197	196	198
WAGE GRADE	0	0	0
TOTAL	252	252	254

DIRECTOR OF LABOR/RESOURCES			
	20	21	22
SES	7	9	9
EXCEPTED/ST	1	1	2
GS/GM 16	0	0	0
GS/GM 15	73	77	77
GS/GM 14	108	112	114
OTHER GS/GM	250	241	244
WAGE GRADE	0	0	0
TOTAL	439	440	446

APPROVED: _____ DATE: _____

AMES
RESEARCH CENTER

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RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1992 ESTIMATES

AMES RESEARCH CENTER

DESCRIPTION

Established in 1940, 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 Aviation Research and Technology Activity. The capital investment at Ames Moffett, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1990, was \$911,554,000.

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, 1990, was \$157,644,000.

CENTER ROLES AND MISSIONS

The programs at Ames involve research and development in the fields of aeronautics, life sciences, space and Earth sciences and applications, and space technology, as well as support for national needs of the new science and technology growing from the aerospace program. 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, 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, biomedical research, advanced life support, 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 Aerodynamics - 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 in the short and vertical takeoff and landing capable aircraft.

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 in rotorcraft and powered-lift aircraft 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 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 Landine (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.

Flieht 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.

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

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 for aerospace planes and orbital transfer vehicles.

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.

Space Automation - advance the state of the art by focusing research in human factors, artificial intelligence, and guidance and controls to support productive, efficient, and safe missions including the Space Station and beyond.

Planetary 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.

Infrared Technology and System Analysis - analyze, develop, and test infrared technologies for space sensor applications, including cryogenics, detectors, optics, mechanisms, and system design.

Life Sciences Spaceflight - develop, manage and operate spaceflight experiments and facilities in the life sciences to advance our knowledge of the effects of gravity, and its absence, on biological systems.

Biomedical Research - maintain health and performance by preventing biomedical and psycho-physiological problems experienced by humans during and following long duration spaceflight, including assessment of the requirement for artificial gravity.

Advanced Life Support - develop the physical/chemical and biogenerative life support technologies and 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 SETI-Microwave Observing Project.

SUPPORTING

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

DISTRIBUTION OF FULL TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

AMES RESEARCH CENTER	1990 ACTUAL	1991		1992 BUDGET ESTIMATE
		BUDGET ESTIMATE	CURRENT ESTIMATE	
SPACE STATION	7	7	18	18
SPACE FLIGHT PROGRAMS.....	14	30	42	36
SPACE TRANSPORTATION CAPABILITY DEV... SPACE SHUTTLE.....	0 14	4 26	0 42	0 36
SPACE SCIENCE AND APPLICATIONS.....	365	360	373	373
PHYSICS AND ASTRONOMY.....	88	129	98	98
LIFE SCIENCES.....	145	145	147	147
PLANETARY EXPLORATION.....	37	37	37	37
SPACE APPLICATIONS.....	95	49	91	91
AERONAUTICS EXPLORATION AND TECHNOLOGY..	1,198	1,225	1,185	1,191
AERONAUTICAL RESEARCH AND TECHNOLOGY.. SPACE RESEARCH AND TECHNOLOGY..... TRANSATMOSPHERIC RESEARCH AND TECH....	981 183 34	992 201 32	981 183 21	987 189 15
COMMERCIAL PROGRAMS.....	7	5	4	4
SAFETY, RELIABILITY & QUALITY ASSURANCE.	18	28	18	18
ACADEMIC PROGRAMS.....	0	0	0	0
TRACKING AND DATA PROGRAMS.....	24	25	26	26
SUBTOTAL - DIRECT FULL-TIME PERM FTE'S	1,633	1,680	1,666	1,666
CENTER MANAGEMENT AND OPERATIONS.....	52e	501	561	561
SUBTOTAL - FULL-TIME PERM FTE'S.....	2,159	2,181	2,227	2,227
OTHER FTE'S.....	62	75	38	38
SUBTOTAL - FULL-TIME EQUIVALENTS.....	2,221	2,256	2,265	2,265
PROJECT CORE.....				137
GRAND TOTAL - FULL-TIME EQUIVALENTS..	2,221	2,256	2,265	2,402

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 the development of airborne and spaceborne infrared telescopes. Detailed design activity will continue in FY 1992 for the Stratospheric Observatory for Infrared Astronomy (SOFIA). SOFIA is a future new start candidate comprised of a 2.5 meter telescope which would fly at 41,000 feet escaping 99 percent of water vapor, therefore eliminating seeing effects and enabling imaging and spectroscopy. The plane would be purchased and modified by Ames and the telescope would be developed by the German space agency (DARA). Ames has mission management responsibility.

Permanent Civil
Service Workyears

LIFE SCIENCES

147

In 1992, civil service personnel will continue to be involved in research, hardware development, and program management related to understanding the effects of space flight on humans and other life forms, managing non-human biological experiments in space, and understanding the origin, evolution, and distribution of life-related chemicals on Earth and elsewhere in the universe.

Research in space medicine and biology will be conducted to investigate the effects of space flight on humans and other organisms. Potential counter measures for neurophysiological, psychophysiological behavioral, musculoskeletal, metabolic, and cardiovascular changes observed during and immediately following spaceflight

will continue to be studied. Ground-based space flight simulations and actual flight experiments with humans and animals will continue to be performed to provide a basis for understanding why and how biological systems are affected by space flight. Newer areas to be emphasized will be long-duration bedrest studies and ground-based research to identify psycho-physiological 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.

Spacelab Life Sciences-1 (SLS-1) is scheduled for launch in May 1991. The Ames Life Support Program integrates work in physical/chemical and bioregenerative 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/SL 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. Work will continue on final integration of experiment payloads for the International Microgravity Laboratory-1 (IML-1), and Spacelab-J (SL-J). Planning continues for support of the secondary payloads as well as the COSMOS '92 mission.

Ames is conducting definition studies for a biological research facility for the Space Station, which includes a large diameter research centrifuge, a zero-G habitat holding system, and a glovebox.

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 and technology programs will also emphasize preparing for experimentation on solar system missions of critical importance to exobiology, including Mars Observer, and CRAF/Cassini. Additional areas of emphasis will include research programs to utilize Earth orbiting facilities, Great Observatories and Space Station Freedom,

for investigations of the chemical evolution of the biogenic elements. Support is also provided for development of planetary protection requirements for future Mars missions, including experiment support for the FY 1992 new initiative in radiation biology, Lifesat.

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 radiotelescopes 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 bioregenerative 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/SL 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.

The biospherics research program will continue to enhance the understanding of the biological aspects of global conditions and biogeochemical processes on Earth. NASA derived technologies will be employed to study and model the environmental parameters which influence the distribution and prevalence of vector borne disease. Nitrous oxide and non-methane hydrocarbons will be studied over tropical and temperate ecosystems and related to major soil types and various disturbance processes, including fire. These in situ studies will then be expanded to large area estimation through remotely-sensed data. Finally, the consequences of various disturbance regimes on atmosphere water biosphere interactions will be investigated through in situ and remote observations.

PLANETARY EXPLORATION

Ames carries out both basic research and project management activities in support of solar system exploration. In 1992, 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 and are now the most distant man-made objects 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 CRAF/Cassini.

Ames maintains an active program of laboratory, computational, and theoretical studies to develop basic atmospheric 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.

SPACE APPLICATIONS.....

In 1992, 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. The calorimetric properties of water bodies as indicators of algal populations are studied in relation to manganese cycling in freshwater lakes. Methane gas flux measurements from arctic and tundra ecosystems are obtained and related to remotely-sensed ecosystem variables.

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.

AERONAUTICS AND SPACE TECHNOLOGY PROGRAMS.....

1.191

AERONAUTICAL RESEARCH AND TECHNO —————

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In 1992, 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, 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 nationwide. Additionally, the vision for the NASA Program is to provide the Nation's aerospace research and development community, by the year 2000, a high-performance operational computing system capable of simulating an entire aerospace vehicle system within a computing time ranging from one to several hours. It is estimated that a sustained computing rate of one trillion floating point operations per second (TFLOPS) is required to accomplish this. Teraflop performance will require new software systems necessary to efficiently execute complex problems.

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; applying optimal control theory in conjunction with artificial intelligence to provide new concepts for automation; and conducting flight research on digital fly-by-wire concepts to continue to support the development of advanced flight systems technology.

In 1992, 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, including powered-lift. The vehicle technology emphasis at Ames relates to, and depends on, the basic capabilities and the aeronautical research disciplines described previously. The 1992 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 and sonic boom. Powered-lift 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 new powered-lift concepts for hovering flight, 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. Studies have been completed to define the most promising STOVL vehicle concepts, and the key technologies needed are being pursued. 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.

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 all-weather rotorcraft capability 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, all 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. Beginning in 1991, investigations of technology for next-generation rotorcraft will pursue further understanding and evaluation of high speed rotorcraft concepts.

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 Research and Technology Directorate of the U.S. Army Aviation Systems Command is located at Ames. The Aeroflightdynamics Directorate, the primary investigator of Army rotorcraft flight dynamics and controls, and aeromechanics, is also located at Ames, 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 HIMARCS support and an AV-8B flight test program with DOD; (2) participation in the joint NASA/DARPA/USAF X-29A forward swept wing demonstration programs; (3) US/UK research program on ASTOVL Aircraft Technology; (4) 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; and (5) work on digital flight control system verification and validation with the FAA. Advanced structural, aerodynamic, propulsion, and control concepts will be investigated.

Permanent Civil
Service Workyears

SPACE RESEARCH AND TECHNOLOGY.....

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In 1992, civil service personnel will provide support to a space research and technology program which encompasses both basic research and project support. The basic research focuses on entry technology materials research, and intelligent systems technology. The project work supports Space Shuttle, the Orbiter Experiments program, the definition of advanced technology for Space Station Freedom. The ARC Space R&T program includes activities of the Civil Space Technology Initiative (CSTI) in the areas of spaceborne processors, science sensor technology and the aero-assisted flight experiment. ARC involvement in the Exploration Technology program will include development of technologies for humans-in-space, ARC also participates in the Space Automation and Telerobotics program in the areas of 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 FY 1991, the Space Shuttle program was supported with ground-based facilities to study a variety of aerodynamic and thermodynamic 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 basic and 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, bioregenerative and EVA (extravehicular activity) 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 bioregenerative program will continue to support the scientific experiments, technological investigations and potential flight experiments necessary for the development of bioregenerative life support systems. In the Extra-Vehicular 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).

During 1992, Ames will continue to increase its involvement as the evolution of the Space Exploration Initiative proceeds. Ames will continue development programs in the areas of life sciences, life support, and human factors.

Permanent Civil
Service Workvears

TRANSATMOSPHERIC RESEARCH AND TECHNOLOGY... ..

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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 the Ames Research Center. These capabilities are being applied to the maturation of specific technologies required for the National Aero-Space Plan Program.

COMMERCIAL PROGRAMS.....

4

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.

Permanent Civil
Service Workyears

SAFETY, RELIABILITY, AND QUALITY ASSURANCE.....

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The Safety Reliability and Quality Assurance (SR&QA) function provides support to all Center projects and operating organizations. The Safety function provides safety support to the entire Center. The Safety Office 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 health, radiation safety, and toxic waste management. In addition, systems safety analyses are provided to projects and operating organizations. The Safety Reliability and Quality Assurance Office provides assistance to projects in developing reliability models and analyses and quality assurance plans. Techniques used include failure mode and effects analyses, inspection planning and monitoring, quantitative risk modeling and test plan verification. This organization also coordinates 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.

TRACKING AND DATA PROGRAMS.....

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In 1992, Dryden will maintain and operate the NASA Western Aeronautical Test Range, which provides direct operational support for a wide variety of aeronautical and aerospace programs including the Space Shuttle. In order to provide real-time control, monitoring, processing and command uplink capabilities, various functional elements such as radar, tracking and data processing, communications, airborne video acquisition, and telemetry data processing all function in an integrated manner in the range Mission Control Centers.

CENTER MANAGEMENT AND OPERATIONS SUPPORT.....

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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:

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

	1990	1991		1992
		Actual	Budget Estimate	Current Estimate
I. PERSONNEL AND RELATED COSTS	123,634	133,258	135,979	144,506
II. TRAVEL	4,191	5,325	5,283	5,278
III. OPERATION OF INSTALLATION	59,515	74,908	68,578	87,066
A. Facilities Services	26,552	38,179	32,155	38,747
B. Technical Services	15,409	18,218	16,648	16,101
C. Management and Operations	17,554	18,511	19,775	23,152
D. Implementation of Project CORE	0	0	0	9,066
Total, Fund Requirement	187,340	213,491	209,840	236,850

1990 <i>Actual</i>	1991		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

RESOURCES REQUIREMENTS BY FUNCTION

I.	PERSONNEL AND RELATED COSTS	123,634	133,258	135,979	144,506
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Summary of Fund Requirements

A.	Compensation and Benefits				
1.	Compensation				
a.	Full-time permanent	98,094	105,460	107,346	113,975
b.	Other than full-time permanent	1,833	2,452	2,322	2,413
c.	Reimbursable detailees	395	918	412	427
d.	Overtime and other compensation	2,115	2,447	2,246	2,336
	Subtotal, Compensation	102,437	111,277	112,326	119,151
2.	Benefits	17,671	18,549	20,124	21,859
	Subtotal, Compensation and Benefits	120,108	129,826	132,450	141,010

	1990 <i>Actual</i>	1991		1992
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
B. Supporting Costs				
1. Transfer of personnel	1,243	866	1,080	949
2. OPM Services	0	0	0	0
3. Personnel training	2,283	2,566	2,449	2,547
Subtotal, Supporting Costs	3,526	3,432	3,529	3,496
Total, Personnel and Related Costs	123,634	133,258	135,979	144,506

Explanation of Fund Requirements

A. Compensation and Benefits

1. Compensation

a. Full-time permanent	98,094	105,460	107,346	113,975
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The increase in the 1991 Current Estimate from the 1991 Budget Estimate reflects the increase in the additional January pay raise from 3.6 percent to 4.1 percent, the additional 4.1 percent pay raise for Senior Executive Service personnel, 40 additional FTE at the Ames/Dryden Flight Research Facility for Dryden restructuring and management systems. The current estimate was offset by a re-estimate decreasing funding requirements because lower salaried personnel were hired in 1990 than planned. The impact of the "Pay Reform Act of 1990" is not yet fully defined and is not included in the Current Estimate. The 1992 Estimate includes funding for a full year of the 1991 pay raise, the anticipated 1992 pay raise, one additional day and full year funding for promotions, within grade increases and other personnel actions.

Basis of Cost for Permanent Workyears

In 1992, the cost of permanent workyears will be \$113,975,000. The increase from 1991 is calculated as follows:

Cost of full-time permanent workyears in 1991.....		\$107,346
Cost Increases in 1992.....		7,794
Within grade and career development advances:		
Full year effect of 1992 actions.....	1,087	
Partial year effect of 1991 actions.....	1,658	
Full year cost of the 1991 pay raise.....	1,431	
Partial year cost of the 1992 pay raise.....	3,169	
Extra Day.....	449	
Cost Decreases in 1992.....		- 1,165
Turnover Savings:		
Full year effect of 1991 actions.....	- 789	
Partial year effect of 1992 actions.....	- 376	
Cost of full-time permanent workyears in 1992.....		\$113,975

1990 <i>Actual</i>	<u>1991</u>		1992
	Budget <i>Estimate</i>	Current <i>Estimate</i>	Budget <i>Estimate</i>

(Thousands of Dollars)

b. Other than full-time permanent

(1) cost	1,833	2,452	2,322	2,413
(2) Workyears	62	75	39	39

The distribution of 1992 workyears is as follows:

Distribution of Other Than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Summer employment program.....	1
Other temporary.....	<u>38</u>
Total	<u>39</u>

The decrease from the 1991 Budget Estimate to the 1991 Current Estimate results from less workyears and lower salaried positions than planned, partially offset by the additional 1/2 percent pay raise for 1991. The 1992 increase includes full year funding of the 1991 pay raise and the cost of the anticipated pay raise in January 1992. The reduction in workyears in the 1991 Current Estimate and the 1992 Budget Estimate is the result of OMB excluding Co-Ops from the agency FTE ceiling.

c. Reimbursable detailees	395	918	412	427
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Military personnel detailed to Ames on a reimbursable basis are experienced in aeronautics, rotorcraft technology, veterinary medicine, and related fields. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects the number of medical and pilot detailees available from the military at this time

1990 <u>Actual</u>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

versus the previous 1991 budget plan, offset by the additional 1/2 percent 1991 pay raise. The Budget plan included funding for 9 detailees and the Current plan funds 6 detailees. The 1992 Estimate maintains the same level of effort as 1991, but includes the full year funding of the 1991 pay raise and the anticipated January 1992 pay raise.

d. Overtime and other compensation	2,115	2,447	2,246	2,336
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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 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 decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to two less Shuttle landings than had been planned in the previous years estimates. The increase in the 1992 Budget reflects the full year effect of the 1991 pay raise, the anticipated 1992 pay raise, overtime as a result of an additional launch in 1992, and an expected increase in wind tunnel activity.

2. Benefits	17,671	18,549	20,124	21,859
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The following are the amounts of contributions by category:

Retirement Fund and Thrift Plan.....	9,678	10,262	10,855	11,663
Employee Life Insurance.....	180	201	187	195
Employee Health Insurance.....	3,914	3,866	4,370	4,924
Workers' Compensation.....	593	675	675	639
FICA.....	2,412	2,454	3,002	3,415
Medicare.....	<u>894</u>	<u>1,091</u>	<u>1,035</u>	<u>1,023</u>
Total.....	<u>17,671</u>	<u>18,549</u>	<u>20,124</u>	<u>21,859</u>

1990 <i>Actual</i>	1991		1992
	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>

(Thousands of Dollars)

The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects a revised estimate of benefits to include the additional 40 FTE which resulted in increases in retirement programs and thrift, FICA, and health insurance. The 1992 increase reflects the full year effect of the 1991 pay raise, the anticipated 1992 pay raise and expected increases above the pay raise in health insurance, retirement programs, and FICA.

B. Supporting Costs

1. Transfer of Personnel	1,243	866	1,080	949
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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 1991 Budget Estimate to the 1991 Current Estimate is due to 40 additional FTE, many of whom will be eligible for these benefits. The decrease in the 1992 Budget results from a projected decrease in the number of hires eligible for relocation benefits.

2. OPM Services	0	0	0	0
3. Personnel Training	2,283	2,566	2,449	2,547

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 decrease from the 1991 Budget Estimate to the 1991 Current Estimate results in reducing these training programs in order to adequately fund the current level of FTE's. The 1992 Budget Estimate reflects a level of

1990 <u>Actual</u>	<u>1991</u>		1992
	Budget Estimate	Current Estimate	Budget Estimate

(Thousands of Dollars)

effort the same and a small increase for increased tuition and associated costs.

II.	TRAVEL	4,191	5,325	5,283	5,278
Summary of Fund Requirements					
A.	Program Travel	2,497	3,780	3,435	3,359
B.	Scientific and Technical Development Travel	660	594	730	758
C.	Management and Operations Travel	1,034	951	1,118	1,161
	Total, Travel	4,191	5,325	5,283	5,278

Explanation of Fund Requirements

A.	Program Travel	2,497	3,780	3,435	3,359
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Program travel is required for the accomplishment of the Center's mission. 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 1991 Budget Estimate to the 1991 Current Estimate is due to a reduction in the anticipated number of trips and reallocation of available funds to meet center priorities. The decrease from the 1991 Current Estimate to the 1992 Budget Estimate results from a reevaluation of available funds.

B.	Scientific and Technical Development Travel	660	594	730	758
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1990 <i>Actual</i>	1991		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

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 accomplishments and problems to associates. The travel costs in the 1991 Current Estimate reflect a continuation of the 1990 level plus increase in number of trips and price escalation. The 1992 Budget Estimate increase is primarily inflation.

C. Management and Operations Travel	1,034	951	1,118	1,161
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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 1991 Current Estimate are increases in the number of trips and inflation. The 1992 Budget Estimate maintains funding of the FY 1991 level.

III. OPERATION OF INSTALLATION

<u>1990</u> <u>Actual</u>	<u>1991</u>		<u>1992</u>
	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>

(Thousands of Dollars)

59,515	74,908	68,578	87,066
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Summary of Fund Requirements

A. Facilities Services

1. Rental of Real Property	164	955	50	52
2. Maintenance and Related Services	6,825	10,776	7,191	12,174
3. Custodial Services	5,183	6,947	6,476	6,846
4. Utility Services	14,380	19,501	18,438	19,675
Total, Facilities Services	26,552	38,179	32,155	38,747

B. Technical Services

1. Automatic Data Processing	8,844	10,465	8,648	7,722
2. Scientific and Technical Information	3,675	4,445	4,459	4,649
3. Shop and Support Services	2,890	3,308	3,541	3,730
Total, Technical Services	15,409	18,218	16,648	16,101

	1990 <i>Actual</i>	1991		1992
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
C. Management and Operations				
1. Administrative Communications	3,994	3,097	3,238	3,398
2. Printing and Reproduction	1,622	1,804	1,682	1,766
3. Transportation	1,231	1,267	1,671	1,744
4. Installation Common Services	10,707	12,343	13,184	16,244
Total, Management and Operations	17,554	18,511	19,775	23,152
D. Project CORE	0	0	0	9,066
Total, Operation of Installation	59,515	74,908	68,578	87,066

Explanation of Fund Requirements

Operation of Installation provides 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 FY 1992 Operation of Installation includes funding for the implementation of Project CORE, which will convert certain functions from contractors to civil servants.

1990 <u>Actual</u>	<u>1991</u>		1992 <u>Budget Estimate</u>
	<u>Budget Estimate</u>	<u>Current Estimate</u>	

(Thousands of Dollars)

The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects a realignment of funds between functions at the Langley and Lewis Research Centers coupled with deferrals of supplies and materials, equipment purchases, postponement of off-site rental space and trailers, library purchases and maintenance projects. The increase in the 1992 Budget Estimate is due to reinstatement of deferred maintenance and related services from the previous year, and rate increases in the support contractor and utility areas. Increases have also been provided for additional contractor support, hazardous waste management and environmental compliance, ADP equipment upgrades and supplies and materials.

A. Facilities Services

1. Rental of Real Property	164	955	50	52
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This function primarily provides for temporary rental of trailers for office space due to the overcrowding of personnel on site. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects indefinite postponement of proposed rental of off-site office space, pending resolution of a revised office space plan.

2. Maintenance and Related Services	6,825	10,776	7,191	12,174
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Maintenance and repair includes the maintenance of grounds and repairs of heating, ventilating, and lighting equipment in institutional buildings and offices. Maintenance of grounds includes 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. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects deferral of maintenance and related activities. The increase in the 1992 Budget Estimate is due to reinstatement of deferred maintenance and related services from the previous year and support contractor rate increases.

1990 <i>Actual</i>	<u>1991</u>		1992
	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>

(Thousands of Dollars)

3. Custodial Services	5,183	6,947	6,476	6,846
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Janitorial and building cleaning services are associated with approximately three million square feet of various types of space located in 231 buildings and structures, and in trailers which provide temporary office and shop space. Security services are for buildings and property, including research aircraft and computer facilities, and "round-the-clock" staffing of a duty office which monitors and coordinates fire protection, security, and safety functions at the Center. Other services include pest control, refuse collection, laundry and custodial supplies. These services are provided by support contractors. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflect a reduction in janitorial support and custodial supplies. The increase in the 1992 Budget Estimate provides for most services at the 1991 budget level.

4. Utility Services	14,380	19,501	18,438	19,675
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The major utility service is electricity; the balance is 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.

1990 <i>Actual</i>	1991		1992
	budget <u>Estimate</u>	Current Estimate	Budget Estimate

(Thousands of Dollars)

The decrease between the 1991 Budget Estimate and the 1991 Current Estimates reflects anticipated PG&E electricity usage credits. The 1992 Budget Estimate reflects anticipated WAPA, PG&E, and Air Force rate increases.

B. Technical Services

1. Automatic Data Processing	8,844	10,465	8,648	7,722
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This category includes the central administrative ADP facility equipment and operating costs. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due primarily to equipment deferrals. The decrease from the 1991 Current estimate to the 1992 Budget Estimate reflects implementation of Project CORE offset by small increases in equipment purchases.

2. Scientific and Technical Information	3,675	4,445	4,459	4,649
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This category provides for the purchase of books, supplies, and materials for the operation of the Ames libraries. Also included is a support contract to perform public information services, media development, and education programs. The 1992 Estimate provides for support contractor rate increases, additional library purchases and a continuation of the existing support level commensurate with the 1991 Current Estimate.

3. Shop and Support Services	2,890	3,308	3,541	3,730
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This category includes institutional safety support, photo, graphics, and audio-visual services which primarily support the Center's public affairs activity. The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects an increase in support to the researchers as well as an increase in institutional safety requirements. The 1992 estimate will permit the same level of effort as 1991 with anticipated contractor rate increases.

C. Management and Operations

1990 <u>Actual</u>	<u>1991</u>		1992
	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>

(Thousands of Dollars)

1. Administrative Communications	3,994	3,097	3,238	3,398
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Communications services are provided 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. The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects rate increases from Pacific Bell, and phone support for additional FTE's. The increase from the 1991 Current Estimate to the 1992 Budget Estimate provides a continuation of the 1991 current level of activity, anticipated rate increases from Pacific Bell, and expected contractor rate increases.

2. Printing and Reproduction	1,622	1,804	1,682	1,766
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The estimate for administrative printing includes 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. The decrease between 1991 Budget Estimate and 1991 Current Estimate reflects equipment reductions to a planned level of effort activity. The 1992 Estimate reflects anticipated contractor rate increases.

3. Transportation	1,231	1,267	1,671	1,744
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The estimates include motor pool operation costs for NASA-owned and GSA-owned vehicles, Government bills of lading, and air freight costs. The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects replacement of obsolete vehicles currently in use at Ames-Moffett. The 1992 Estimate provides for the same level of service in 1991 with expected rate increases.

1990 <u>Actual</u>	<u>1991</u>		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

4. Installation Common Services	10,707	12,343	13,184	16,244
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These services include 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. The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects increased rates and scope of operations in the hazardous waste management area. The increase in the 1992 Budget Estimate reflects anticipated contractor rate increases, and continued increases in the cost of environmental compliance which includes an environmental health services program, hazardous materials pick-up and disposal, compliance with Federal, State and Local environmental regulations, chemical and hazardous material, health regulations, directives, equipment, and permits.

D. Implementation of Project CORE	0	0	0	9,066
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During FY 1992, the Ames Research Center plans to convert 200 positions (estimated to consume 137 FTE in FY 1992) from contractors to civil servants. These funds will be transferred into Personnel and Related Costs to cover the actual civil service salaries when the contractors, or their replacements, come on board as civil servants. They will also be transferred to Travel and Operation of Installation to cover the travel expense of these positions and to provide the necessary accommodations -- desks, supplies, personal computers, etc. -- needed to bring them into the Center workforce. In the event that circumstances beyond our control prevent us from having the full civil service complement in place at the date of the planned termination of the contracted functions, some of these funds will be used to provide for a continuation of the contractor support until the civil service transition can be completed.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
 AMES RESEARCH CENTER
 ORGANIZATION AND STAFFING CHART

STAFFING SUMMARY

SES	21	22
GS/GM 16	46	48
GS/GM 15	1	1
GS/GM 14	220	229
OTHER GS/GM	378	386
WAGE	1272	1281
TOTAL	325	329
TOTAL	2238	2263

OFFICE OF THE DIRECTOR

SES	21	22
GS/GM 16	8	8
GS/GM 15	0	0
GS/GM 14	19	19
OTHER GS/GM	24	24
WAGE	124	125
TOTAL	0	0
TOTAL	173	176

DIRECTOR OF ADMINISTRATION			DIRECTOR OF ENGINEERING AND TECHNICAL SERVICES			DIRECTOR OF AEROSPACE SYSTEMS			DIRECTOR OF FLIGHT OPERATIONS AND RESEARCH			DIRECTOR OF AEROPHYSICS			DIRECTOR OF SPACE RESEARCH		
SES	21	22	SES	2	1	SES	2	2	SES	2	2	SES	2	2	SES	2	2
GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0
GS/GM 15	1	1	GS/GM 15	1	1	GS/GM 15	0	0	GS/GM 15	2	2	GS/GM 15	1	1	GS/GM 15	1	1
GS/GM 14	0	0	GS/GM 14	1	1	GS/GM 14	1	1	GS/GM 14	3	3	GS/GM 14	1	1	GS/GM 14	2	2
OTHER GS/GM	2	2	OTHER GS/GM	2	2	OTHER GS/GM	3	3	OTHER GS/GM	10	10	OTHER GS/GM	4	4	OTHER GS/GM	2	2
WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0
TOTAL	4	4	TOTAL	6	5	TOTAL	6	6	TOTAL	17	17	TOTAL	8	8	TOTAL	7	7

SECURITY OPERATIONS OFFICE

SES	21	22
GS/GM 16	0	0
GS/GM 15	1	1
GS/GM 14	0	0
OTHER GS/GM	11	11
WAGE	0	0
TOTAL	12	12

FACILITIES PLANNING OFFICE

SES	21	22
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

AIRCRAFT TECHNOLOGY

SES	21	22
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

CHIEF ENGINEER'S OFFICE

SES	21	22
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

NUMERICAL AEROODYN. SIMULATION SYSTEMS DIVISION

SES	21	22
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

SEARCH EXTRA-TERRESTRIAL INTELLIGENCE

SES	21	22
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

LOGISTICS MGMT. DIVISION

SES	21	22
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

INFORMATION AND COMMUNICATIONS SYSTEMS DIVISION

SES	21	22
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

FULL-SCALE AEROODYNAMICS RESEARCH DIVISION

SES	21	22
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

DRYDEN AIRCRAFT OPERATIONS DIVISION

SES	21	22
GS/GM 16	0	0
GS/GM 15	9	9
GS/GM 14	3	3
OTHER GS/GM	81	81
WAGE	96	96
TOTAL	190	190

AEROODYNAMICS DIVISION

SES	21	22
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

SUPPORTED RESEARCH

SES	21	22
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

HUMAN RESOURCES DIVISION

SES	21	22
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

SYSTEMS ENGINEERING DIVISION

SES	21	22
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

AEROSPACE HUMAN FACTORS RESEARCH DIVISION

SES	21	22
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

SCIENCE AND APPLICATIONS AIRCRAFT DIVISION

SES	21	22
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

COMPUTER SYSTEMS & RESEARCH DIVISION

SES	21	22
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

SPACE SCIENCE DIVISION

SES	21	22
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

ACQUISITION DIVISION

SES	21	22
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 SERVICES DIVISION

SES	21	22
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

FLIGHT SYSTEMS AND SIMULATION RESEARCH DIVISION

SES	21	22
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

DRYDEN AEROSPACE PROJECT OFFICE

SES	21	22
GS/GM 16	0	0
GS/GM 15	4	4
GS/GM 14	7	7
OTHER GS/GM	7	7
WAGE	0	0
TOTAL	19	19

FLUID DYNAMICS DIVISION

SES	21	22
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

SPACE EXPLORATION PROJECTS OFFICE

SES	21	22
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

TECHNICAL INFORMATION DIVISION

SES	21	22
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

MAINTENANCE MANAGEMENT DIVISION

SES	21	22
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

INFORMATION SCIENCES DIVISION

SES	21	22
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

AMES AIRCRAFT OPERATIONS DIVISION

SES	21	22
GS/GM 16	0	0
GS/GM 15	4	4
GS/GM 14	5	5
OTHER GS/GM	15	15
WAGE	48	48
TOTAL	70	70

THERMOSCIENCES DIVISION

SES	21	22
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

SPACE LIFE SCIENCES PAYLOADS OFFICE

SES	21	22
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

MANAGEMENT PROCRAUS

SES	21	22
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

12-FOOT WIND TUNNEL OFFICE

W C U 15	21	22
GS/GM 14	0	0
OTHER GS/GM	0	0
WAGE	0	0
TOTAL	10	10

RESEARCH ENGINEERING DIVISION

SES	21	22
GS/GM 16	1	2
GS/GM 15	17	17
GS/GM 14	31	31
OTHER GS/GM	115	115
WAGE	0	0
TOTAL	164	168

LIFE SCIENCE DIVISION

SES	21	22
GS/GM 16	1	1
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

SES	21	22
GS/GM 16	0	0
GS/GM 15	5	5
GS/GM 14	13	13
OTHER GS/GM	25	25
WAGE	0	0
TOTAL	45	45

RESEARCH CENTER /

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1992 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, 1990, was \$877,889,000.

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 Aerodynamics - 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 Technology - develop a technology base and systems analysis capability for advanced spacecraft, large space systems, space station system trade studies, and manned Mars and lunar base missions.

Sensors and Data Acauisition - 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.

Flieht Management - conduct research to develop technology for efficient, safe crew/vehicle interface and for improved aerospace vehicle operations.

Technology 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, atmospheric sciences, and advanced space transportation systems.

Atmospheric Sciences- develop improved techniques for atmospheric sensing, including development of Shuttle and Earth observation system 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 of Shuttle and Earth Observation System (EOS) payloads and instruments for free fliers related to atmospheric sensing.

Hypersonic Propulsion- contribute to the technology base of airbreathing propulsion systems by advancing the state-of-the-art of hypersonic propulsion.

Space Station Freedom - conduct the planning and analyses needed to establish direction and content of the evolutionary Space Station Freedom program, and define advanced technology requirements.

Automation and Robotics - develop technology for telerobotic and autonomous robotic systems and evaluate application of resulting systems to future space mission needs.

SUPPORTING:

Rotorcraft Technoloey - contribute to the development of the technology base to advance rotorcraft performance with emphasis on structures, aeroelasticity, acoustics, and avionics components.

Computational Fluid Dynamics - contribute to the software technology base; improve the capability to compute the flow about vehicles at entry velocities to permit accurate assessments of aerodynamic performance and heat shield requirements.

DISTRIBUTION OF FULL TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

LANGLEY RESEARCH CENTER	1990 ACTUAL	1991		1992 BUDGET ESTIMATE
		BUDGET ESTIMATE	CURRENT ESTIMATE	
SPACE STATION.....	51	29	22	22
SPACE FLIGHT PROORAMS.....	41	22	23	22
SPACE TRANSPORTATION CAPABILITY DEV....	41	22	25	22
SPACE SHUTTLE.....	0	0	0	0
SPACE SCIENCE AND APPLICATIONS.....	218	214	225	217
PHYSICS AND ASTRONOMY.....	0	0	0	0
LIFE SCIENCES.....	7	5	5	5
PLANETARY EXPLORATION.....	0	0	0	0
SPACE APPLICATIONS.....	211	209	220	212
AERONAUTICS EXPLORATION AND TECHNOLOOY..	1,852	1,947	1,931	1,941
AERONAUTICAL RESEARCH AND TECHNOLOOY..	1,205	1,311	1,279	1,294
SPACE RESEARCH AND TECHNOLOGY.....	543	552	537	540
TRANSATMOSPHERIC RESEARCH AND TECH....	104	84	115	107
COMMERCIAL PROGRAMS.....	7	9	10	10
SAFETY, RELIABILITY & QUALITY ASSURANCE.	11	9	10	11
ACADEMIC PROGRAMS.....	0	0	0	0
TRACKING AND DATA PROORAMS.....	0	0	0	0
SUBTOTAL - DIRECT FULL-TIME PERM FTE'S	2,180	2,230	2,223	2,223
CENTER MANAGEMENT AND OPERATIONS.....	702	702	702	702
SUBTOTAL - FULL-TIME PERM FTE'S.....	2,887	2,932	2,925	2,925
OTHER FTE'S.....	105	99	19	19
SUBTOTAL - FULL-TIME EQUIVALENTS.....	2,992	3,031	2,944	2,944
PROJECT CORE.....				73
GRAND TOTAL - FULL-TIME EQUIVALENTS..	2,992	3,031	2,944	3,017

PROGRAM DESCRIPTION

Permanent Civil
Service Workyears

SPACE STATION... .. 22

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 22

SPACE TRANSPORTATION CAPABILITY DEVELOPMENT 22

Langley has the lead Center focus for 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 contractual study is scheduled to continue in FY 1992. Langley in-house studies of concepts, technology levels, and mission requirements are coordinated with complementary studies at Johnson Space Center, Marshall Space Flight Center, and Kennedy Space Center.

Langley is responsible for assessing Space Station Assured Crew Return Capability vehicle concepts with a lift capability and moderate performance that will minimize entry loads and allow it to land horizontally. Conceptual design studies will be conducted and experimental aerodynamic and heating data will be obtained and analyzed.

A SCIENCE AND APPLICATIONS . 217

LIFE SCIENCES..... 5

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 protection handbook for future manned spaceflight. This activity has a significant importance to current and future human exploration initiatives.

Permanent Civil
Service Workyears

SPACE APPLICATIONS

212

The space applications program at Langley provides a national research capability for 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 first Mission to Planet Earth--the Earth Observing System (EOS). Four Langley experiments were solicited for EOS definition: Clouds and the Earth's Radiant Energy System (CERES), SAGE 111, TRACER, 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. 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 ozone hole in the 1987 international campaign and focused their capabilities on the Arctic mission in 1989. 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 II, and Stratospheric Aerosol and Gas Experiments, Measurements of Air Pollution from Satellites, and Earth Radiation Budget Experiments. Langley has delivered for spacecraft integration the Halogen Occultation Experiment to fly on the Upper Atmospheric Research Satellite to measure trace stratospheric constituent.

The Laser Atmospheric Sounder Experiment 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 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

<u>AERONAUTICS, EXPLORATION AND TECHNOLOGY</u>	<u>1.941</u>
<u>AERONAUTICAL RESEARCH AND TECHNOLOGY</u>	1,294

The aeronautical and research 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 both aircraft and spacecraft. 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. The impact of lightning on inducing errors in digital aircraft systems will continue to be assessed and data disseminated. 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

540

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 Vehicle (STV), Space Station Freedom, lunar bases, and Mars exploration. LaRC supports a number of programs in the Civil Space Technology Initiative (CSTI) and Exploration Technology. 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 in 1992. 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 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 space vehicle and spacecraft technology program develops experimental and theoretical data bases to support: Space Shuttle enhancements, reduction and interpretation of Shuttle flight data, development of the Aeroassist Flight Experiment, future space transportation vehicles for the 1990's and beyond that employ advanced technologies other than those used for the Space Shuttle, lunar and planetary exploration concepts, and large space systems. 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 convert solar and laser radiation efficiently into electricity or other useful forms of energy. The objective of the energy conversion effort is to perform basic research on solar-pumped lasers for conversion of solar energy directly into electromagnetic radiation, laser power, and development of potential power generation, transmission, storage, and control for future space missions.

Permanent Civil
Service Workyears

TRANSATMOSPHERIC RESEARCH AND TECHNOLOGY

107

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.

Permanent Civil
Service Workvears

COMMERCIAL PROGRAMS

10

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 solution 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.

SAFETY, RELIABILITY, MAINTAINABILITY AND QUALITY ASSURANCE..

11

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.

Permanent Civil
Service Workyears

CENTER MANAGEMENT AND OPERATIONS.....

702

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, 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

	1990 Actual	1991		1992
		Budget Estimate	Current Estimate	Budget Estimate
I. PERSONNEL AND RELATED COSTS	144,563	156,089	156,132	166,138
II. TRAVEL	4,248	4,918	4,622	4,799
III. OPERATION OF INSTALLATION	49,068	56,163	53,746	60,252
A. Facilities Services	21,070	25,279	22,877	26,208
B. Technical Services	10,527	12,787	12,339	14,728
C. Management and Operations	17,471	18,097	18,530	16,174
D. Implementation of Project CORE	0	0	0	3,142
Total, Fund Requirement	197,879	217,170	214,500	231,189

1990 <i>Actual</i>	1991		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

RESOURCES REQUIREMENTS BY FUNCTION

I.	PERSONNEL AND RELATED COSTS	144,563	156,089	156,132	166,138
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Summary of Fund Requirements

A. Compensation and Benefits

1. Compensation

a.	Full-time permanent	118,552	127,185	127,240	134,940
b.	Other than full-time permanent	1,987	1,995	2,153	2,355
c.	Reimbursable detailees	0	0	0	0
d.	Overtime and other compensation	1,535	2,056	1,553	1,622
	Subtotal, Compensation	122,074	131,236	130,946	138,917

2. Benefits

	Subtotal, Compensation and Benefits	142,229	153,092	153,565	163,492
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	1990 <u>Actual</u>	1991		1992
		Budget Estimate	Current <u>Estimate</u>	Budget <u>Estimate</u>
	(Thousands of Dollars)			
B. Supporting Costs				
1. Transfer of personnel	480	412	588	588
2. OPM Services	0	0	0	0
3. Personnel training	1,854	2,585	1,979	2,058
Subtotal, Supporting Costs	<u>2,334</u>	<u>2,997</u>	<u>2,567</u>	<u>2,646</u>
Total, Personnel and Related Costs	<u>144,563</u>	<u>156,089</u>	<u>156,132</u>	<u>166,138</u>

Explanation of Fund Requirements

A. Compensation and Benefits				
1. Compensation				
a. Full-time permanent	118,552	127,185	127,240	134,940

The increase in the 1991 Current Estimate from the 1991 Budget Estimate reflects the increase in the additional 1991 January pay raise from 3.6 percent to 4.1 percent and the additional 4.1 percent pay raise for Senior Executive Service personnel, partially offset by a re-estimate decreasing funding requirements because lower salaried personnel were hired in 1990 than planned. The 1992 Estimate includes funding for a full year of the 1991 pay raise, the anticipated 1992 pay raise, one additional day and full year funding for promotions, within grade increases and other personnel actions.

Basis of Cost for Permanent Workyears

In 1992. the cost of permanent workyears will be \$134.940.000 . The increase from 1991 is calculated as follows:

Cost of permanent workyears in 1991.....		<u>\$127,240</u>
Cost increases in 1991.....		9,281
Within grade and career development advances:		
Full year effect of 1991 actions.....	1,486	
Partial year effect of 1992 actions.....	1,909	
Full year cost of 1991 pay raise.....	1,595	
Partial year cost of 1992 pay raise.....	3,759	
Extra Days.....	532	
Cost Changes in 1992.....		- 1,581
Full year effect of 1991 actions.....	- 733	
Partial year effect of 1992 actions.....	+ 309	
Decrease to attain approved FTE ceiling.....	- 1,157	
Cost of full-time permanent workyears in 1992.....		<u>\$134,940</u>

1990 <i>Actual</i>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

b.	Other than full-time permanent				
	(1) cost	1,987	1,995	2,153	2,355
	(2) Workyears	105	99	17	17

The distribution of 1992 workyears is as follows:

Distribution of Other Than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Temporary programs	<u>17</u>
Total	<u>17</u>

The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects the additional 1/2 percent pay raise for 1991 and higher salaried temporary positions than planned. The 1992 increase reflects a continuation of the current higher salaried temporary personnel, with full year funding of the 1991 pay raise and the cost of the anticipated pay raise in January 1992. The reduction in workyears in the 1991 Current Estimate and the 1992 Budget Estimate is the result of the Office of Management and Budget excluding Co-Ops from the agency FTE ceiling.

c.	Reimbursable detailees	0	0	0	0
d.	Overtime and other compensation	1,535	2,056	1,553	1,622

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

1990 <i>Actual</i>	1991		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

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 1991 Budget Estimate to the 1991 Current Estimate results re-evaluation of overtime requirements and a reduction in the planned large increase in incentive awards. The 1992 increase reflects full year funding of the 1991 pay raise and the anticipated 1992 pay raise.

2. Benefits	20,155	21,856	22,619	24,575
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The following are the amounts of contribution by category:

Retirement Fund and Thrift Plan.....	10,431	11,816	11,402	11,749
Federal Group Life Insurance.....	231	247	249	256
Employee Health Insurance.....	5,827	5,683	6,591	7,579
Worker's Compensation.....	550	565	648	605
FICA.....	1,811	2,454	2,335	2,885
Medicare.....	1,300	1,091	1,394	1,501
Total.....	<u>20,155</u>	<u>21,856</u>	<u>22,619</u>	<u>24,575</u>

The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects a revised estimate of benefits to include the additional 1/2 percent January 1991 pay raise along with increases in health insurance and medicare, offset by decreases in retirement and thrift and FICA. The 1992 increase reflects the full year effect of the 1991 pay raise, the anticipated 1992 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 new hires participating in the more expensive FERS program and health insurance increases are in line with prior annual rate experience.

1990 <i>Actual</i>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

B. Supporting Costs

1. Transfer of Personnel	480	412	588	588
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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 1991 Budget Estimate to the 1991 Current Estimate is based on an accession plan which indicates more hires eligible for these benefits. The 1992 Budget provides for the same level of relocation benefits as in 1991.

2. OPM Services	0	0	0	0
3. Personnel Training	1,854	2,585	1,979	2,058

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 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 decrease from the 1991 Budget Estimate to the 1991 Current Estimate results from diverting funds to meet other center priorities. The 1992 Budget Estimate reflects a level of effort the same as in 1991 with a small increase for increased tuition and associated costs.

		1990	1991		1992
		<i>Actual</i>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)			
II.	TRAVEL	4,248	4,918	4,622	4,799
Summary of Fund Requirements					
A.	Program Travel	2,719	2,981	3,006	3,147
B.	Scientific and Technical Development Travel	1,058	1,447	1,104	1,131
C.	Management and Operations Travel	471	490	512	521
	Total, Travel	4,248	4,918	4,622	4,799

Explanation of Fund Requirements

A.	Program Travel	2,719	2,981	3,006	3,147
B.	Scientific and Technical Development Travel	1,058	1,447	1,104	1,131

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 1992 Budget Estimate are primarily due to inflation.

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 1991 Budget Estimate to the 1991 Current Estimate is due to a

<u>1990</u> <u>Actual</u>	<u>1991</u>		<u>1992</u>
	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
(Thousands of Dollars)			

reduction in the anticipated number of trips as a result of reallocation of funds to meet Center priorities. The increase from the 1991 Current Estimate to the 1992 Budget Estimate provides for the same level of operation.

C. Management and Operations Travel	471	490	512	521
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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 increase from the 1991 Budget Estimate to the 1991 Current Estimate is due to a reallocation of available resources to meet Center priorities. The increase to the 1992 Budget Estimate reflects essentially the same level of operation as anticipated in 1991.

	1990 <i>Actual</i>	1991		1992
		Budget Estimate	Current Estimate	Budget Estimate
(Thousands of Dollars)				
III. OPERATION OF INSTALLATION	49,068	56,163	53,746	60,252
Summary of Fund Requirements				
A. Facilities Services				
1. Rental of Real Property	2	1,236	10	10
2. Maintenance and Related Services	4,823	6,053	4,482	5,636
3. Custodial Services	3,621	3,469	3,963	4,685
4. Utility Services	12,624	14,521	14,422	15,877
Total, Facilities Services	21,070	25,279	22,877	26,208
B. Technical Services				
1. Automatic Data Processing	5,294	6,538	6,287	8,457
2. Scientific and Technical Information	5,233	6,249	6,052	6,271
3. Shop and Support Services	0	0	0	0
Total, Technical Services	10,527	12,787	12,339	14,728

	1990 <i>Actual</i>	1991		1992
		Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
(Thousands of Dollars)				
C. Management and Operations				
1. Administrative Communications	5,344	5,501	4,721	1,595
2. Printing and Reproduction	1,607	1,611	1,505	1,620
3. Transportation	1,416	1,707	1,725	1,801
4. Installation Common Services	9,104	9,278	10,579	11,158
Total, Management and Operations	17,471	18,097	18,530	16,174
D. Implementation of Project CORE	0	0	0	3,142
Total, Operation of Installation	49,068	56,163	53,746	60,252

Explanation of Fund Requirements

Operation of Installation provides 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 FY 1992 Operation of Installation includes funding for the implementation of Project CORE, which will convert certain functions from contractors to civil servants.

1990 <i>Actual</i>	1991		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects a rephrased funding plan for a multi-year telecommunications systems upgrade and deferral of procurement for supplies and equipment. In 1992, utility costs are expected to increase, and funding is included at the anticipated rates. All other areas reflect expected rate increases and an increased funding level that is commensurate with the required level of support for 1992.

A. Facilities Services

1. Rental of Real Property	2	1,236	10	10
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The estimate covers 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. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects a few trailer rentals and no off-site leasing due to a change in the anticipated space needed to house existing personnel pending resolution of a revised office space plan.

2. Maintenance and Related Services	4,823	6,053	4,482	5,636
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This estimate provides funds for maintenance and repair of institutional administrative buildings and other facilities, and roads and grounds maintenance. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects the deferral and delay of repair and alteration projects and replacement of equipment. The increase in the 1992 budget is due to anticipated support contractor wage increases, replacement of equipment and maintenance and restoration of projects delayed from previous years.

3. Custodial Services	3,621	3,469	3,963	4,685
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This activity provides 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

1990 <u>Actual</u>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

of all on-site personnel and visitors, and vehicle identification. Fire protection is purchased from the City of Hampton. The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects an increase in fire protection service costs. The increase in the 1992 Budget Estimate reflects support contractor rate increases, fire protection service costs and the enhancement of security, fire protection and custodial services.

4. Utility Services	12,624	14,521	14,422	15,877
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Included in this item is the purchase of electric service from Virginia Power Company, fuel oil from a local supplier, and water and sewage charges. Also included are 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 burner for facilities located in the west area of Langley. Contractor support for the steam generating and high pressure air plant is included. The net decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects lower than expected rates in the cost of electricity, offset by a small increase in consumption. The increase from the 1991 Current Estimate to the 1992 Budget Estimate is attributable to anticipated higher electrical consumption due to the existing backlog of work, utility rate increases, and expected growth in support contractor rates.

B. Technical Services

1. Automatic Data Processing	5,294	6,538	6,287	8,457
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This estimate provides 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. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects deferral of hardware purchases. The 1992 Budget Estimate reflects expected rate increases and incremental costs for the lease of a more powerful central processing unit (CPU).

1990 <i>Actual</i>	1991		1992
	Budget <i>Estimate</i>	Current Estimate	Budget <i>Estimate</i>

(Thousands of Dollars)

2. Scientific and Technical Information	5,233	6,249	6,052	6,271
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This estimate provides 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. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects deferral of photographic equipment purchases for the technical library. The increase in 1992 reflects expected contractor rate increases.

C. Management and Operations

1. Administrative Communications	5,344	5,501	4,721	1,595
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Includes funds for local telephone and exchange costs, and datafax and telegraph service. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects adjustments in the funding plan for a multi-year telecommunications systems upgrade and deferral of equipment purchases. The reduction in 1992 Budget Estimate reflects completion of funding for a multi-year telecommunications systems upgrade.

2. Printing and Reproduction	1,607	1,611	1,505	1,620
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The estimate for administrative printing includes the operating cost of the printing and reproduction facility as well as supplies, materials, equipment acquisitions and outside procurements. This also includes services performed by other agencies, chiefly the Government Printing Office. All common processes of duplicating including photostating, blueprinting, microfilming, and other reproductions are included. These services are provided by a support contractor. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects a reduction in the level of printing activity. The increase in the 1992 Budget Estimate provides for level services at anticipated rate increases.

1990 <i>Actual</i>	1991		1992
	Budget <u>Estimate</u>	Current Estimate	Budget <u>Estimate</u>

(Thousands of Dollars)

3. Transportation	1,416	1,707	1,725	1,801
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Includes 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. The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects anticipated freight rate increases. The 1992 Budget increase reflects anticipated rate increases in fuel, freight, and support contracts.

4. Installation Common Services	9,104	9,278	10,579	11,158
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Provides 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 copy machines and equipment, minority programs, and other administrative services and supplies. The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects an increase in support contractor rates, substantial increases in the cost of hazardous waste disposal, increased office equipment maintenance, and postage rates. The increase in 1992 provides for anticipated rate increases, and continued increases in hazardous waste disposal.

D. Implementation of Project CORE	0	0	0	3,142
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During FY 1992, the Langley Research Center plans to convert 80 positions (estimated to consume 73 FTE in FY 1992) from contractors to civil servants. These funds will be transferred into Personnel and Related Costs to cover the actual civil service salaries when the contractors, or their replacements, come on board as civil servants. They will also be transferred to Travel and Operation of Installation to cover the travel expense of these positions and to provide the necessary accommodations -- desks, supplies, personal computers, etc. -- needed to bring them into the Center workforce. In the event that circumstances beyond our control prevent us from having the full civil service complement in place at the date of the planned termination of the contracted functions, some of these funds will be used to provide for a continuation of the contractor support until the civil service transition can be completed.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LANGLEY RESEARCH CENTER
ORGANIZATION AND STAFFING CHART

STAFFING SUMMARY		
	21	22
SES	1	1
GS/GM 16	0	0
GS/GM 15	0	0
GS/GM 14	0	0
OTHER G	0	0
WAGE	0	0
TOTAL	1	1

OFFICE OF THE DIRECTOR		
	21	22
SES	4	4
GS/GM 16	0	0
GS/GM 15	4	4
GS/GM 14	3	3
OTHER GS/GM	22	22
WAGE	0	0
TOTAL	33	33

OFFICE OF DIRECTOR FOR ELECTRONICS			OFFICE OF DIRECTOR FOR STRUCTURES			OFFICE OF DIRECTOR FOR AERONAUTICS			OFFICE OF DIRECTOR FOR MANAGEMENT OPERATIONS			OFFICE OF DIRECTOR FOR SYS ENG & OPERATIONS			OFFICE OF DIRECTOR FOR SPACE			OFFICE OF DIRECTOR FOR FLIGHT SYSTEMS		
	21	22		21	22		21	22		21	22		21	22		21	22		21	22
SES	1	1	SES	1	1	SES	2	2	SES	1	1	SES	2	2	SES	1	1	SES	1	1
GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0
GS/GM 15	0	0	GS/GM 15	1	1	GS/GM 15	0	0	GS/GM 15	5	5	GS/GM 15	1	1	GS/GM 15	1	1	GS/GM 15	3	3
GS/GM 14	2	2	GS/GM 14	0	0	GS/GM 14	2	2	GS/GM 14	3	3	GS/GM 14	1	1	GS/GM 14	3	3	GS/GM 14	5	5
OTHER GS/GM	3	3	OTHER GS/GM	3	3	OTHER GS/GM	4	4	OTHER GS/GM	9	9	OTHER GS/GM	3	3	OTHER GS/GM	4	4	OTHER GS/GM	14	14
WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0
TOTAL	6	6	TOTAL	5	5	TOTAL	8	8	TOTAL	18	18	TOTAL	7	7	TOTAL	9	9	TOTAL	23	23

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LEWIS
RESEARCHCENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1992 ESTIMATES

LEWIS RESEARCH CENTER

DESCRIPTION

The Lewis Research Center (LeRC) occupies **two** sites in north central Ohio. The original site, established in **1941**, adjacent to the Cleveland-Hopkins International Airport, includes **366** acres, **14** of which are leased from the City of Cleveland. There are over 170 buildings and structures, including wind tunnels, test chambers, laboratories and other research facilities at the Cleveland location.

The Plum Brook Station, established in **1956**, is located south of Sandusky, Ohio, about **50** miles west of Cleveland, on land formerly occupied by the Plum Brook Ordnance 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, 1990**, was **\$637,281,000**.

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 including internal computational fluid dynamics, internal unsteady aerodynamics and aeroelasticity, aircraft icing phenomena; aeronautical propulsion and power technologies including engine materials and structures, propulsion system integration, advanced propellers, instrumentation and controls technology; and the associated research facilities and experimental techniques.

Transatmospheric Research and Technology - combine 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 and development of the Space Station Freedom Power System.

Communications - develop the high-risk technology required to ensure continued U.S. preeminence in satellite communications which will be applicable to a wide range of future communication systems required by NASA, other Government Agencies and U.S. Industry.

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 Technology - develop and maintain the technology base for advanced high and low thrust primary and auxiliary propulsion systems, including associated structures, materials and analytical technologies.

Space Energy Processes and Svstems Technology - develop and maintain the technology base for space power and energy conversion systems, including associated structures, materials and analytical technologies.

In-Space Flight Experiments - develop and implement basic microgravity science experiments in materials processing, combustion and fluid physics, and conduct flight experiments which contribute to technology developments for space power, propulsion, fluid and thermal management systems.

Commercialization of Space - promote and facilitate the commercialization of space by increasing the awareness of U.S. industry of space opportunities and encouraging increased industry investment and participation in high technology space-based research, applications, and development.

Technology Utilization - plan, organize and facilitate the transfer of NASA-developed technology to the non-aerospace community.

SUPPORTING:

Energy Processes and Systems Technology - manage selected research and technology projects for terrestrial propulsion and energy conservation systems synergistic to NASA programs.

DISTRIBUTION OF FULL TIME EQUIVALENT (FTE) WRKYEARS BY PROGRAM

LEWIS RESEARCH CENTER	1991			1992 BUDGET ESTIMATE
	1990 ACTUAL	BUDGET ESTIMATE	CURRENT ESTIMATE	
SPACE STATION.....	370	417	409	426
SPACE FLIGHT PROGRAMS.....	78	58	71	71
SPACE TRANSPORTATION CAPABILITY DEV....	8	4	7	7
SPACE SHUTTLE.....	70	54	64	64
SPACE SCIENCE AND APPLICATIONS.....	323	290	294	294
PHYSICS AND ASTRONOMY.....	0	0	0	0
LIFE SCIENCES.....	0	0	0	0
PLANETARY EXPLORATION.....	0	0	0	0
SPACE APPLICATIONS.....	323	290	294	294
AERONAUTICS EXPLORATION AND TECHNOLOGY...	1,415	1,501	1,493	1,476
AERONAUTICAL RESEARCH AND TECHNOLOGY...	840	928	917	869
SPACE RESEARCH AND TECHNOLOGY.....	480	519	524	555
TRANSATMOSPHERIC RESEARCH AND TECH....	95	54	52	52
COMMERCIAL PROGRAMS.....	9	12	8	8
SAFETY, RELIABILITY & QUALITY ASSURANCE.	1	3	2	2
ACADEMIC PROGRAMS.....	0	0	0	0
TRACKING AND DATA PROGRAMS.....	10	0	4	4
SUBTOTAL - DIRECT FULL-TIME PERM FTE'S	2,206	2,281	2,281	2,281
CENTER MANAGEMENT AND OPERATIONS.....	509	328	316	310
SUBTOTAL - FULL-TIME PERM FTE'S.....	2,715	2,809	2,797	2,791
OTHER FTE'S.....	80	89	34	40
SUBTOTAL - FULL-TIME EQUIVALENTS.....	2,795	2,878	2,831	2,831
PROJECT CORE.....				81
GRAND TOTAL - FULL-TIME EQUIVALENTS..	2,793	2,878	2,831	2,912

PROGRAM DESCRIPTION

Permanent Civil
Service Workyears

SPACE STATION.....

426

In 1992, civil service personnel will continue to manage the detail design and development activities, and prepare for the Level II controlled critical design review of the Space Station Freedom Electric Power System. 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 solar dynamic component development and hooks and scars definition.

SPACE FLIGHT PROGRAMS.....

71

SPACE TRANSPORTATION CAPABILITY DEVELOPMENT.....

7

During 1992, Lewis will continue to conduct studies which provide the agency with long-range planning for future launch systems. Lewis will manage in-house and contractor studies that will define concepts and technology levels required for future missions.

SPACE TRANSPORTATION OPERATIONS.....

64

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 the GOES I, J, K, L, and M missions on Atlas/Centaur vehicles, and for Mars Observer on Titan 111. Contractual arrangements are underway for SOHO and MSAT missions on intermediate class vehicles. In addition, feasibility studies, launch vehicle/spacecraft integration activities, and procurement actions will be underway for missions such as TDRSS, CRAF/CASSINI, and AXAF.

Permanent Civil
Service Workyears

SPACE SCIENCE AND APPLICATIONS

294

SPACE APPLICATIONS

294

Space Applications activity at Lewis consists of: space communications research and development, and 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.

In 1992, 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 is managing development of the Advanced Communications Technology Satellite. Final integration tests will be conducted and preparations will be made for shipping the spacecraft to Kennedy Space Center in preparation for launch in 1992. A comprehensive experiments program is being defined and implemented. This activity will continue at an increased pace in 1992.

Lewis will continue and expand its work in advanced design, development and operation of microgravity experimental flight hardware and conduct 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 1992.

AERONAUTICS. EXPLORATION AND TECHNOLOGY

1.476

AERONAUTICAL RESEARCH AND TECHNOLOGY

869

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 Aviation Systems 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), which includes computational methods, modeling and verification, and applications; 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 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 non-intrusive research instrumentation and engine sensors/controls for the "smart" adaptive propulsion systems of the future. The advanced materials research is focused on super-alloys, intermetallics, coatings, 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 advanced ice protection systems. The goal of the 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 including ceramics through the development of advanced materials and improved experimental and analytical tools. The objective of NPSS is to develop a multi-disciplinary 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.

In vehicle focused research and technology, Lewis is developing the enabling propulsion technology for specific engines and propulsion systems. R&T in this area involves small engines (gas turbines and intermittent combustion engines), advanced turboprops, convertible engines, variable cycle engines, and new, innovative propulsions systems 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.....

555

The Lewis program in space research and technology is planned to advance the state of the art and maintain a technology base for power systems, advanced high and low thrust primary and auxiliary propulsion, cryogenic fluid management in microgravity, and space communications and advanced electronics. This includes associated materials technology, structural analysis and life prediction technology, computational fluid dynamics, power management and distribution technology including fault tolerance and autonomy and advanced development work in support of the space station, its evolutionary growth, and other future space applications such as Mission to Planet Earth, the Space Exploration Initiative and advanced space science missions. In-space flight experiments are defined, developed and implemented in the context of the above technology areas and in the

underlying basic sciences. In major roles, Lewis will pursue the Civil Space Technology Initiative programs in power, propulsion and power, propulsion and cryogenic elements involved in surface and rover power, chemical and nuclear electric and thermal transfer vehicle engine systems technology and communications technology in support of the Exploration Technology program.

The Lewis primary propulsion programs emphasize the extension and advancement of the technologies of hydrogen-fueled engines such as the Space Shuttle Main Engine and National Launch Systems, etc., toward long-life, reusable, serviceable, cost effective systems for Earth-to-orbit applications. This concentrates on thrust chamber cooling and life, critical turbomachinery components, advanced structural analysis and life prediction, 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 in the areas of performance, life and reusability and autonomy based on expert systems. Emphasis is on combustion and heat transfer, long-life lightweight reusable components and subsystem assemblies and system level test beds, high expansion area nozzles, and health monitoring and diagnostics. Nuclear, electric, and thermal propulsion system technologies will receive increasing emphasis for potential requirements of the Space Exploration Initiative.

The Lewis low thrust propulsion programs are directed toward Space Station Freedom, Earth-orbiting satellite, Space Transportation System and scientific exploration applications. Technologies for gaseous hydrogen-oxygen thrusters, resistojets capable of using various fuels, arcjets, inert gas ion, and high temperature thrusters for storable reactants are being developed.

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 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 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 electromagnetic actuator system concepts are being studied and technology developed for a wide range of aerospace applications. Interactions between the space plasma environment and the power systems are also being studied.

The space communications program includes applied research and advanced development in microwave electron beam amplifiers and microwave solid-state devices. The program consists of efforts to develop advanced concepts, techniques, and communications systems components which will enable growth in the utilization of the radio frequency spectrum to frequencies well beyond 100 GHz.

The Lewis program in space materials and structures research and technology emphasizes the development of improved materials, advanced structural analysis and life prediction for advanced space power generation, propulsion and communications systems.

During 1992, Lewis will continue its involvement in exploration technologies in the areas of power, cryogenic and advanced propulsion, transportation systems, cryogenic fluid management, and communications systems.

Permanent Civil
Service Workyears

TRANSATMOSPHERIC RESEARCH AND TECHNOLOGY

52

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 and airframe 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 TECHNOLOGY UTILIZATION

8

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 technical expertise for evaluation and testing of **ideas/concepts**.

The 1992 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 recent legislative actions.

SAFETY, RELIABILITY AND QUALITY ASSURANCE

2

In 1992, Lewis will continue and expand the research and technology activities involving institutional safety, and support of fire-safety design requirements for Space Station Freedom and advanced spacecraft. Lewis has established itself as a lead center 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 1992, Lewis will continue its lead efforts to enhance the safety, reliability and performance of NASA's aerospace primary and secondary batteries as well as space power systems. Lewis has begun significant efforts to document Space Reliability practices to provide for the application of proven techniques to assure the life of critical long term space activities such as Space Station Freedom and future manned exploration of the Solar System. Efforts are also underway to provide uniform, timely, and valuable data to enable the management of the risks associated with the development of new and on-going Space and Aeronautical Engineering technologies.

TRACKING AND DATA PROGRAMS

4

The center provides technology assessments for telecommunications, navigation, and information management systems for Space Exploration Initiative.

CENTER MANAGEMENT AND OPERATIONS.....

510

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.

Manaeement 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

	1990 Actual	1991		1992
		Budget Estimate	Current Estimate	Budget Estimate
1. PERSONNEL AND RELATED COSTS	144,067	158,803	159,694	172,027
II. TRAVEL	3,965	4,257	4,259	4,423
III. OPERATION OF INSTALLATION	57,974	69,356	68,749	78,959
A. Facilities Services	30,532	37,488	33,543	37,980
B. Technical Services	10,478	13,809	13,596	15,240
C. Management and Operations	16,964	18,059	21,610	23,609
D. Implementation of Project CORE	0	0	0	2,130
Total, Fund Requirement	206,006	232,416	232,702	255,409

1990 <u>Actual</u>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

RESOURCES REQUIREMENTS BY FUNCTION

I.	PERSONNEL AND RELATED COSTS	144.067	158.803	159,694	172.027
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Summary of Fund Requirements

A. Compensation and Benefits

1. Compensation

a.	Full-time permanent	116,268	126,796	127,324	135,930
b.	Other than full-time permanent	2,121	1,721	2,313	2,553
c.	Reimbursable detailees	0	0	0	0
d.	Overtime and other compensation	2,080	2,294	2,222	3,034
	Subtotal, Compensation	120,469	130,811	131,859	141,517

2. Benefits

	Subtotal, Compensation and Benefits	141,264	155,379	156,261	168,743
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1990 <i>Actual</i>	1991		1992
	Buaget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

B. Supporting Costs

1. Transfer of personnel	538	525	875	626
2. OPM Services	0	0	0	0
3. Personnel training	2,265	2,899	2,558	2,658
Subtotal, Supporting Costs	2,803	3,424	3,433	3,284
Total, Personnel and Related Costs	144,067	158,803	159,694	172,027

Explanation of Fund Requirements

A. Compensation and Benefits

1. Compensation

a. Full-time permanent	116,268	126,796	127,324	135,930
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The increase in the 1991 Current Estimate from the 1991 Budget Estimate reflects the increase in the 1991 January pay raise from 3.6 percent to 4.1 percent and the additional 4.1 percent pay raise for Senior Executive Service personnel. The 1992 Estimate includes funding for a full year of the 1991 pay raise, the anticipated 1992 pay raise, one additional day and full year funding for promotions, within grade increases and other personnel actions.

Basis of Cost for Permanent Workyears

In 1992. the cost of permanent workyears will be \$135.930.000 . The increase from 1991 is calculated as follows:

Cost of permanent workyears in 1991.....		<u>\$127,374</u>
Cost of increases in 1992.....		10.139
Within grade and career advancements:		
Full year effect of 1991 actions.....	1.469	
Partial year effect of 1992 actions.....	2.718	
Full year cost of 1991 pay raise.....	1.455	
Partial year effect of 1992 pay raise.....	3.961	
Extra Days.....	536	
Cost of changes in 1992.....		.1. 533
Full year effect of 1991 actions.....	.1. 394	
Partial year effect of 1992 actions.....	252	
Decreases to attain approved FTE ceiling.....	- 391	
Cost of Full-Time Permanent Workyears in 1992.....		<u>\$135.930</u>

1990 <i>Actual</i>	1991		1992
	Budget <u>Estimate</u>	Current Estimate	Budget Estimate

(Thousands of Dollars)

b.	Other than full-time permanent				
	(1) cost	2,121	1,721	2,313	2,553
	(2) Workyears	81	69	35	41

The distribution of 1992 workyears is as follows:

Distribution of Other Than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Development programs.....	2
Other temporary programs.....	<u>39</u>
Total.....	41

The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects the additional 1/2 percent payraise for 1991, higher salaried temporary positions than planned and an increase in the part time permanent program. The 1992 increase reflects a continuation of the 1991 program with full year funding of the 1991 pay raise and the cost of the anticipated pay raise in January 1992. The reduction in workyears in the 1991 Current Estimate and the 1992 Budget Estimate is the result of the Office of Management and Budget excluding Co-Ops from the agency FTE ceiling.

c.	Reimbursable detailees	0	0	0	0
d.	Overtime and other compensation	2,080	2,294	2,222	3,034

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

1990 <i>Actual</i>	1991		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

primarily used for off-peak operation of major facilities, primarily wind tunnel operations. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to a re-evaluation of overtime requirements for wind tunnel operations. The increase in the 1992 Budget reflects the full year effect of the 1991 pay raise and the anticipated 1992 pay raise and an increase in the nonsupervisory award program.

2. Benefits	20,795	24,568	24,402	27,226
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The following are the amounts of contribution by category:

Retirement Fund and Thrift Plan.....	10,928	12,379	12,433	13,362
Employees Life Insurance.....	184	240	216	235
Employees Health Insurance.....	5,651	7,356	6,837	7,918
Workers' Compensation.....	474	541	541	773
FICA.....	2,360	2,486	3,039	3,508
Medicare.....	1,178	1,560	1,316	1,405
Other Benefits.....	<u>20</u>	<u>6</u>	<u>20</u>	<u>25</u>
Total.....	<u>20.795</u>	<u>24.568</u>	<u>24.402</u>	<u>27.226</u>

The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects a revised estimate of benefits to reflect decreased health insurance and medicare costs, offset by the additional 1/2 percent January 1991 pay raise and an increase in FICA. The 1992 increase reflects the full year effect of the 1991 pay raise, the anticipated 1992 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 and health insurance increases are in line with prior annual rate experience.

<u>1990</u> <u>Actual</u>	<u>1991</u>		<u>1992</u>
	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>

(Thousands of Dollars)

B. Supporting Costs

1. Transfer of Personnel	538	525	875	626
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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 1991 Budget Estimate to the 1991 Current Estimate is based on an accession plan which indicates more hires eligible for these benefits. The 1992 Budget is based on a plan that is consistent with normal hiring skill mixes.

2. OPM Services	0	0	0	0
3. Personnel Training	2,265	2,899	2,558	2,658

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 decrease from the 1991 Budget Estimate to the 1991 Current Estimate results in reducing these training programs in order to divert funds to meet other center priorities and yet adequately fund training for the current level of FTE's. The 1992 Budget Estimate reflects a level of effort the same as in 1991 with a small increase for increased tuition and associated costs.

	1990 <i>Actual</i>	1991		1992
		Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
II. TRAVEL	3,965	4,257	4,259	4,423

Summary of Fund Requirements

A. Program Travel	2,554	2,979	2,912	3,043
B. Scientific and Technical Development Travel	679	638	646	652
C. Management and Operations Travel	732	640	701	728
Total, Travel	3,965	4,257	4,259	4,423

Explanation of Fund Requirements

A. Program Travel	2,554	2,979	2,912	3,043
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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 1991 Budget Estimate to the 1991 Current Estimate is due to a reallocation of funds based on Center priorities. The 1992 Budget Estimate increase is due to rate increases.

B. Scientific and Technical Development Travel	679	638	646	652
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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

1990 <u>Actual</u>	1991		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
(Thousands of Dollars)			

technological advances outside Lewis, as well as to present both accomplishments and problems to their associates is invaluable. Funding for the 1991 Current Estimate and the 1992 Budget Estimate is essentially stable.

C. Management and Operations Travel	732	640	701	728
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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 1991 Budget Estimate to the 1991 Current Estimate reflects an increase in the number of trips. The increase in the 1992 Budget estimate is inflation driven.

	1990 <i>Actual</i>	1991		1992
		Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
(Thousands of Dollars)				
III. OPERATION OF INSTALLATION	57,974	69,356	68,749	78,959
Summary of Fund Requirements				
A. Facilities Services				
1. Rental of Real Property	125	1,363	690	1,144
2. Maintenance and Related Services	10,236	13,094	8,442	10,367
3. Custodial Services	5,567	5,463	5,922	6,751
4. Utility Services	14,604	17,568	18,489	19,718
Total, Facilities Services	30,532	37,488	33,543	37,980
B. Technical Services				
1. Automatic Data Processing	5,361	8,172	7,872	8,690
2. Scientific and Technical Information	2,793	3,121	3,441	4,006
3. Shop and Support Services	2,324	2,516	2,283	2,544
Total, Technical Services	10,478	13,809	13,596	15,240

	1990 <u>Actual</u>	<u>1991</u>		1992
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
C. Management and Operations				
1. Administrative Communications	1,768	2,008	2,151	2,344
2. Printing and Reproduction	462	653	784	839
3. Transportation	3,731	4,127	4,440	4,818
4. Installation Common Services	11,003	11,271	14,235	15,608
Total, Management and Operations	16,964	18,059	21,610	23,609
D. Implementation of Project CORE	0	0	0	2,130
Total, Operation of Installation	57,974	69,356	68,749	78,959

Explanation of Fund Requirements

Operation of Installation provides 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 includes funding for the implementation of Project CORE, which will convert certain functions from contractors to civil servants.

The net decrease from the 1991 Budget Estimate to the 1991 Current Estimate is primarily due to a realignment

1990 <i>Actual</i>	<u>1991</u>		1992
	<u>Budget</u> <u>Estimate</u>	Current Estimate	Budget Estimate

(Thousands of Dollars)

of funds between functions at the Ames and Langley Research Centers offset with deferrals of equipment and supplies and materials. The increase in the 1992 Budget Estimate is due to reinstatement of deferred maintenance from the previous year, anticipated rate increases in the support contractor and utility areas, and additional contractor workyears. Increases have also been provided in the areas of hazardous waste management, ADP equipment upgrades, and offsite moves.

A. Facilities Services

1. Rental of Real Property	125	1,363	690	1,144
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This activity provides for lease of office space for civil servants. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects slower than anticipated implementation of civil service off-site moves. The 1992 estimate reflects the full year impact of off-site moves.

2. Maintenance and Related Services	10,236	13,094	8,442	10,367
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This activity provides for the operation and maintenance of facilities at the Cleveland site and at the Plum Brook Station. Facilities maintenance includes buildings and grounds maintenance and maintenance of heating, ventilating, and air-conditioning systems and equipment. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects a transfer of funds to other areas to accommodate more critical problems. The increase in the 1992 Budget Estimate reinstates maintenance and related projects to an acceptable level commensurate with 1990 experience and begins to address a large maintenance backlog.

3. Custodial Services	5,567	5,463	5,922	6,751
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Custodial services include janitorial services, security services, fire protection, trash removal, pest control and industrial cleaning of walls and lights on an as-needed basis, all of which are provided by support contractors. The increases in the 1991 Current Estimate and the 1992 Budget Estimate reflect additional requirements for security engineering services. They include alarm monitoring, secure facility monitoring and additional security investigations.

1990 <u>Actual</u>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

4. Utility Services	14,604	17,568	18,489	19,718
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Electrical power is provided by the local utility company. Natural gas is the primary heating fuel with oil as a backup fuel. A support contractor operates the central heating plant. The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects an increase in consumption resulting from the 10 x 10 Supersonic Wind Tunnel (SWT) reactivation and additional contractor workyear growth. This increase reflects full utilization of the wind tunnel and allows for some catch-up work on the current backlog of experiments. The 1992 Budget Estimate is based on projected utility and support contractor rate increases.

B. Technical Services

1. Automatic Data Processing	5,361	2,172	7,272	2,690
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Funds provide 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 are 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 supported include: institutional management, accounting and finance, procurement contract status and tracking, personnel management and utility tracking. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to deferral of purchases of ADP equipment in order to meet higher priority requirements. The increase in the 1992 Budget Estimate provides for anticipated support contractor rate increases for the contractor workforce needed to operate the administrative ADP systems and restores some purchases of up-to-date ADP equipment needed to improve productivity as well as providing support to agencywide systems.

2. Scientific and Technical Information	2,793	3,121	3,441	4,006
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Included in this activity is 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

1990 <i>Actual</i>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

transport of special exhibits, and related activities. The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects increased equipment purchases following the 1990 budget reductions. The 1992 Budget Estimate maintains the current level of support plus additional services and replacement of equipment needed to function more effectively.

3.	Shop and Support Services	2,324	2,516	2,283	2,544
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These funds provide 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. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate reflects the deferral of purchases of photo and audio visual equipment until 1991. The increase in the 1992 Budget Estimate reflect expected contractor rate increases and restores services and purchases of photo and graphic replacement equipment.

C. Management and Operations

1.	Administrative Communications	1,768	2,008	2,151	2,344
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This estimate provides 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. The increase in the 1991 Current Estimate and the 1992 Budget Estimate provides for local rate increases.

2.	Printing and Reproduction	462	653	784	839
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The estimate for administrative printing includes 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. The increase in the 1991 Current Estimate and 1992

1990 <u>Actual</u>	1991		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

Budget Estimate reflects the purchase of printing equipment which had been deferred in previous years and expected contractor rate increases.

3. Transportation	3,731	4,127	4,440	4,818
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This activity includes the cost of the support contract for bus, mail and package delivery, stock issuance and administrative aircraft maintenance. It also includes moving and hauling services and motor vehicle purchase, lease and maintenance. The increase from the 1991 Budget Estimate to the 1991 Current Estimate represents the need for additional GSA vehicle leasing, and the replacement of passenger vehicles which are no longer economic to maintain. The 1992 Budget Estimate includes a continued increase in the leasing and replacement of passenger vehicles.

4. Installation Common Services	11,003	11,271	14,235	15,608
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This funding provides 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 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. The increase in the 1991 Current Estimate reflects additional administrative support for off-site personnel, medical equipment purchases, additional contractor workyears in the medical area, environmental code compliance and increased costs of hazardous waste disposal and monitoring. Due to the unexpected severity in the environmental area, increases have been provided for in the areas of core sampling and chemical analysis of soils, water and air, studies of contaminated areas and adequate clean-up plans, adequate responses to emergencies and monitoring of conditions, proper oversight of Plum Brook red water ponds and asbestos abatement and an Environmental Specialist for Plum Brook Station. The 1992 Budget Estimate represents a continuation of environmental activities at the 1991 level with projected contractor rate increases.

1990 <u>Actual</u>	1991		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

D. Implementation of Project CORE	0	0	0	2,130
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During 1992, the Lewis Research Center plans to convert 81 positions (estimated to consume 61 FTE in 1992) from contractors to civil servants. These funds will be transferred into Personnel and Related Costs to cover the actual civil service salaries when the contractors, or their replacements, come on board as civil servants. They will also be transferred to Travel and Operation of Installation to cover the travel expense of these positions and to provide the necessary accommodations -- desks, supplies, personal computers, etc. -- needed to bring them into the Center workforce. In the event that circumstances beyond our control prevent us from having the full civil service complement in place at the date of the planned termination of the contracted functions, some of these funds will be used to provide for a continuation of the contractor support until the civil service transition can be completed.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LEWIS RESEARCH CENTER
ORGANIZATION AND STAFFING CHART

STAFFING SUMMARY		
	21	22
SES	38	38
GS/GM 16	2	2
GS/GM 15	471	478
GS/GM 14	328	339
OTHER GS/GM	1738	1811
WAGE	485	438
TOTAL	2728	2804

OFFICE OF THE DIRECTOR		
	21	22
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

OFFICE OF EXTERNAL AFFAIRS			OFFICE OF UNIVERSITY PROGRAMS			OFF. OF INTERAGENCY & INDUSTRY PERS.			OFFICE OF SAFETY, RELIABILITY & QA			THE OFFICE OF THE CHIEF COUNSEL			OFFICE OF EQUAL OPPORTUNITY PGMs.			OFFICE OF HEALTH SERVICES		
	21	22		21	22		21	22		21	22		21	22		21	22		21	22
SES	0	0	SES	0	1	SES	1	1	SES	1	1	SES	0	0	SES	0	0	SES	0	0
GS/GM 16	0	0	GS/GM 16	1	1	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0
GS/GM 15	1	1	GS/GM 15	1	4	GS/GM 15	1	3	GS/GM 15	3	3	GS/GM 15	2	2	GS/GM 15	0	0	GS/GM 15	1	1
GS/GM 14	0	1	GS/GM 14	2	2	GS/GM 14	1	1	GS/GM 14	13	11	GS/GM 14	6	7	GS/GM 14	1	0	GS/GM 14	0	0
OTHER GS/GM	10	16	OTHER GS/GM	2	3	OTHER GS/GM	8	9	OTHER GS/GM	36	36	OTHER GS/GM	3	3	OTHER GS/GM	5	7	OTHER GS/GM	0	2
WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0
TOTAL	11	17	TOTAL	9	11	TOTAL	11	14	TOTAL	52	51	TOTAL	11	12	TOTAL	6	7	TOTAL	3	3

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		
	21	22		21	22		21	22		21	22		21	22		21	22		21	22		21	22
SES	2	2	SES	1	1	SES	4	2	SES	1	1	SES	2	2	SES	1	1	SES	0	0	SES	1	1
GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0
GS/GM 15	0	0	GS/GM 15	0	0	GS/GM 15	0	0	GS/GM 15	0	0	GS/GM 15	0	0	GS/GM 15	0	0	GS/GM 15	1	1	GS/GM 15	0	0
GS/GM 14	0	1	GS/GM 14	0	0	GS/GM 14	1	0	GS/GM 14	0	0	GS/GM 14	0	0	GS/GM 14	0	0	GS/GM 14	2	0	GS/GM 14	0	0
OTHER GS/GM	8	8	OTHER GS/GM	1	1	OTHER GS/GM	1	2	OTHER GS/GM	1	1	OTHER GS/GM	2	2	OTHER GS/GM	1	1	OTHER GS/GM	28	28	OTHER GS/GM	1	1
WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	2	0	WAGE	0	0	WAGE	0	0
TOTAL	7	8	TOTAL	2	2	TOTAL	6	4	TOTAL	2	2	TOTAL	4	4	TOTAL	2	2	TOTAL	32	30	TOTAL	2	2

ADVANCED PLANNING AND ANALYSIS OFFICE			MATERIALS DIVISION			PROJECT CONTROL OFFICE			ACTS PROJECT OFFICE			SOFTWARE ENGINEERING OFFICE			FACILITY PLANNING OFFICE			PERSONNEL DIVISION			RESOURCES ANALYSIS & MANAGEMENT OFFICE		
	21	22		21	22		21	22		21	22		21	22		21	22		21	22		21	22
SES	1	1	SES	1	1	SES	0	0	SES	1	1	SES	0	0	SES	0	0	SES	0	0	SES	0	0
GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0
GS/GM 15	2	2	GS/GM 15	13	13	GS/GM 15	1	1	GS/GM 15	2	2	GS/GM 15	1	1	GS/GM 15	1	1	GS/GM 15	1	1	GS/GM 15	1	1
GS/GM 14	8	8	GS/GM 14	18	17	GS/GM 14	2	4	GS/GM 14	11	8	GS/GM 14	0	2	GS/GM 14	0	0	GS/GM 14	2	4	GS/GM 14	5	5
OTHER GS/GM	20	20	OTHER GS/GM	70	78	OTHER GS/GM	18	20	OTHER GS/GM	20	33	OTHER GS/GM	0	10	OTHER GS/GM	5	2	OTHER GS/GM	27	33	OTHER GS/GM	26	26
WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0
TOTAL	29	29	TOTAL	102	107	TOTAL	21	25	TOTAL	44	46	TOTAL	1	13	TOTAL	6	4	TOTAL	30	38	TOTAL	32	31
SES	1	1	SES	1	1	SES	0	0	SES	0	0	SES	0	0	SES	0	0	SES	1	1	SES	0	0
GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0
GS/GM 15	4	4	GS/GM 15	9	9	GS/GM 15	5	5	GS/GM 15	5	5	GS/GM 15	1	1	GS/GM 15	0	0	GS/GM 15	6	6	GS/GM 15	1	1
GS/GM 14	9	12	GS/GM 14	11	11	GS/GM 14	12	9	GS/GM 14	11	11	GS/GM 14	0	2	GS/GM 14	1	1	GS/GM 14	15	13	GS/GM 14	14	1
OTHER GS/GM	35	35	OTHER GS/GM	45	50	OTHER GS/GM	46	41	OTHER GS/GM	45	56	OTHER GS/GM	0	8	OTHER GS/GM	82	86	OTHER GS/GM	124	107	OTHER GS/GM	4	43
WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	280	244	WAGE	0	0	WAGE	0	0
TOTAL	49	52	TOTAL	67	72	TOTAL	63	56	TOTAL	62	73	TOTAL	1	11	TOTAL	343	331	TOTAL	146	127	TOTAL	46	45
SES	1	1	SES	1	1	SES	0	0	SES	1	1	SES	1	1	SES	0	0	SES	0	0	SES	0	0
GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0
GS/GM 15	28	18	GS/GM 15	13	15	GS/GM 15	5	4	GS/GM 15	2	5	GS/GM 15	5	7	GS/GM 15	8	7	GS/GM 15	14	11	GS/GM 15	1	1
GS/GM 14	80	80	GS/GM 14	68	70	GS/GM 14	37	37	GS/GM 14	29	36	GS/GM 14	49	44	GS/GM 14	130	78	GS/GM 14	1	1	GS/GM 14	81	90
WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	10	8	WAGE	0	0	WAGE	0	0
TOTAL	87	88	TOTAL	67	69	TOTAL	46	48	TOTAL	38	43	TOTAL	60	57	TOTAL	149	88	TOTAL	34	36	TOTAL	89	97
SES	1	1	SES	1	1	SES	0	0	SES	0	0	SES	1	1	SES	0	0	SES	0	0	SES	0	0
GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0
GS/GM 15	16	14	GS/GM 15	10	10	GS/GM 15	0	2	GS/GM 15	1	1	GS/GM 15	2	4	GS/GM 15	0	0	GS/GM 15	0	0	GS/GM 15	0	0
GS/GM 14	27	29	GS/GM 14	27	26	GS/GM 14	0	8	GS/GM 14	7	4	GS/GM 14	8	7	GS/GM 14	1	1	GS/GM 14	1	1	GS/GM 14	1	1
OTHER GS/GM	57	52	OTHER GS/GM	70	78	OTHER GS/GM	0	21	OTHER GS/GM	19	19	OTHER GS/GM	4	46	OTHER GS/GM	40	42	OTHER GS/GM	33	34	OTHER GS/GM	33	34
WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	76	62	WAGE	3	6	WAGE	0	0
TOTAL	131	136	TOTAL	108	113	TOTAL	0	31	TOTAL	27	24	TOTAL	56	58	TOTAL	117	108	TOTAL	37	41	TOTAL	37	41
SES	1	1	SES	1	1	SES	0	0	SES	1	1	SES	1	1	SES	0	0	SES	0	0	SES	0	0
GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0
GS/GM 15	9	9	GS/GM 15	8	8	GS/GM 15	5	5	GS/GM 15	2	2	GS/GM 15	2	2	GS/GM 15	4	6	GS/GM 15	0	0	GS/GM 15	0	0
GS/GM 14	39	39	GS/GM 14	12	15	GS/GM 14	6	5	GS/GM 14	5	7	GS/GM 14	6	7	GS/GM 14	10	15	GS/GM 14	0	0	GS/GM 14	9	9
OTHER GS/GM	57	76	OTHER GS/GM	55	59	OTHER GS/GM	48	50	OTHER GS/GM	6	13	OTHER GS/GM	48	43	OTHER GS/GM	66	63	OTHER GS/GM	0	0	OTHER GS/GM	11	11
WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0
TOTAL	100	106	TOTAL	86	83	TOTAL	60	64	TOTAL	18	23	TOTAL	56	58	TOTAL	81	85	TOTAL	0	0	TOTAL	11	11
SES	1	1	SES	0	0	SES	0	1	SES	0	0	SES	0	0	SES	0	0	SES	0	0	SES	0	0
GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	5	4	GS/GM 16	5	4	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0	GS/GM 16	0	0
GS/GM 15	0	0	GS/GM 15	5	4	GS/GM 15	6	7	GS/GM 15	2	2	GS/GM 15	0	0	GS/GM 15	0	0	GS/GM 15	1	0	GS/GM 15	1	0
GS/GM 14	0	0	GS/GM 14	6	7	GS/GM 14	36	28	GS/GM 14	3	3	GS/GM 14	2	0	GS/GM 14	3	1	GS/GM 14	0	0	GS/GM 14	3	1
OTHER GS/GM	2	0	OTHER GS/GM	36	28	OTHER GS/GM	0	0	OTHER GS/GM	0	0	OTHER GS/GM	36	28	OTHER GS/GM	16	26	OTHER GS/GM	0	0	OTHER GS/GM	16	26
WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0	WAGE	0	0
TOTAL	3	1	TOTAL	47	40	TOTAL	0	0	TOTAL	36	30	TOTAL	36	30	TOTAL	20	27	TOTAL	0	0	TOTAL	20	27

NASA HEADQUARTERS/
SPACE STATION
PROGRAM OFFICE

/



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1992 ESTIMATES

NASA HEADQUARTERS

DESCRIPTION

NASA Headquarters is located at 400 Maryland Avenue, S.W., 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, S.W., beginning in December, 1991.

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 - Plans, directs, executes, and evaluates the research, development, acquisition and operation of space flight programs, and the design, development, test evaluation and overall management of the Space Station Freedom program. Included in the space flight program is the Space Shuttle. The Space Shuttle Director, located at Headquarters, and his two Deputies, located at Johnson Space Center and Kennedy Space Center, have full responsibility and authority for operations and conduct of the Space Shuttle Program including budget, schedule, program requirements, engineering, and performance. They report directly to the Associate Administrator for Space Flight. Also included in the program are the orbiters, engines, external tanks, solid rocket boosters, and ground and flight systems.

The Office of Space Flight develops and implements policy for all system users to interface with the program, and promotes improvements in safety, reliability, and effectiveness of program operational performance. Responsibilities also include the use of Expendable Launch Vehicles for NASA and other civil government programs, Spacelab, upper stages, advanced programs, and other developmental space-based transportation programs. 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.

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 Flight coordinates user requirements for 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, 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 - 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. Responsibilities also include conducting research and development activities leading to demonstration and transfer of space-related technology and capabilities which can be effectively applied and used for practical benefits on Earth. These research and development activities involve the following program areas: earth observations, environmental observations, communications, material processing in space, and information systems.

Office of Aeronautics, Exploration and Technology - Plans, directs, executes, and evaluates the aeronautical and space research and technology programs, the National Aero-Space Plane (NASP) program, the Space Exploration Initiative and Exploration Mission Studies. The Aeronautics Research and Technology program develops technologies which are responsive to national aviation needs and which culminate in a safer, more efficient, economical and environmentally acceptable air transportation system. The Space Research and Technology program provides the enabling technologies validated at a level suitable for user readiness, for future space missions through basic and applied research programs. The objective of basic research is to gain a fuller knowledge and understanding of the fundamental aspects of phenomena and observables in critical disciplines. Applied research programs, developed and implemented based on requirements provided by the potential users of the technology, develop technology for specific applications and deliver products in the form of proven hardware, software and design techniques and data. The NASA portion of the National Aero-Space Plane program, a joint NASA/DOD program, will accelerate the development and validation of key

aerothermodynamics, airbreathing propulsion, and structural systems for transatmospheric vehicles. The Office of Aeronautics, Exploration and 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. The goal of the Space Exploration Initiative (SEI) is to expand human presence and activity beyond Earth's orbit into the Solar System. The SEI objectives are: to establish a human lunar outpost, to undertake a human mission to the planet Mars, to establish the technological, scientific, and institutional infrastructure needed to undertake exploration missions. In support of these broad objectives, Exploration Mission Studies will be conducted to provide the technical, programmatic, and cost analyses required to support a future national decision on a specific SEI architecture.

Office of Space Operations - Develops, implements, and operates tracking, data acquisition, command, communications, and data processing facilities, systems and services required for support of all **NASA** flight missions. This office also performs a management overview function for **NASA** administrative communications, and is responsible for developing a plan and organizational structure to manage **NASA's** spaceflight operations which would become effective when Shuttle recovery is complete.

Office of Safety and Mission Quality - The Office of Safety and Mission Quality (SMQ) plans, directs, implements, and evaluates that part of the overall **NASA** program concerned with systems assurance (including the functions of safety, reliability, maintainability and quality assurance, and quality and productivity improvements). Focusing on these activities will enhance operational success of **NASA** programs. The office also provides overall technical review of **NASA** programs and projects to ensure development efforts and mission operations are being conducted on a sound engineering basis with proper controls and attention to development risk.

Office of Commercial Programs - Provides a focus within **NASA** for an agencywide 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 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:

- o 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;
- o Administering operational and logistical support to those Headquarters elements concerned with carrying out the mission of the National Aeronautics and Space Administration; and
- o Providing adequate facilities to house the workforce in Washington, D.C.

The Headquarters workforce consists of professional, technical, administrative and clerical staff organized into the program offices indicated above and appropriate supporting staff offices. Funding for salaries, travel and necessary support services are included in this portion of the budget submission. Each office is assigned a function consistent with the NASA mission.

The number of personnel allocated to an office is determined by management based on the approved personnel ceiling for the Agency and the functions to be performed. The composition of the staff of an office is determined by the head of the office based on the office ceiling and the function to be performed. All personnel are appointed and paid consistent with classification standards established by the Office of Personnel Management (OPM). Overall Agency direction is provided by the Administrator, and his personal office staff. The Agency currently has eight installations, and the Jet Propulsion Laboratory, throughout the United States which perform Agency operational missions under direction of the Headquarters staff.

Technical support required by Headquarters is performed primarily by support contractors. Administrative support is provided by the in-house workforce assisted by miscellaneous contract services. Such support includes communications, printing, equipment, transportation, occupational medicine and health, and other administrative support services.

SPACE STATION FREEDOM PROGRAM OFFICE

The Space Station Freedom **organization** was modified during FY 1990. The Office of Space **Flight** and the Office of Space Station have been merged with one Associate Administrator for Space Flight with Directors for each of

the major programs. 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

The 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, and the Canadians. There are four prime work package contractors for the United 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, it 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 Flight 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 the 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 definition and control. Manages space operations facilities implementation, space 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. Serves as the Level II utilization and operations interface with the 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 TMS 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 II. Coordinates and tracks configuration control board activities. Baselines the program requirements and control changes to the baseline. Keeps program documentation updated.

Program 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 Programs 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			1992 BUDGET ESTIMATE
	1990 ACTUAL	BUDGET ESTIMATE	CURRENT ESTIMATE	
SPACE STATION..... (SPACE STATION PROJECT OFFICE - LEVEL II)	258 (207)	320 (264)	277 (220)	282 (220)
SPACE FLIGHT PROGRAMS.....	175	177	192	205
SPACE TRANSPORTATION CAPABILITY DEV...	27	27	38	38
SPACE SHUTTLE.....	148	150	154	167
SPACE SCIENCE AND APPLICATIONS.....	194	222	229	254
PHYSICS AND ASTRONOMY.....	57	64	65	65
LIFE SCIENCES.....	24	27	28	28
PLANETARY EXPLORATION.....	28	33	34	34
SPACE APPLICATIONS.....	85	98	102	127
AERONAUTICS EXPLORATION AND TECHNOLOGY..	128	148	154	158
AERONAUTICAL RESEARCH AND TECHNOLOGY..	56	66	68	69
SPACE RESEARCH AND TECHNOLOGY.....	65	74	78	81
TRANSATMOSPHERIC RESEARCH AND TECH....	7	8	8	8
COMMERCIAL PROGRAMS.....	36	41	44	46
SAFETY, RELIABILITY & QUALITY ASSURANCE.	72	81	94	94
ACADEMIC PROGRAMS.....	19	22	25	26
TRACKING AND DATA PROGRAMS.....	59	60	61	61
SUBTOTAL - DIRECT FULL-TIME PERM FTE's	941	1,071	1,076	1,130
CENTER MANAGEMENT AND OPERATIONS.....	698	794	850	900
SUBTOTAL - FULL-TIME PERM FTE's.....	1,639	1,865	1,926	2,030
OTHER FTE's.....	124	130	85	61
SUBTOTAL - FULL-TIME EQUIVALENTS.....	1,763	1,995	2,011	2,091
PROJECT CORE.....				116
GRAND TOTAL - FULL-TIME EQUIVALENTS..	1,763	1,995	2,011	2,207

SUMMARY OF RESOURCES REQUIREMENTS
FUNDING PLAN BY FUNCTION

	1990	1991		1992
		Actual	Budget Estimate	Current Estimate
I. PERSONNEL AND RELATED COSTS	119,079	151,254	144,871	165,696
II. TRAVEL	9,156	11,500	10,875	11,500
III. OPERATION OF INSTALLATION	146,587	169,869	145,572	174,538
A. Facilities Services	27,888	37,018	39,137	49,203
B. Technical Services	65,686	64,721	60,509	68,843
C. Management and Operations	53,013	68,130	45,926	47,406
D. Implementation of Project CORE	0	0	0	9,086
Total, Fund Requirement	274,822	332,623	301,318	351,734

1990 <u>Actual</u>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

RESOURCES REQUIREMENTS BY FUNCTION

I.	PERSONNEL AND RELATED COSTS	<u>119,079</u>	<u>151,254</u>	<u>144,871</u>	<u>165,696</u>
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Summary of Fund Requirements

A.	Compensation and Benefits				
1.	Compensation				
a.	Full-time permanent	86,088	108,278	107,842	121,300
b.	Other than full-time permanent	4,915	5,342	3,524	2,875
c.	Reimbursable detailees	418	518	440	462
d.	Overtime and other compensation	2,280	3,909	4,049	4,695
	Subtotal, Compensation	<u>93,701</u>	<u>118,047</u>	<u>115,855</u>	<u>129,332</u>
2.	Benefits	<u>13,676</u>	<u>17,598</u>	<u>17,844</u>	<u>22,891</u>
	Subtotal, Compensation and Benefits	<u>107,377</u>	<u>135,645</u>	<u>133,699</u>	<u>152,223</u>

		1990	1991		1992
		<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)					
B.	Supporting Costs				
1.	Transfer of personnel	3,233	5,164	2,643	3,844
2.	OPM Services	2,525	3,500	3,390	3,792
3.	Personnel training	5,944	6,945	5,139	5,837
	Subtotal, Supporting Costs	11,702	15,609	11,172	13,473
	Total, Personnel and Related Costs	119,079	151,254	144,871	165,696

Explanation of Fund Requirements

A. Compensation and Benefits

1. Compensation

a. Full-time permanent	86,088	108,278	107,842	121,300
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The change in compensation from the 1991 Budget Estimate to the 1991 Current Estimate results from the decrease in the average base cost per FTE due to 1990 staffing experience and revised cost projections for personnel pay actions in 1991. Compensation increases from the 1991 Current Estimate to the 1992 Budget Estimate are due to the planned increase in FTE, the full year effect of the 1991 pay raise, the 1992 general schedule and executive pay raises, agency SES bonuses, the effect of within-grade increases and promotions, and other personnel pay actions.

1990 <u>Actual</u>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

Basis of Cost for Permanent Positions

In 1992 the cost of permanent workyears will be \$121,300,000. The increase from 1991 results from the following:

Cost of full-time permanent workyears in 1991.....		\$107,842
Cost increases in 1992.....		8,112
Within grade and career advances:		
Full year effect of 1992 actions.....	961	
Partial year effect of 1992 actions.....	1,470	
Full year effect of 1991 pay raise.....	2,414	
Partial year effect of 1992 pay raise.....	3,267	
Cost Changes in 1992.....		5,346
Turnover Effects:		
Full year effect of 1991 actions.....	3,034	
Partial year effect of 1992 actions.....	1,790	
Extra paid days in 1992.....	522	
Cost of full-time permanent workyears in 1992.....		\$121,300

b.	Other than full-time permanent				
	(1) cost	4,915	5,342	3,524	2,875
	(2) Workyears	124	130	85	61

The distribution of 1992 workyears is as follows:

Distribution of Other Than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Development programs	23
Other temporary.....	38
Total.....	<u>61</u>

The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to the reductions in other than full-time permanent employment to accommodate Headquarters full-time permanent staffing plans. The Current Estimate has also been impacted by revised salary estimates based on 1990 experience. The decrease from the 1991 Current Estimate to the 1992 Budget Estimate is due to the further reduction of other than full-time permanent workyears.

c.	Reimbursable detailees	418	518	440	462
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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 decrease from the 1991 Budget Estimate to the Current Estimate is due to a decrease in the planned number of personnel employed in detailee assignments and revised salary estimates based on 1990 experience. The increase from 1991 to the 1992 Budget Estimate is due to normal salary growth for promotions and other pay adjustments.

1990 <u>Actual</u>	1991		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

d. Overtime and other compensation	2,280	3,909	4,049	4,695
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The increase from the 1991 Budget Estimate to the 1991 Current Estimate is due to adjustments in the agency SES bonus pool and pay and cost of living adjustments for overseas assignments. The increase from 1991 to the 1992 Budget Estimate is due primarily to an increase in the agency SES bonus pool.

2. Benefits	13,676	17,598	17,844	22,891
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The following are the NASA Headquarters costs for employee benefits by category:

Civil Service Retirement Fund.....	5,274	4,844	6,181	6,877
Federal Employee Retirement System.	1,818	3,283	2,985	4,614
Agency Thrift Plan Contributions...	413	1,018	682	1,142
Employee Life Insurance.....	185	215	211	235
Employee Health Insurance.....	3,128	4,296	3,878	4,683
Workers' Compensation.....	332	550	299	430
FICA.....	1,369	2,055	1,968	3,231
Medicare.....	858	949	1,263	1,286
Other benefits.....	<u>250</u>	<u>388</u>	<u>377</u>	<u>339</u>
Total.....	<u>13,627</u>	<u>17,598</u>	<u>17,844</u>	<u>22,891</u>

The changes from the 1991 Budget Estimate to the 1991 Current Estimate result from an increase in the number of employees covered by the benefits programs and revised rate estimates bases on 1990 experience and current assumptions for 1991. The increases from 1991 to 1992 for retirement costs are due to the general schedule and executive pay raises, the planned growth in the civil service workforce, and the continued growth in FERS participation. 1992 health benefits costs reflect increased rates and increased numbers of participants.

1990 <u>Actual</u>	1991		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

B. Supporting Costs

1. Transfer of Personnel	3,233	5,164	2,643	3,844
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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 and miscellaneous moving expenses related to change of duty station. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to the application of stricter criteria for the use of relocation services due to overall budget limitations. The increase from 1991 to the 1992 Budget Estimate is due to the growth in the number of relocations associated with the hiring effort in 1992 and relocation contract cost increases.

2. OPM Services	2,525	3,500	3,390	3,792
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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 OPM. Beginning in 1990 Headquarters began reimbursing the FBI for fingerprint checks required as part of the background investigations. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to revised cost estimates based on 1990 experience and deferral of some reinvestigations. The increase from 1991 to 1992 is due to anticipated increases in unit costs and the number of investigations.

3. Personnel Training	5,944	6,945	5,139	5,837
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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 decrease from the 1991 Budget Estimate to the Current Estimate is due to the limitation of appropriated funds. The increase from 1991 to 1992 results from inflationary increases in the current

	<u>1991</u>		1992
1990	Budget	Current	Budget
<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>

(Thousands of Dollars)

training programs, the need to increase agency wide mission-related training opportunities for a growing workforce, and the need for more management and executive development and program/project management training to prepare the next generation of NASA leaders to replace the current management/executive component.

	1990	1991		1992
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
	(Thousands of Dollars)			
II. TRAVEL	9,156	11,500	10,875	11,500

Summary of Fund Requirements

A. Program Travel	4,138	5,688	5,307	5,612
B. Scientific and Technical Development Travel	886	1,104	1,036	1,096
C. Management and Operations Travel	4,132	4,708	4,532	4,792
Total, Travel	9,156	11,500	10,875	11,500

Explanation of Fund Requirements

A. Program Travel	4,138	5,688	5,307	5,612
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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 decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to reductions in Space Station program activities, and a change in the planned number of shuttle launches. The 1992 estimate provides for inflationary changes 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.

<u>1990</u> <u>Actual</u>	<u>1991</u>		<u>1992</u>
	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>

(Thousands of Dollars)

B. Scientific and Technical Development Travel	886	1,104	1,036	1,096
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Scientific and technical development travel permits employees to participate in meetings and seminars with 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. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to a reduction in the anticipated number of trips based on reallocation of funds to meet Center priorities. The increase from 1991 to the 1992 Budget Estimate is due primarily to anticipated rate increases.

C. Management and Operations Travel	4,132	4,708	4,532	4,792
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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 for 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 decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to decreased number of trips as a result of reallocation of funds to meet Center priorities. The increase from 1991 to the 1992 Budget Estimate is due primarily to projected rate increases.

	<u>1990</u> <u>Actual</u>	<u>1991</u>		<u>1992</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
(Thousands of Dollars)				
III. OPERATION OF INSTALLATION	<u>146,587</u>	<u>169,869</u>	<u>145,572</u>	<u>174,538</u>
Summary of Fund Requirements				
A. Facilities Services				
1. Rental of Real Property	17,689	19,365	18,855	21,410
2. Maintenance and Related Services	9,255	16,535	19,421	26,834
3. Custodial Services	944	1,118	861	959
4. Utility Services	0	0	0	0
Total, Facilities Services	<u>27,888</u>	<u>37,018</u>	<u>39,137</u>	<u>49,203</u>
B. Technical Services				
1. Automatic Data Processing	42,555	43,101	38,653	44,018
2. Scientific and Technical Information	20,772	16,780	18,582	21,247
3. Shop and Support Services	2,359	4,840	3,274	3,578
Total, Technical Services	<u>65,686</u>	<u>64,721</u>	<u>60,509</u>	<u>68,843</u>

	1990 <u>Actual</u>	<u>1991</u>		1992
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
(Thousands of Dollars)				
C. Management and Operations				
1. Administrative Communications	16,502	12,739	12,060	12,298
2. Printing and Reproduction	3,522	3,387	4,371	3,721
3. Transportation	1,899	15,631	2,136	2,214
4. Installation Common Services	31,090	36,373	27,359	29,173
Total, Management and Operations	53,013	68,130	45,926	47,406
D. Implementation of Project CORE	0	0	0	9,086
Total, Operation of Installation	146,587	169,869	145,572	174,538

Explanation of Fund Requirements

Operation of Installation provides 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).

1990 <u>Actual</u>	<u>1991</u>		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

A. Facilities Services

1. Rental of Real Property	17,689	19,365	18,855	21,410
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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. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is result of cost savings from assuming the SSPO building lease from the Jet Propulsion Laboratory. The increase from the 1991 Budget Estimate to the 1992 Budget Estimate is due to increased rates, additional leased space and the costs of dual leases during transition to the new Headquarters office facility located at 300 E Street, S.W. Transition to the new building will begin around December 1991.

2. Maintenance and Related Services	9,255	16,535	19,421	26,834
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This estimate includes maintenance, repair and alterations of buildings such as partition changes, auxiliary air conditioning systems for ADP equipment, telephone changes and general buildings maintenance. The increase from the 1991 Budget Estimate to the 1991 Current Estimate is due a revised estimate for interior design and construction of the new Headquarters office building and for other costs associated with the building consolidation project. The increase from the 1991 Current Estimate to the 1992 Budget Estimate is due primarily to building consolidation costs including open landscape furniture and equipment purchases, and logistic support services for the new building. (Headquarters will be required to provide maintenance and facilities operations support for both the current leased offices and the new building until the transition to the new building is completed.)

1990 <u>Actual</u>	1991		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

3. Custodial Services	944	1,118	861	959
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These funds cover security guard and safety support services in the various Headquarters buildings. They also include reimbursement to GSA for the installation and maintenance of security alarm systems and equipment in the NASA Headquarters buildings. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to the conversion of contract positions to civil service positions. The increase from the 1991 Current Estimate to the 1992 Budget Estimate is due to the acquisition of supplies and materials for the agency security program.

B. Technical Services

1. Automatic Data Processing	42,555	43,101	38,653	44,018
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This estimate provides 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). The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to conversion of contractor positions. These positions have been targeted as Government civil service functions for ADP operations support dealing with policy and acquisition. Deferral of planned ADP acquisitions and support as a result of overall budget constraints have also added to the decrease. The increase from the 1991 Current Estimate to the 1992 Budget Estimate reflects contractor rate increases, development and maintenance costs for the agencywide accounting and financial information system and other agency ADP systems, upgrading of central computing facility hardware, life cycle replacement of ADP hardware and software throughout Headquarters offices (curtailed for the previous 2 years due to funding constraints), and relocation of the central computer facility to the new Headquarters office building.

2. Scientific and Technical Information	20,772	16,780	18,582	21,247
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1990 <u>Actual</u>	<u>1991</u>		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

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2. Scientific and Technical Information	20,772	16,780	18,582	21,247
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1990 <u>Actual</u>	1991		1992
	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>

(Thousands of Dollars)

The activities contained in this subfunction are 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 provide 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 supports equal employment opportunity exhibits and films to relate the key roles that women and minorities have in the United States space program.

The increase from the 1991 Budget Estimate to the 1991 Current Estimate is due primarily to increased funding for the NASA exhibits program. The increase in the 1992 Budget Estimate reflects an increased level of effort in support contracts, rate increases for the projected cost for the STIF operations follow-on contract, and the STIF modernization effort. 1992 funding also partially restores AIAA data retrieval accessions capability which has eroded in prior budget reductions.

3.	Shop and Support Services	2,359	4,840	3,274	3,578
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These funds provide for the continuation of studies on NASA-wide safety, reliability, and quality assurance standards, and graphic and photo processing services. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to deferral of equipment purchases due to funding limitations. The 1992 Budget Estimate provides funding for contract costs at the required level of support and funds some equipment deferrals from 1991.

C. Management and Operations

1.	Administrative Communications	16,502	12,739	12,060	12,298
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Included in this category are the costs of leased lines, long distance tolls, total agency FTS charges,

1990 <u>Actual</u>	<u>1991</u>		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

telephone exchange services, and other communications. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate results from elimination of the planned acquisition of a PABX system for the Space Station Program Office in Reston, Virginia. The increase from the 1991 Current Estimate to the 1992 Budget Estimate is due to projected rate increases.

2. Printing and Reproduction	3,522	3,387	4,371	3,721
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Administrative printing includes funds for contractual printing and the related composition and binding operations. This includes 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. The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects the new requirement to replace numerous obsolete photocopiers which are no longer cost effective to maintain. The 1992 Budget Estimate maintains a stable level of support in the printing function after the one-time acquisition costs in 1991.

3. Transportation	1,899	15,631	2,136	2,214
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Transportation services include rental of trucks, as well as the movement of supplies, materials, equipment and related items. Also included are the costs of operating and maintaining the administrative aircraft which are assigned to the Jet Propulsion Laboratory and Headquarters. The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to deferral of the planned replacement of the Marshall Space Flight Center administrative aircraft. The increase from the 1991 Current Estimate to the 1992 Budget Estimate reflect rate increases for aircraft maintenance and operations support for the Headquarters administrative aircraft.

4. Installation Common Services	31,090	36,373	27,359	29,173
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This function provides for those 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.

The decrease from the 1991 Budget Estimate to the 1991 Current Estimate due to conversion of contract

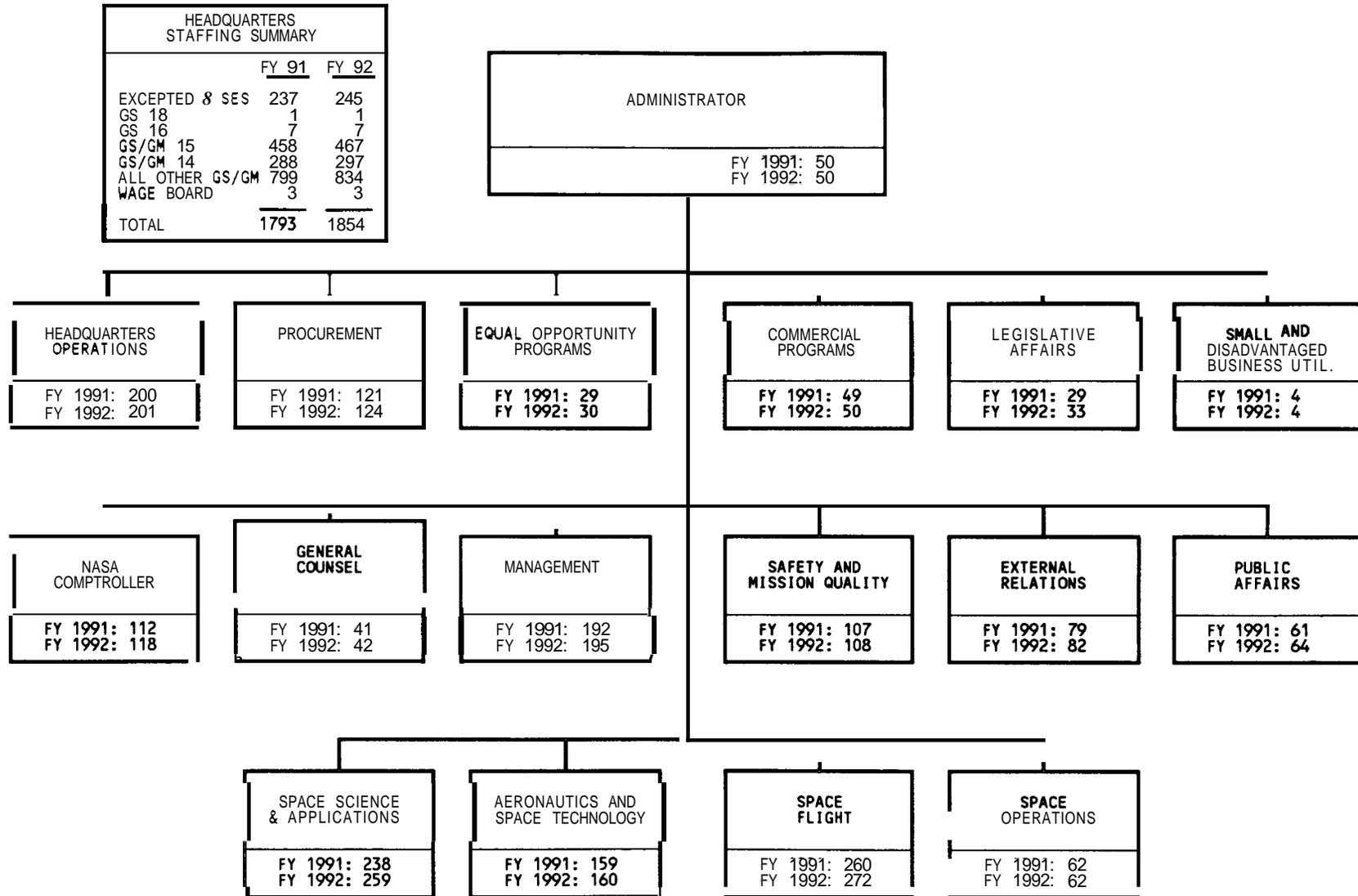
1990 <u>Actual</u>	1991		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)			

positions to the civil service, and elimination of planned levels of growth due to funding constraints. The increase from 1991 to the 1992 Budget Estimate is due to contract rate increases and growth in commercialization, space science, aeronautics, space station, and space flight technical and administrative support.

D. Implementation of Project CORE	0	0	0	9,086
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During 1992, NASA Headquarters Center plans to convert 206 positions (estimated to consume 116 FTE in 1992) from contractors to civil servants. These funds will be transferred into Personnel and Related Costs to cover the actual civil service salaries when the contractors, or their replacements, come on board as civil servants. They will also be transferred to Travel and Operation of Installation to cover the travel expense of these positions and to provide the necessary accommodations -- desks, supplies, personal computers, etc. -- needed to bring them into the Center workforce. In the event that circumstances beyond our control prevent us from having the full civil service complement in place at the date of the planned termination of the contracted functions, some of these funds will be used to provide for a continuation of the contractor support until the civil service transition can be completed.

ORGANIZATION AND STAFFING
NASA HEADQUARTERS



NOTE: DATA REPRESENTS ESTIMATED PAID ON-BOARD EMPLOYEES AT END OF FISCAL YEAR.

DP/01/10/91

ORGANIZATION AND STAFFING
NASA HEADQUARTERS

SPACE STATION FREEDOM PROGRAM OFFICE (LEVEL II) STAFFING SUMMARY		
	FY 91	FY 92
EXCEPTED & SES	28	30
GS/GM 15	73	76
GS/GM 14	51	53
ALL OTHER GS/GM	74	76
TOTAL	226	235

SPACE STATION FREEDOM PROGRAM OFFICE (LEVEL II)	
	FY 1991: 226
	FY 1992: 235

NOTE: DATA REPRESENTS ESTIMATED PAID ON-BOARD EMPLOYEES AT END OF FISCAL YEAR

DP/01/10/91

RPM 9-27

INSPECTOR GENERAL

INSPECTOR GENERAL

FISCAL YEAR 1992 ESTIMATES

OFFICE OF INSPECTOR GENERAL

DESCRIPTION

The NASA Office of Inspector General (OIG) is located at 400 Maryland Avenue, SW, Washington, D.C.. The OIG field locations include offices at Ames Research Center, California; Goddard Space Flight Center, Maryland; Headquarters, Washington, D.C.; Jet Propulsion Laboratory, California; Johnson Space Center, Texas; Kennedy Space Center, Florida; Langley Research Center, Virginia; Lewis Research Center, Ohio; and Marshall Space Flight Center, Alabama.

ROLES AND MISSIONS

The NASA Office of Inspector General (OIG), was created by the Inspector General Act of 1978 (P.L. 95-452) as amended, as an independent and objective unit within NASA to: conduct audits and investigations of NASA's programs and operations; promote economy, efficiency, and effectiveness in the administration of programs and operations; prevent and detect fraud, waste, and mismanagement in these programs and operations; and keep the Administrator and the Congress fully and currently informed about NASA programs, deficiencies relating to the administration of such programs, and the necessity for and progress of corrective actions. The OIG'S emphasis and resources are being applied selectively and on a priority basis to ensure that NASA's programs, operations, and initiatives meet established objectives and are carried out effectively and efficiently. The OIG performs these critical oversight and evaluation functions by conducting audits and investigations in all areas of NASA's programs and operations.

BASIS OF FY 1992 ESTIMATE

The OIG will prioritize audit coverage of the most critical and vulnerable activities on the basis of available funding, program needs and characteristics, Congressional/Administration/public concerns, and prior audit coverage and results. Investigations will continue to focus on the most serious allegations of criminal or fraudulent activity in the Administration's programs and operations.

The OIG staffing level remained constant at 136 FTEs for the period FY 1988-FY 1990 with an increase of 25 FTEs in FY 1991. The proposed FY 1992 budget reflects an increase of 35 FTEs; of these, 25 FTEs are required in FY 1992 to enable the OIG to more effectively fulfill its responsibilities of conducting audits and investigations of NASA's programs and operations and an additional 10 FTEs are required to hire auditors to develop and implement a process for auditing NASA's annual financial statements. Financial Statements are now required by legislation which has not existed before, so the requested funds and FTEs are estimates to begin the program. Future requests will more accurately reflect the full workload.

Expected growth in NASA's programs and operations will require additional OIG staff to provide oversight of those areas most vulnerable to fraud and abuse. Additional staffing is needed to provide a reasonable level of assurance that NASA's internal control weaknesses are identified early to ensure that timely corrective actions can be implemented. The areas requiring additional OIG emphasis include: support contracting activities, procurement and contract management, information resource management, program/project planning, management and accomplishment, safety and mission quality, commercialization, and financial management.

OBJECTIVES AND STATUS

OIG audit workload is defined primarily in a structured, internal audit universe which encompasses all of NASA's programs and operations; and an external universe comprised of NASA's prime contractors, their subcontractors and grantees. The OIG audit program prioritizes internal and external audits to maximize the return on available audit resources. Ideally each universe should be provided audit coverage on a three year cycle. At the FY 1991 audit staffing level, the OIG is operating on an 18 year internal audit cycle which is unacceptable. Additionally, the growth in NASA's programs increases the external contractor and subcontractor procurement environment which increases the need for OIG oversight and audit emphasis to determine cost, schedule and performance effectiveness. This overwhelming audit workload requires continual prioritization of available staff to provide balanced coverage of programs and operations most susceptible to abuse and mismanagement.

NASA's continued reliance on contractors and grantees (approximately 88 percent of the agency's total obligations are allocated to procurement) requires direct OIG audit emphasis and oversight of DCAA's audit results to ensure effective contract execution and administration. NASA is currently reimbursing DCAA approximately \$11 million annually to provide audit assistance to its contracting officers.

The additional audit resources will enable the OIG to improve the scope, timeliness and thoroughness of its oversight of NASA's programs and operations and enhance its capability to assist NASA management to achieve program goals. As existing NASA programs expand and new projects start, OIG's already severely constrained oversight and evaluation efforts must also increase. This in turn requires additional OIG staff. Procurement management, including contract management and administration, will remain an OIG audit priority. Additional audit emphasis is needed to assess program and operational effectiveness based on cost impact and potential vulnerabilities to waste and mismanagement considering the following: cost estimating system effectiveness in identifying and controlling cost overruns; whether program/project objectives are met in a 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; adequacy of the audit follow-up system to inform management of the status of corrective actions; completeness of safety and mission quality activities relating to the programs and operations being audited; and the adequacy of agency-wide corrective actions addressing environmental concerns.

The OIG investigations program is focused primarily on complex white collar criminal cases - fraud against the Government (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 case load. In addition, the non-criminal case workload 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 expand faster than the growth in our investigative resources. This workload growth has created an investigative program that has been predominantly reactive with priority emphasis given to the more serious criminal allegations. The current investigative staffing level does not allow sufficient flexibility to effectively respond to this increasingly complex workload. As the number of complex cases continues to increase each case takes longer to resolve, further reducing our management flexibility to improve and expand the program. Compounding the increasing and more complex case workload is an associated increase in the quantity of investigative allegations. These allegations require a preliminary evaluation to determine their potential impact and, if serious, opening an investigation; further adversely affecting the timely completion of the ongoing caseload. The FY 1992 request would allow for an investigative staffing increase to enhance program 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 subassemblies; implementing proactive initiatives having potential for fraud and mismanagement; reducing average case duration; and maintaining a quality and manageable caseload of criminal allegations. Increased investigative staff will reduce vulnerabilities and risks and improve agency operations.

The growth in NASA's budget, programs, and operations creates a corresponding OIG audit and investigative workload. This additional workload generates the need for additional funds to provide: necessary and mandated training; increased travel; personnel management and legal support; and the equipment and information systems the OIG uses to function most productively while meeting mission requirements.

FISCAL YEAR 1992 CONGRESSIONAL BUDGET

DISTRIBUTION OF PERMANENT WORKYEARS BY PROGRAM

	1990 <u>Actual</u>	<u>1991</u>		1992
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
<u>INSPECTOR GENERAL</u>				
Full-time permanents	135	161	161	196
Other controlled FTE'S	<u>9</u>	<u>10</u>	<u>10</u>	<u>10</u>
Total (full-time equivalents)	<u>144</u>	<u>171</u>	<u>171</u>	<u>206</u>

SUMMARY OF RESOURCES REQUIREMENTS

FUNDING PLAN BY FUNCTION

	1990	1991		1992	Page
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>	<u>Number</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	
		(Thousands of Dollars)			
I. Personnel and related costs.....	7,869	10,037	9,667	13,130	IG-6
11. Travel.....	370	475	475	720	IG-10
111. Operation of installations.....	284	488	358	750	IG-10
A. Facilities services.....	(--)	(--)	(--)	(--)	
B. Technical services.....	(247)	(406)	(278)	(455)	
C. Management and operations.....	<u>—(37)</u>	<u>—(82)</u>	<u>—(80)</u>	<u>—(295)</u>	
Total, fund requirement.....	<u>8,523</u>	<u>11,000</u>	<u>10,500</u>	<u>14,600</u>	

RESOURCES REQUIREMENTS BY FUNCTION

	1990	<u>1991</u>		1992
	<i>Actual</i>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
I. PERSONNEL AND RELATED COSTS...	<u>7.869</u>	<u>10.037</u>	<u>9.667</u>	<u>13.130</u>

Summary of Fund Requirements

A. Compensation and Benefits

1. Compensation

a. Full-time permanent.....	5,986	7,736	7,297	9,800
b. Other than full-time permanent.....	287	210	200	200
c. Overtime and other compensation....	<u>92</u>	<u>105</u>	<u>100</u>	<u>105</u>
Subtotal.....	6,365	8,051	7,597	10,105

2. <u>Benefits</u>	<u>1.003</u>	<u>1.203</u>	<u>1.320</u>	<u>1.612</u>
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Subtotal, Compensation & Benefits..	<u>7.368</u>	<u>9.254</u>	<u>8.917</u>	<u>11.717</u>
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B. Supporting Costs

1. Transfer of personnel.....	425	650	670	1,200
2. Personnel training.....	76	86	70	165
3. OPM Services.....	<u>--</u>	<u>47</u>	<u>10</u>	<u>48</u>

Subtotal, Support Costs.....	<u>501</u>	<u>783</u>	<u>750</u>	<u>1.413</u>
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Total, Personnel and Related Costs.	<u>7.869</u>	<u>10.037</u>	<u>9.667</u>	<u>13.130</u>
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Explanation of Fund Requirements

	1990 <u>Actual</u>	1991		1992
		Budget Estimate	Current Estimate	Budget Estimate
		(Thousands of Dollars)		
A. <u>Compensation and Benefits</u>	<u>7.368</u>	<u>9.254</u>	<u>8.917</u>	<u>11.717</u>
1. <u>Compensation</u>	<u>6.365</u>	<u>8.051</u>	<u>7.597</u>	<u>10.105</u>
a. Full-time permanent	5,986	7,736	7,297	9,800

Basis of Cost for Permanent Positions

In 1992 the cost of permanent workyears will be \$9,800,000. The increase from 1991 results from the following:

Cost of full-time permanent workyears in 1991		7,297
Cost changes in 1992		2,603
Within-grade and career advances:		
Full year effort of 1991 actions	+130	
Partial year effect of 1992 actions	+204	
Additional FTE	+1,750	
Full year effect of 1991 pay raise	+163	
Partial year cost of 1992 pay raise	+318	
Additional day	+38	
Turnover Effect		-100
Full year 1991 effect	-60	
Part year 1992 effect	-40	
Cost of full-time permanent workyears in 1992		9,800

	1990 <i>Actual</i>	1991		1992
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
b. Other than full-time permanent				
(1) cost...	287	210	200	200
(2) Workyears.....	9	10	10	10
c. Overtime and other compensation....	92	105	100	105
2. <u>Benefits</u>	1,003	1,203	1,320	1,612

Contributions by category:

Retirement fund and thrift plan.....	574	704	766	922
Employee life insurance.....	13	17	17	17
Employee health insurance.....	255	296	330	419
Workmen's compensation.....	--	20	16	20
FICA.....	95	86	99	122
Medicare.....	<u>66</u>	<u>80</u>	<u>92</u>	<u>112</u>
Total.....	<u>1,003</u>	<u>1,203</u>	<u>1,320</u>	<u>1,612</u>

The increase from the 1991 budget to the 1992 estimate reflects the latest projected staffing levels. The FY 1991 current estimate change in breakdowns reflects actual experience in FY 1990.

B. Supporting costs.....	<u>501</u>	<u>783</u>	<u>750</u>	<u>1,413</u>
1. Transfer of personnel.....	425	650	670	1,200

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 increase from the 1991 budget estimate to the 1991 current estimate reflects higher than anticipated moving expenses. The FY 1992 figure reflects the costs of additional requested FTE and the escalating costs associated with change of station moves.

	1990 <u>Actual</u>	<u>1991</u>		1992
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
2. Personnel training.....	76	86	70	165

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 decrease in funding from FY 1991 budget to current estimate is due to the Congressional reduction. The increase in 1992 is needed to fund training requirements resulting from a 1988 revision to the GAO audit standards, training for Financial Management Audits, and requested additional FTE.

3. OPM services (Headquarters only)...	--	47	10	48
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The costs associated with the Office of Personnel Management's (OPM) investigation of new hires for the Office of Inspector General is included here. In FY 1991, NASA will be conducting some investigations of new hires due to a backlog at OPM. OPM will conduct a larger portion of these investigations in FY 1992.

	1990 <i>Actual</i>	1991		1992 Budget Estimate
		Budget Estimate (Thousands of Dollars)	Current Estimate	
11. TRAVEL.....	<u>369</u>	<u>475</u>	<u>475</u>	<u>720</u>

Summary of Fund Requirements

Travel funding is required to carry out audit, investigation and management duties. The increase from the current estimate in 1991 to the 1992 budget estimate is due to additional FTE and increased airline costs.

111. OPERATION OF INSTALLTIONS.....	<u>284</u>	<u>488</u>	<u>358</u>	<u>750</u>
Technical services.....	247	406	278	455
Management and operations.....	37	82	80	295

Explanation of Fund Reuirements

Operation of Installation provides a broad range of services and equipment in support of the Inspector General's activities.

A. Technical services.....	<u>247</u>	<u>406</u>	<u>278</u>	<u>455</u>
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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 Office of Inspector General. 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 EDP system.

	1990 <i>Actual</i>	1991		1992
		Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
B. Management and Operations.....	<u>37</u>	<u>82</u>	<u>80</u>	<u>295</u>

Summary of Fund Requirements

1. Administrative communications.....	--	--	--	--
2. Printing and reproductions.....	--	--	--	--
3. Installation common services.....	37	82	80	295

Explanation of Fund Requirements

<u>Administrative Communications</u>	<u>--</u>	<u>--</u>	<u>--</u>	<u>--</u>
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The costs of telephone services for the Inspector General's office are provided at no charge to the Inspector General by NASA.

<u>Printing and Production</u>	<u>--</u>	<u>--</u>	<u>--</u>	<u>--</u>
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Costs of printing and reproduction services used by the Office of Inspector General are provided at no charge to the Inspector General by NASA.

<u>Installation Common Services</u>	<u>37</u>	<u>82</u>	<u>80</u>	<u>295</u>
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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.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

OFFICE OF INSPECTOR GENERAL

WORKLOAD

	1990 <u>Actuals</u>	1991 Estimate	1992 Estimate
Office Staff Ceiling			
Full-Time Permanents	136	161	196
<u>Investigations</u>			
Cases pending beginning of year.....	303	342	392
Opened during year.....	289	357	425
Closed during year.....	250	307	364
Cases pending end of year.....	342	392	453
<u>Audits</u>			
Audits pending beginning of year.....	62	67	62
Opened during year.....	64	74	82
Closed during year.....	59	79	88
Audits pending end of year.....	67	62	56

SPECIAL ANALYSES

1



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1992 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), McLean, Virginia (support to the Technology and Applications Programs Office), Reston, Virginia (technical and scientific support to the Space Station), and Washington, D.C. (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, 1990, was \$789,675,899.

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, except for the lease or purchase of administrative aircraft and the purchase of passenger motor vehicles, which are funded from the Research and Program Management (R&PM) appropriation. 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 produced enormous scientific returns.

The Jet Propulsion Laboratory was a major participant in the Viking project. This involved the development of the two orbiters which, each carrying a lander, reached Mars during the summer of 1976. 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.

JPL also has project responsibility for the Voyager missions. The two Voyager spacecraft were launched in 1977 and made close flybys of Jupiter and its major satellites in 1979. In 1980 and 1981, both spacecraft encountered Saturn. Each of these historic encounters resulted in major scientific discoveries and obtained unique data. Both spacecraft remained in good operating condition following the Saturn encounters, and, therefore, the Voyager mission was extended well beyond its original objectives. Voyager 2 was targeted to a flyby of Uranus, which occurred in January 1986, with highly satisfactory scientific results, and completed its "grand tour" of the solar system with a flyby of Neptune in August 1989. Meanwhile, Voyager 1 continues to collect and transmit data on the interplanetary space environment as it proceeds out of the solar system.

The Laboratory also has project responsibility for the Galileo mission, which will arrive at Jupiter and send an instrumented probe into the planet's atmosphere in 1995. The probe 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.

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 will extend over one Venusian year equal to 243 earth days. JPL is managing 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, and conducts the corresponding data analysis. JPL also provides mission support to ESA. ESA developed the spacecraft and a set of its own instruments. Ulysses was launched successfully in October 1990, enroute for a gravity-assist at Jupiter in February 1992.

The Mars Observer mission will study the composition and physical state of Martian materials, examine the major surface forming processes and their time scales, and explore the structure and circulation of the atmosphere. JPL has management responsibility for the scientific payload, and has contracted with industry for development of the spacecraft bus. Mars Observer is scheduled for a September 1992 launch.

JPL also manages the Comet Rendezvous and Asteroid Flyby (CRAF)/Cassini mission. The CRAF spacecraft will rendezvous with a comet and conduct remote sensing Observations and measurements. It will determine the chemical, physical, and geological states of the cometary nucleus, and will characterize the chemical and physical natures of the coma (dust, gas, and plasma). CRAF will also determine the processes of the comet tail formation and dynamics, and characterize the interactions with radiation and the solar wind. CRAF's trajectory will also enable the spacecraft to flyby an asteroid, thus characterizing the physical and geological structure, determining the major mineralogical phases on the surface and their spatial distribution, measuring the mass and density of the body, and characterizing the physical properties of the surface.

The Cassini mission will conduct an extensive investigation of the planet Saturn. The primary scientific goals are 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. The JPL Visible Infrared Mapping Spectrometer (VIMS), Titan Radar Mapper, and Imaging Science Subsystem are being developed for Cassini.

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 II, with lenses to correct the spherical aberration of the Hubble, will be delivered/installed in orbit in 1993.

In 1990, NASA selected JPL to manage the Space Infrared Telescope Facility (SIRTF), the last one of NASA's family of great observatories in space. SIRTF is a one-meter cryogenically cooled telescope for infrared astronomy which will provide a thousand-fold gain in sensitivity and discoveries of the physical conditions of the early solar system, prevalence of planetary systems in nearby stars, formation of solar-like stars, and galaxy formation and evolution. Definition phase work is under way toward a projected new-start readiness in the mid-1990's.

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), a cooperative effort with the French in the TOPEX/Poseidon Project, to develop and launch a 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 June 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 II, the Shuttle Imaging Radar-C, and the NASA Scatterometer on ADEOS. In addition, a variety of instruments are being studied and developed for the Earth Observation System (EOS). Geodynamics and plate tectonics are two other important areas of research in space applications. Microgravity experiments being developed for Shuttle flights include the Drop Physics Module and the Lambda Point Experiment.

Spacecraft Flight Operations - 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 are located in California, Spain, and Australia, and 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.

Research and Analysis - 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 1992 SIMULATED RESEARCH AND PROGRAM MANAGEMENT (R&PM)
 DISTRIBUTION OF PERMANENT WORKYEARS BY PROGRAM

	1990	1991		1992
	<u>Actual Workyears</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
<u>Space Station</u>	<u>68</u>	<u>84</u>	<u>70</u>	<u>77</u>
<u>Space Flight Proerams</u>	<u>20</u>	<u>27</u>	<u>20</u>	<u>22</u>
Space Transportation Capability Dev.....	11	18	11	12
Space Shuttle.....	9	9	9	10
<u>Space Science and Applications</u>	<u>1.890</u>	<u>1.861</u>	<u>1.944</u>	<u>2.142</u>
Physics and Astronomy.....	146	113	150	165
Life Science.....	13	11	13	14
Planetary Exploration.....	1,115	1.146	1.147	1.265
Space Applications.....	616	591	634	698
<u>Commercial Programs</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>
<u>Aeronautics Exploration and Technoloey</u>	<u>179</u>	<u>201</u>	<u>184</u>	<u>202</u>
Aeronautics R&T.....	4	2	4	4
Space R&T.....	175	199	180	198
<u>Safetv. Reliabilitv. Maintainabilitv & Quality Assurance (OSRMOA)</u>	<u>24</u>	<u>24</u>	<u>25</u>	<u>28</u>
<u>Trackine and Data Advanced Svstems</u>	<u>461</u>	<u>451</u>	<u>474</u>	<u>522</u>
<u>DIRECT SUPPORT</u>	<u>534</u>	<u>532</u>	<u>571</u>	<u>563</u>
<u>CENTER MANAGEMENT AND OPERATIONS</u>	<u>1.447</u>	<u>1.431</u>	<u>1.509</u>	<u>1.516</u>
Total. Permanent Workyears.....	<u>4.628</u>	<u>4.616</u>	<u>4.802</u>	<u>5.077</u>

JET PROPULSION LABORATORY
 FY 1992 SIMULATED RESEARCH AND PROGRAM MANAGEMENT (R&PM)
 FUNDING PLAN BY FUNCTION

	1990	1991		1992
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		(Thousands of Dollars)		<u>Estimate</u>
I. PERSONNEL AND RELATED COSTS	309,265	329,764	338,059	378,242
11. TRAVEL.....	13,878	14,887	15,168	16,961
111. OPERATION OF INSTALLATION.....	57,822	72,943	63,933	72,660
A. Facilities Services.....	(25,346)	(31,717)	(27,052)	(29,990)
B. Technical Services.....	(13,157)	(13,278)	(13,914)	(14,693)
C. Management and Operations.....	(19,319)	(27,948)	(22,967)	(27,977)
Total, Fund Requirements.....	<u>380,965</u>	<u>417,594</u>	<u>417,160</u>	<u>467,863</u>

Explanation of Fund Reaquirements

I. PERSONNEL AND RELATED COSTS	309,265	329,764	338,059	378,242
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The increase from the 1991 Budget Estimate to the 1991 Current Estimate is due to the change in estimated workforce levels, revised salary estimates based on 1990 experience, and related benefit costs. The increase from the 1991 Current Estimate to the 1992 Estimate is due to normal salary increases, associated increases in personnel benefits, and the change in the estimated workforce level.

JET PROPULSION LABORATORY
 FY 1992 SIMULATED RESEARCH AND PROGRAM MANAGEMENT (R&PM)
 FUNDING PLAN BY FUNCTION

	1990	<u>1991</u>		1992
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
11. TRAVEL.....	13,878	14,887	15,168	16,961

The increase from the 1991 Budget Estimate to the 1991 Current Estimate is due to a reassessment of travel requirements based on current programmatic activities. The increase from the 1991 Current Estimate to the 1992 Budget Estimate reflects increased Travel Costs levels.

111. OPERATION OF INSTALLATION.....	57,882	72,943	63,933	72,660
A. Facilities Services.....	(25,346)	(31,717)	(27,052)	(29,990)

The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is primarily attributable to reductions in rents, services, supplies and materials, and equipment costs. The net increase from the 1991 Current Estimate to the 1992 Budget Estimate is due to higher services, supplies and materials, and equipment costs.

B. Technical Services.....	(13,157)	(13,278)	(13,914)	(14,693)
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The increase from the 1991 Budget Estimate to the 1991 Current Estimate reflects a revised estimate of technical services based on institutional requirements which are expected to continue in future fiscal years. The increase from the 1991 Current Estimate to the 1992 Budget Estimate results from expected price changes.

C. Management and Operations.....	(19,319)	(27,948)	(22,967)	(27,977)
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The decrease from the 1991 Budget Estimate to the 1991 Current Estimate is due to revised estimates for supplies and materials, and equipment. The increase from the 1991 Current Estimate to the 1992 Budget Estimate is due to increased business volume, and price increases.

RESEARCH AND DEVELOPMENT
 FISCAL YEAR 1992 ESTIMATES
 BUDGET SUMMARY

OFFICE OF AERONAUTICS, EXPLORATION AND TECHNOLOGY

AIR TRANSPORTATION

SUMMARY OF RESOURCES REQUIREMENTS

	1990 <u>Actual</u>	1991		1992
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
Research and development.....	472,112	571,500	559,500	627,200
Construction of facilities.....	61,300	56,000	46,000	51,600
Research and program management.....	<u>313.518</u>	<u>377.900</u>	<u>371.270</u>	<u>396.820</u>
 Total.....	<u>846.930</u>	<u>1.005.400</u>	<u>976.770</u>	<u>1.075.620</u>
 Number of direct workyears associated with air transportation	3,210	3,394	3,354	3,366

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 commercial 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 1992 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 bold strategic thrusts: (1) develop selected, high-leverage technologies for 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 fixed- and rotary-wing aircraft; (4) develop critical technologies for future hypersonic vehicles; (5) pioneer fundamental research, crosscutting technology development, and validation of numerical simulation techniques to maintain the theoretical, experimental, and predictive foundation required for advanced systems; and (6) develop, maintain and operate critical national facilities for aeronautical research and for support of industry, Department of Defense (DOD) and other NASA 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 Department of Defense. One half of the NASA funding for this effort is allocated to the air transportation funding. 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 1992 provides for the salaries and travel of 3,366 direct civil service workyears, for the utilities necessary to conduct wind tunnel operations, and for other general operation of installation costs necessary to conduct the NASA aeronautics and transatmospheric research and technology programs.

The construction of facilities funding in FY 1992 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 1992

SUMMARY OF CONSUL SERVICES ESTIMATES

	1990 Actual	<u>1991</u> Budget Current <u>Estimate</u> <u>Estimate</u>		1992 Budget <u>Estimate</u>
		(Thousands of Dollars)		
<u>Research and Proeram Management</u>				
Consultants employed by NASA.....	494	1,300	1,300	1,300
Contractual Services.....	<u>3.222</u>	<u>400</u>	<u>5.697</u>	<u>6.426</u>
Subtotal.....	3,716	1,700	6,997	7,726
<u>Research and Development</u>				
Contractual Services..	7,619	2,500	10,012	11,254
<u>Space Flight, Control and Data Communications</u>				
Contractual Services.....	1,275	0	1,449	548
Total, NASA.....	12,610	4,200	18,458	19,528

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:

1990 <u>Actual</u>	<u>1991</u>		1992
	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

Research and Program Management

Consultants Employed by NASA....	494	1,300	1,300	1,300
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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...	3,222	400	5,697	6,426
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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

<u>Contractual Services</u>	7,619	2,500	10,012	11,254
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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 1992, 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.

	1990	1991		1992
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
<u>Space Flight, Control and Data Communications</u>				
Contract Services.....	1,275	0	1,440	548

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.

**FY 1992 CONGRESSIONAL BUDGET
DETAIL OF PERMANENT POSITIONS**

NASA AGENCY	FY 1990 ACTUAL	FY 1991 ESTIMATE	FY 1992 ESTIMATE
Erooutlvr level II	1	1	1
Erooutlvr level III	1	1	1
Executive level V	0	0	0
Subtotal	2	2	2
ES-6	42	47	48
ES-5	128	135	140
ES-4	288	321	327
ES-3	32	35	35
ES-2	22	29	30
ES-1	11	13	14
	523	580	594
GS-18	1	1	1
OS-16	12	17	19
GS/GM-15	2,200	2,329	2,348
OS/GM-14	3,582	3,677	3,702
GS/OM-13	5,174	5,369	5,374
OS-12	3,587	3,723	3,702
GS-11	2,293	2,340	2,333
OS-10	325	333	330
GS-09	1,293	1,310	1,309
OS-08	322	326	329
OS-07	1,107	1,112	1,097
OS-06	698	714	697
OS-05	1,161	1,173	1,150
OS-04	306	300	301
OS-03	62	81	79
OS-02	9	13	15
	22,140	22,826	22,786
SPECIAL UNOAADED POSITIONS ESTABLISHED BY THE NASA ADMINISTRATOR	10	14	17
UNQRAOED POSITIONS	824	767	736
TOTAL PERMANENT POSITIONS	23,499	24,189	24,135
UNFILLED POSITIONS, EOY	0	0	0
TOTAL PERM EMPLOYMENT, EOY	23,499	24,189	24,135

1992 CONGRESSIONAL BUDGET

PERSONNEL SUMMARY

	FY 1990	FY 1991	FY 1992
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AVERAGE GS/GM GRADE	11.6	11.6	11.6
AVERAGE ES SALARY	\$79,395	\$101,206	\$106,266
AVERAGE GS/GM SALARY	\$44,286	\$45,614	\$46,982
AVERAGE SALARY OF SPECIAL UNGRADED POSITIONS ESTAB- LISHED BY NASA ADMINISTRATOR	\$77,736	\$80,068	\$82,470
AVERAGE SALARY OF UNGRADED POSITIONS	\$33,230	\$34,227	835,254

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
 ESTIMATED FY 1992 EQUIPMENT OBLIGATIONS TO BE PUCED
 AT NASA INSTALLATIONS

<u>PROGRAM BUDGET LINE ITEM</u>	<u>(THOUSANDS OF DOLLARS)</u>
<u>RESEARCH AND DEVELOPMENT</u>	<u>\$473,641.3</u>
Space Station	177,880.0
Space Transportation Capability Development	102,470.6
Physics and Astronomy	3,128.9
Life Sciences	5,469.8
Planetary Exploration	9,577.0
Space Applications	61,521.9
Aeronautical Research and Technology	99,534.2
Transatmospheric Research and Technology	2,664.1
Space Research and Technology	11,394.8
<u>SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS</u>	<u>208,494.2</u>
Shuttle Production and Capability Development	119,685.4
Space Transportation Operations	71,760.8
Space and Ground Network, Communications and Data Systems	17,048.0
GRAND TOTAL	<u>\$682,135.5</u>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
SPACE RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21FL-00, 890130	AEROSPACE HUMAN FACTORS RESEARCH DIVISIO-DYNAMIC RASTER GRAPHICS SYSTEM 239/62	SPACE R&T BASE	281.3
SPACE RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21F1-00, 920018	INFORMATION SCIENCES DIVISION- HARDWRE PURCHASE V014	CIVIL SPACE TECH INITIATIVE (CSTI) PROGRAM	1038.6
SPACE RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21RT-00, 920042	THERHOSCIENCES DIVISION- HARDUARE PURCHASE RTSUTS	SPACE R&T BASE	324.6
SPACE RESEARCH & TECHNOLOGY	JET PROPULSION LABORATORY LOCATION 5517-1P, 920080	TECHNICAL DATA PROC. SUPPORT SYSTEMS-MGR STN DN570 TO SUPPORT AUTOHATION & ROBOTICS	AUTOMATION AND ROBOTICS	260.0
SPACE RESEARCH & TECHNOLOGY	JET PROPULSION LABORATORY LOCATION 5517-1P, 920082	TECHNICAL DATA PROC. SUPPORT SYSTEMS-MGR IDEA STATION DN3000 FOR AUTOMATION & ROBOTICS	AUTOMATION AND ROBOTICS	300.0

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
AERONAUTICAL RESEARCH & TECHNOLOGY	AHES RESEARCH CENTER LOCATION 21FL-00, 890138	AEROSPACE HUMAN FACTORS RESEARCH DIVISIO-SHALL OFFICE & LAB SYSTEMS 239/62	AERONAUTICS RLT BASE	422.0
AERONAUTICAL RESEARCH & TECHNOLOGY	AHES RESEARCH CENTER LOCATION 21FS-01, 890192	FLIGHT SYSTEMS AND SIMULATION (X048/X163)-PERFORMANCE IMPROVEMENTS X048	AERONAUTICS RLT BASE	512.9
AERONAUTICAL RESEARCH & TECHNOLOGY	AHES RESEARCH CENTER LOCATION 21FS-01, 890194	FLIGHT SYSTEMS AND SIMULATION (X048/X163)-REPLACEMENT HARDWARE X048	AERONAUTICS RLT BASE	541.0
AERONAUTICAL RESEARCH & TECHNOLOGY	AHES RESEARCH CENTER LOCATION 210F-00, 890240	RESEARCH ENGINEERING DIVISION- HARDWARE REHAB & MOD (BASELINE) OFTITF	AERONAUTICS RLT BASE	324.6
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21RN-00, 890370	NUMERICAL AERODYNAMIC SIMULATION SYSTEMS-DNS/LH COMMUNICATIONS (EAD) RNNPSN	NUMERICAL AERODYNAMIC SIMULATION (NAS)	768.2
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21RN-00, 890660	NUMERICAL AERODYNAMIC SIMULATION SYSTEMS-HIGH SPEED PROCESSOR 2(EAD) RNNPSN	NUMERICAL AERODYNAMIC SIMULATION (NAS)	9815.9
AERONAUTICAL RESEARCH & TECHNOLOGY	AHES RESEARCH CENTER LOCATION 21RN-00, 890662	NUMERICAL AERODYNAMIC SIMULATION SYSTEMS-HIGH SPEED PROCESSOR 3(EAD) RNNPSN	NUMERICAL AERODYNAMIC SIMULATION (NAS)	7591.3
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21RN-00, 890664	NUMERICAL AERODYNAMIC SIMULATION SYSTEMS-HIGH SPEED PROCESSOR 1(EAD) RNNPSN	NUMERICAL AERODYNAMIC SIMULATION (NAS)	2016.8
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21FF-00, 900122	FULL-SCALE AERODYNAMICS RESEARCH DIVISIO-HARDWARE PURCHASE FFRRTF	AERONAUTICS RLT BASE	541.0

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21RA-01, 900310	SUTDS, CODE RA-DATA ACQUISITION AND COMPUTER EQUIPMENT P034	AERONAUTICS R&T BASE	649.2
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21RN-00, 900358	NUMERICAL AERODYNAMIC SIMULATION SYSTEMS-APPLIED RESEARCH(EAD) RNNPSN	NUMERICAL AERODYNAMIC SIMULATION (NAS)	2542.7
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21ET-00, 920014	Technical Services Division- HARDWARE PURCHASE ETT207	AERONAUTICS RLT BASE	270.4
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21FF-01, 920016	SWTDS, CODE FF-SWTS REPLACEMENT FFSUTS	AERONAUTICS R&T BASE	1839.4
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21RN-00, 920034	NUMERICAL AERODYNAMIC SIMULATION SYSTEMS-WRKSTATION DEVELOPMENT RNNPSN	NUMERICAL AERODYNAMIC SIMULATION (NAS)	2127.2
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21RN-00, 920036	NUMERICAL AERODYNAMIC SIMULATION SYSTEMS-SERV B HARDWARE PURCHASE RNNPSN	NUMERICAL AERODYNAMIC SIMULATION (NAS)	286.7
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21RN-00, 920038	NUMERICAL AERODYNAMIC SIMULATION SYSTEMS-OPERATIONS HARDWARE RNNPSN	NUMERICAL AERODYNAMIC SIMULATION (NAS)	847.2
AERONAUTICAL RESEARCH & TECHNOLOGY	AMES RESEARCH CENTER LOCATION 21RN-00, 920040	NUMERICAL AERODYNAMIC SIMULATION SYSTEMS-MASS STORAGE DEVELOPMENT RNNPSN	NUMERICAL AERODYNAMIC SIMULATION (NAS)	887.2

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
AERONAUTICAL RESEARCH & TECHNOLOGY	AHES RESEARCH CENTER LOCATION 21RN-00, 920066	NUMERICAL AERWYNAHIC SIMULATION SYSTEMS-SCIENTIFIC ANALYSIS SYSTEMS RNNPSN	NUMERICAL AERODYNAMIC SIMULATION (NAS)	1563.5
AERONAUTICAL RESEARCH & TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2200- , 890022	LERC - ADP ACTIVITY-SHARED MASS STORAGE HARDWARE	AERONAUTICS R&T BASE	800.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2200- , 890024	LERC - ADP ACTIVITY-ARCHIVAL MASS STORAGE HARDWARE	AERONAUTICS R&T BASE	1200.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2201-VC, 890030	CENTRAL SCIENTIFIC CLUSTER- CENTRAL SCIEN. CLUSTER HARDWARE	AERONAUTICS R&T BASE	3201.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2201-05, 890036	MULTI-PURPOSE CENTRAL SCIENTIFIC SYS-VH-AMDAHL 5860/VH HARDWARE	AERONAUTICS R&T BASE	3520.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2212-04, 890052	ESCORT III SHARED HIGH SPEED DATA REDUC.-ESCORT III HARDWARE AUGMENT	AERONAUTICS R&T BASE	725.0
AERONAUTICAL RESEARCH 6 TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2201-04, 890110	HIGH SPEED COMPUTATIONAL SYSTEM-SUPER-COMPUTER HARDWARE	AERONAUTICS R&T BASE	8500.0
AERONAUTICAL RESEARCH 6 TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2201-PP, 900014	PARALLEL PROCESSOR-PARALLEL PROCESSOR HARDWARE	AERONAUTICS R&T BASE	2000.0
AERONAUTICAL RESEARCH 6 TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2201-TR, 900024	TRADAR III DATA RECORDING SYSTEM-TRANSIENT DATA REC. III H/W	AERONAUTICS R&T BASE	470.0

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION		PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
	BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION		
AERONAUTICAL RESEARCH & TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2201-03, 900036	CADAM SYSTEM-SCIENTIFIC SYSTEM HARDWARE	AERONAUTICS R&T BASE	1820.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2201-03, 920016	CADAM SYSTEM-INTERACTIVE COMP. ASSISTED RES. & ENGR. H/W	AERONAUTICS RLT BASE	800.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2212-06, 920028	ESCORT D DATA REDUCTION SYS- ESCORT-D HARDWARE UPGRADE	AERONAUTICS RLT BASE	250.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LEWIS RESEARCH CENTER LOCATION 2201-07, 920042	SCIENTIFIC SUPER MINI SYSTEM- ARC ADP CONVEX CONTRACT	AERONAUTICS R&T BASE	483.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LANGLEY RESEARCH CENTER LOCATION 2302-10, 890026	LARC CENTRAL SCIENTIFIC COMPUTER COMPLEX-NETWORK LOCAL HBU	AERONAUTICS RLT BASE	600.0
AERONAUTICAL RESEARCH L TECHNOLOGY	LANGLEY RESEARCH CENTER LOCATION 2302-10, 890028	LARC CENTRAL SCIENTIFIC COMPUTER COHPLEX-SUPER COMPUTING	AERONAUTICS R&T BASE	6000.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LANGLEY RESEARCH CENTER LOCATION 2302-10, 890034	LARC CENTRAL SCIENTIFIC COMPUTER COMPLEX-PERIPHERALS	AERONAUTICS R&T BASE	500.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LANGLEY RESEARCH CENTER LOCATION 2302-10, 890036	LARC CENTRAL SCIENTIFIC COMPUTER COMPLEX-FLIGHT SIMULATION COMPUTER SYSTEM	AERONAUTICS RLT BASE	2400.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LANGLEY RESEARCH CENTER LOCATION 2304-D1, 890064	AERODYNAMICS RESEARCH DATA SYS-1-NATIONAL TRANSONIC FACILITY DATA SYS UPGRADE	AERONAUTICS RLT BASE	1100.0

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
AERONAUTICAL RESEARCH & TECHNOLOGY	LANGLEY RESEARCH CENTER LOCATION 2303-30, 920018	AERONAUTICS DISTRIBUTED S&E COMPUTING-COMPUTATIONAL FLUID DYNAMICS MINI SUPER COMPUTER	AERONAUTICS R&T BASE	500.0
AERONAUTICAL RESEARCH & TECHNOLOGY	LANGLEY RESEARCH CENTER LOCATION 2303-30, 920020	AERONAUTICS DISTRIBUTED S&E COMPUTING-NUMERICAL AERODYNAMIC SIMULATOR WORKSTATIONS	AERONAUTICS RLT BASE	500.0

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	AMES RESEARCH CENTER LOCATION 210F-00, 900260	RESEARCH ENGINEERING DIVISION- R/T PROCESSING & DISPLAY SYS UPGRADES OFIATR	GROUND NETWORK	703.3
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	GODDARD SPACE FLIGHT CENTER LOCATION 5101-AC, 920018	CENTRAL TELEMETRY DATA PROCESSING AND DA-CENTRAL TELEMETRY DATA PROCESSING & DATA SYS	COMMUNICATIONS AND DATA SYSTEMS	810.2
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	GODDARD SPACE FLIGHT CENTER LOCATION 5103-BG, 920060	SPACELAB INPUT PROCESSING SYSTEM-SPACELAB INPUT PROCESSING SYSTEM	COMMUNICATIONS AND DATA SYSTEMS	3960.0
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	GODDARD SPACE FLIGHT CENTER LOCATION 5103-BK, 920064	MISSION AND DATA OPERATIONS TEST BED PRO-MISSION & DATA OPERATIONS TEST BED PROCESSORS	COMMUNICATIONS AND DATA SYSTEMS	2351.8
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	GODDARD SPACE FLIGHT CENTER LOCATION 5103-BZ, 920066	MISCELLANEOUS TELEMETRY DATA PROCESSING-MISCELLANEOUS TELEMETRY DATA PROCESSING	COMMUNICATIONS AND DATA SYSTEMS	575.0
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	GODDARD SPACE FLIGHT CENTER LOCATION 5104-M, 920080	NASA COMMUNICATIONS SYSTEM (NASCOM)-NASA COMMUNICATIONS SYSTEM (NASCOM)	COMMUNICATIONS AND DATA SYSTEMS	1643.0

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	GODDARD SPACE FLIGHT CENTER LOCATION 5106-AE, 920088	MULTI-SATELLITE OPERATIONS CONTROL CENTER-MULTI-SATELLITE OPERATIONS CONTROL CENTER	COMMUNICATIONS AND DATA SYSTEMS	5140.4
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	GODDARD SPACE FLIGHT CENTER LOCATION 5106-BB, 920090	COMMAND MANAGEMENT SYSTEM-COMMAND MANAGEMENT SYSTEM	COMMUNICATIONS AND DATA SYSTEMS	2440.0
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	GODDARD SPACE FLIGHT CENTER LOCATION 5106-BC, 920092	OPERATIONS SUPPORT COMPUTING FACILITY SY-OPERATIONS SUPPORT COMPUTING FACILITY SYS	COMMUNICATIONS AND DATA SYSTEMS	4912.0
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	GODDARD SPACE FLIGHT CENTER LOCATION 5103-BK, 920216	MISSION AND DATA OPERATIONS TEST BED PRO-HISSION & DATA OPERATIONS TEST BED PROCESSORS	COMMUNICATIONS AND DATA SYSTEMS	500.0
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	GODDARD SPACE FLIGHT CENTER LOCATION 5105-AB, 920218	TRACKING AND DATA RELAY SATELLITE SYSTEM-TRACKING AND DATA RELAY SATELLITE SYSTEM	SPACE NETWORK	300.0
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	JET PROPULSION LABORATORY LOCATION 5512-00, 900034	DEEP SPACE NETWORK OPERATIONAL SYSTEMS-HIGH RATE TELEMETRY	GROUND NETWORK	2000.0
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	JET PROPULSION LABORATORY LOCATION 5512-00, 920020	DEEP SPACE NETWORK OPERATIONAL SYSTEMS-ANTENNA POINTING ASSY UPGRADE	GROUND NETWORK	410.0

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	JET PROPULSION LABORATORY LOCATION 5512-DO, 920024	DEEP SPACE NETWORK OPERATIONAL SYSTEMS-LINK MONITOR AND CONTROL UPGRADE	GROUND NETWORK	2897.0
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	JET PROPULSION LABORATORY LOCATION 5512-DO, 920028	DEEP SPACE NETWORK OPERATIONAL SYSTEMS-TDA DEV SYS HARDWARE EXPANSION	GROUND NETYORK	300.0
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	JET PROPULSION LABORATORY LOCATION 5512-DO, 920030	DEEP SPACE NETWORK OPERATIONAL SYSTEMS-RADIO SCIENCE UPGRADE FOR DSCC	GROUND NETYORK	410.0
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	JET PROPULSION LABORATORY LOCATION 5512-DO, 920034	DEEP SPACE NETWORK OPERATIONAL SYSTEMS-SIGNAL PROC. CENTER REPLACEMENT	GROUND NETWORK	1000.0
SPACE AND GROUND NETUORK, COMMUNICATIONS AND DATA SYSTEMS	JET PROPULSION LABORATORY LOCATION 5512-SD, 920036	TRACKING 6 DATA ACQUISITION S/ W DEV. SYS-RADIO SCIENCE UPGRADE	GROUND NETYORK	972.0
SPACE AND GROUND NETWORK, COMMUNICATIONS AND DATA SYSTEMS	MARSHALL SPACE FLIGHT CENTER LOCATION 6203-P6, 910038	HUNTSVILLE OPERATIONS SUPPORT CNTR, HOSC-HVL OPNS SPT CEN/CENTRAL PROCESS SYS AUG	COMMUNICAT IONS AND DATA SYSTEMS	2547.0

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	HEADQUARTERS LOCATION 1000- , 920012	HQS - ADP ACTIVITY-PURCHASE OF AUTOMATED EWIPMENT (R&D) (M)	LAUNCH AND MISSION SUPPORT	1370.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	MARSHALL SPACE FLIGHT CENTER LOCATION 6206-08, 890110	SOFTWARE & DATA MANAGEMENT-CI 5000 ANALOG COMPUTER REPLACEMENT	SPACE SHUTTLE MAIN ENGINE (SSME)	600.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	STENNIS SPACE CENTER LOCATION 6400- , 920018	SSC - ADP ACTIVITY-PROGRAM SUPPORT ADP EQUIPMENT PURCHASES (ASRM)	ADVANCED SOLID ROCKET MOTOR (ASRM)	250.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	STENNIS SPACE CENTER LOCATION 6406-47, 920032	SHUTTLE ICE DETECTION SYSTEM H/DWE - SHUTTLE ICE DETECTION SYSTEM H/DWE.	ORBITER	250.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7281-GA, 890212	INTEGRATED MANAGEMENT INFORMATION CENTER-INTEGRATED MANAG'T INFORMATION SYSTEMS UPGRADE	LAUNCH AND MISSION SUPPORT	2500.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7281-WA, 900156	INTEGRATED MANAGEMENT INFORMATION CENTER-INTEGRATE	LAUNCH AND MISSION SUPPORT	3500.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7203-DA, 910018	MISSION CONTROL CENTER-MISSION CONTROL CENTER UPGRADE HARDWARE	LAUNCH AND MISSION SUPPORT	4046.0

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7203-DA, 910020	MISSION CONTROL CENTER-MISSION CONTROL CENTER UPGRADE WORKSTATION	LAUNCH AND MISSION SUPPORT	1350.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7208-DA, 910040	SHUTTLE MISSION SIMULATOR- SHUTTLE MISSION SIMULATOR HARDWARE	LAUNCH AND MISSION SUPPORT	1412.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7274-DA, 910150	FLIGHT DESIGN COMPUTATIONAL FACILITY-FLIGHT DESIGN COMPUTATIONAL FACILITY HARDWARE	LAUNCH AND MISSION SUPPORT	5394.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7277-DA, 910158	SOFTWARE PRODUCTION FACILITY- SOFTWARE PRODUCTION FACILITY EQUIPMENT UPGRADE	LAUNCH AND MISSION SUPPORT	1800.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7277-DA, 910160	SOFTWARE PRODUCTION FACILITY- SOFTWARE PRODUCTION FACILITY REPLACEMENT	LAUNCH AND MISSION SUPPORT	4100.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7208-DA, 920046	SHUTTLE MISSION SIMULATOR- SHUTTLE MISSION SIMULATOR PURCHASE WORKSTATIONS	LAUNCH AND MISSION SUPPORT	384.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7245-VA, 920100	ORBITER AND GFE PROJECTS SYSTEMS-PROJECT OFFICE AUTOMATION & MIS SYSTEMS	LAUNCH AND MISSION SUPPORT	300.0

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7274-DA, 920134	FLIGHT DESIGN COMPUTATIONAL FACILITY-FLIGHT DESIGN COMPUTATIONAL FACILITY WORKSTATIONS	LAUNCH AND MISSION SUPPORT	2731.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7278-EA, 920150	SOFTWARE DEVELOPMENT FACILITY- SOFTWARE DEVELOPMENT FACILITY PRINTER UPGRADE	LAUNCH AND MISSION SUPPORT	308.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7278-EA, 920152	SOFTWARE DEVELOPMENT FACILITY- SOFTWARE DEVELOPMENT FACILITY WORKSTATION UPGRADES	LAUNCH AND MISSION SUPPORT	265.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	JOHNSON SPACE CENTER LOCATION 7278-EA, 920154	SOFTWARE DEVELOPMENT FACILITY- SOFTWARE DEVELOPMENT FACILITY DISK STORAGE UPGRADE	LAUNCH AND MISSION SUPPORT	462.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	KENNEDY SPACE CENTER LOCATION 7635-P6, 890030	CHECKOUT, CONTROL 6 MONITOR SYSTEM XI-CHECKOUT, CONTROL 6 MONITOR SYSTEM II	LAUNCH SITE EQUIPMENT	14582.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	KENNEDY SPACE CENTER LOCATION 7601-F1, 890036	CENTRAL DATA SYSTEM-CENTRAL DATA SYSTEM (SECURE)	LAUNCH SITE EQUIPMENT	3992.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	KENNEDY SPACE CENTER LOCATION 7601-M1, 890040	CHECKOUT, CONTROL & MONITOR SYSTEM/RHMS-CHECKOUT, CONTROL & MONITOR SYSTEM	LAUNCH SITE EQUIPMENT	4284.0

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	KENNEDY SPACE CENTER LOCATION 7623-CS, 920034	OPS CONTRACTOR MGMT INFORMATION SYS-OPERATIONS CONTRACTOR MANAGEMENT INFORMATION	LAUNCH SITE EQUIPMENT	325.0
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	KENNEDY SPACE CENTER LOCATION 7623-SA, 920036	LAUNCH TEAM TRAINING SYSTEM- LAUNCH TEAM TRAINING SYSTEM	LAUNCH SITE EQUIPMENT	3109.9
SPACE SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY	KENNEDY SPACE CENTER LOCATION 7623-WA, 920038	SHUTTLE PROC DATA MGMT SYS 11- SHUTTLE PROC DATA MGMT SYS I1	LAUNCH SITE EQUIPMENT	4600.0

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
SPACE TRANSPORTATION OPERATIONS	MARSHALL SPACE FLIGHT CENTER LOCATION 6219-27, 890030	SYSTEMS DEVELOPMENT & IMPLEMENTATION SW-SHUTTLE MODE AUGMENTATION	FLIGHT HARDWARE	619.0
SPACE TRANSPORTATION OPERATIONS	MARSHALL SPACE FLIGHT CENTER LOCATION 6202-01, 890190	SLIDELL COMPUTER COMPLEX, SCC- UNISERVO SUBSYSTEM REPLACEMENT	FLIGHT HARDWARE	348.0
SPACE TRANSPORTATION OPERATIONS	MARSHALL SPACE FLIGHT CENTER LOCATION 6202-01, 910030	SLIDELL COMPUTER COMPLEX, SCC- UNISYS 4000 TERMINAL REPLACEMENT PHASE I, PURCHASE	FLIGHT HARDWARE	428.0
SPACE TRANSPORTATION OPERATIONS	MARSHALL SPACE FLIGHT CENTER LOCATION 6202-01, 910054	SLIDELL COMPUTER COMPLEX, SCC- UNISYS 1100/90 SYSTEM REPLACEMENT	FLIGHT HARDWARE	1902.0
SPACE TRANSPORTATION OPERATIONS	MARSHALL SPACE FLIGHT CENTER LOCATION 6202-01, 920016	SLIDELL COMPUTER COMPLEX, SCC- FR-80 REPLACEMENT	FLIGHT HARDWARE	385.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7266-DA, 910130	FLIGHT TRAINING & PLANNING FACILITIES-MOD ENGINEERING WORKSTATIONS	FLIGHT OPERATIONS	1875.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7266-DA, 910138	FLIGHT TRAINING & PLANNING FACILITIES-MOD PERSONAL COMPUTERS	FLIGHT OPERATIONS	3946.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7202-PA, 920026	CENTER INFORMATION SYSTEM- CENTER INFORMATION SYSTEM AUGMENTATION	FLIGHT OPERATIONS	2519.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7202-PA, 920028	CENTER INFORMATION SYSTEM- CENTER INFORMATION SYSTEM UPGRADE	FLIGHT OPERATIONS	612.0

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7209-PA, 920052	CENTER INFORMATION NETWRK- LOCAL AREA NETUORK EXPANSION	FLIGHT OPERATIONS	1515.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7222-EA, 920066	STRUCTURES AND MECHANICS ENGINEERING SYS-ADPE LIFE-CYCLE REPLACEMENT HARDWARE	FLIGHT OPERATIONS	596.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7234-EA, 920070	CREU AND THERMAL ENGINEERING SYSTEMS-ADD PERSONAL COMPUTERS, TERMINALS, WORKSTATIONS	FLIGHT OPERATIONS	760.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7234-EA, 920072	CREU AND THERMAL ENGINEERING SYSTEMS-ADPE LIFE-CYCLE REPLACEMENT HARDWARE	FLIGHT OPERATIONS	310.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7234-EA, 920074	CREU AND THERMAL ENGINEERING SYSTEMS-ENHANCE CREU & THERMAL SYS DIV ANALYSIS SYSTEM	FLIGHT OPERATIONS	425.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7236-EA, 920092	TRACKING AND COMMUNICATIONS SYSTEMS-UPGRADE DIVISION VAX	FLIGHT OPERATIONS	280.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7245-VA, 920102	ORBITER AND GFE PROJECTS SYSTEMS-MISSION EVALUATION ROOM SUPPORT HARDWARE	FLIGHT OPERATIONS	525.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7257-EA, 92011.4	FLIGHT DATA SYSTEMS- REPLACEMENT OF OBSOLETE ADP EQUIPMENT	FLIGHT OPERATIONS	1425.0

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7257-EA , 920116	FLIGHT DATA SYSTEMS-ADVANCED DEVELOPMENT SYSTEMS LAB PURCHASES	FLIGHT OPERATIONS	<i>300.0</i>
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7263-EA , 920122	ENGINEERING DIRECTORATE OFFICE AUTOMATION	FLIGHT OPERATIONS	250.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7263-EA , 920128	ENGINEERING DIRECTORATE OFFICE AUTOMATIO-NETWORK AUGMENTATION	FLIGHT OPERATIONS	<i>300.0</i>
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7265-EA , 920132	NAVIGATION, CONTROL 6 AERONAUTICS SYSTEM-UPGRADES AND REPLACEMENTS	FLIGHT OPERATIONS	<i>300.0</i>
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7276-PA , 920142	SOFTWARE TECHNOLOGY LABORATORY-SOFTWARE TECHNOLOGY GRAPHICS & ANALYSIS LAB	FLIGHT OPERATIONS	700.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7276-PA , 920144	SOFTWARE TECHNOLOGY LABORATORY-SOFTWARE TECHNOLOGY ENGINEERING LAB	FLIGHT OPERATIONS	379.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7276-PA , 920146	SOFTWARE TECHNOLOGY LABORATORY-SOFTWARE TECHNOLOGY INFORMATION SYSTEMS	FLIGHT OPERATIONS	575.0
SPACE TRANSPORTATION OPERATIONS	JOHNSON SPACE CENTER LOCATION 7276-PA , 920148	SOFTWARE TECHNOLOGY LABORATORY-SOFTWARE TECHNOLOGY MISSION OPERATIONS SUPPORT LAB	FLIGHT OPERATIONS	700.0

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
SPACE TRANSPORTATION OPERATIONS	KENNEDY SPACE CENTER LOCATION 7602-A1, 890016	ADMINISTRATIVE COMPUTER SYSTEM-ADMINISTRATIVE COMPUTER SYSTEM	FLIGHT OPERATIONS	286.0
SPACE TRANSPORTATION OPERATIONS	KENNEDY SPACE CENTER LOCATION 7602-53, 890022	KENNEDY INVENTORY MANAGEMENT SYSTEM-KENNEDY INVENTORY MANAGEMENT SYSTEM	FLIGHT OPERATIONS	253.0
SPACE TRANSPORTATION OPERATIONS	KENNEDY SPACE CENTER LOCATION 7604-P3, 920020	COMPUTER AIDED DESIGN/ ENGINEERING SYSTEM-CAD/CAE	LAUNCH AND LANDING OPERATIONS	273.0
SPACE TRANSPORTATION OPERATIONS	KENNEDY SPACE CENTER LOCATION 7602-A1, 920078	ADMINISTRATIVE COMPUTER SYSTEM-ADMINISTRATIVE COMPUTER SYSTEM	FLIGHT OPERATIONS	802.0
SPACE TRANSPORTATION OPERATIONS	KENNEDY SPACE CENTER LOCATION 7602-53, 920080	KENNEDY INVENTORY MANAGEMENT SYSTEM-KENNEDY INVENTORY MANAGEMENT SYSTEM	FLIGHT OPERATIONS	834.0

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
** With the Space Station configuration under continuing review, details concerning revised ADPE requirements are not presently available. These acquisitions are consistent with the previous baseline program. **				
SPACE STATION	HEADQUARTERS LOCATION 1001-T1, 890053	SPACE STATION TMIS-SPACE STATION TMIS ADP EQUIPMENT PURCHASES	MANAGEMENT AND INTEGRATION	4656.3
SPACE STATION	LEWIS RESEARCH CENTER LOCATION 2202-85, 920026	SPACE STATION SUPPORT-SPACE STATION SUPPORT SYSTEM HW	POWER SYSTEM	1331.0
SPACE STATION	MARSHALL SPACE FLIGHT CENTER LOCATION 6206-00, 890090	SOFTWARE & DATA MANAGEMENT, IGDS MULTI-INTERACTIVE GRAPHIC DESIGN SYS CENTRAL SYS REQUIREMENT	PRESSURIZED MODULES	750.0
SPACE STATION	MARSHALL SPACE FLIGHT CENTER LOCATION 6206-CT, 890104	SOFTWARE & DATA MANAGEMENT IGDS-INTERACTIVE GRAPHICS DESIGN SYS MODIF BLDG 4487	PRESSURIZED MODULES	500.0
SPACE STATION	MARSHALL SPACE FLIGHT CENTER LOCATION 6206-06, 890118	SOFTWARE & DATA MANAGEMENT- ANALOG COMPUTER REPLACEMENTS, BLDG 4487	PRESSURIZED MODULES	450.0
SPACE STATION	MARSHALL SPACE FLIGHT CENTER LOCATION 6210-00, 890154	PROPULSION IGDS-INTERACTIVE GRAPHICS 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 MODS BLDG 4708	PRESSURIZED MODULES	350.0
SPACE STATION	MARSHALL SPACE FLIGHT CENTER LOCATION 6203-09, 910034	HUNTSVILLE OPERATIONS SUPPORT CNTR, HOSC-HVL OPNS SPT CEN/VAX CLUSTER UPGRADE	OPERATIONS/ UTILIZATION CAPABILITY DEVELOPMENT (OUCD)	1687.0

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
<p>** With the Space Station configuration under continuing review, details concerning revised ADPE requirements are not presently available. These acquisitions are consistent with the previous baseline program. **</p>				
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7205-DA, 900036	SPACE STATION SUPPORT SYSTEMS- MOD SPACE STATION TECHNICAL OFFICE ENG URKSTATIONS	OPERATIONS/ UTILIZATION CAPABILITY DEVELOPMENT (OUCD)	2197.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7205-DA, 900044	SPACE STATION SUPPORT SYSTEMS- SPACE STATION MOD INFORMATION SYSTEMS HOSTS	OPERATIONS/ UTILIZATION CAPABILITY DEVELOPMENT (OUCD)	750.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7205-DA, 900048	SPACE STATION SUPPORT SYSTEMS- SPACE STATION SUPPORT CENTER SYSTEM	OPERATIONS/ UTILIZATION CAPABILITY DEVELOPMENT (OUCD)	1249.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7283-KA, 900158	SPACE STA PROJECT OFF DATA	MANAGEMENT AND INTEGRATION	5936.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7283-KA, 900160	SPACE STA PROJECT OFF DATA SUPPORT SYSTEMS-DATA SUPPORT SYSTEMS-TMIS-COMPATIBLE HARDWARE	MANAGEMENT AND INTEGRATION	3004.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7206-DA, 910028	SPACE STATION TRAINING FACILITY-SPACE STATION TRAINING FACILITY HARDWARE	OPERATIONS/ UTILIZATION CAPABILITY DEVELOPMENT (OUCD)	4555.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7207-DA, 910032	SPACE STATION CONTROL CENTER- SPACE STATION CONTROL CENTER HARDWARE	OPERATIONS/ UTILIZATION CAPABILITY DEVELOPMENT (OUCD)	20421.0

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
<p>** With the Space Station configuration under continuing review, details concerning revised ADPE requirements are not presently available. These acquisitions are consistent with the previous baseline program. **</p>				
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7264-EA, 910110	SYSTEMS ENGINEERING DIVISION- SIMULATION SYSTEMS BRANCH PURCHASE/AUGMENTATION	OPERATIONS/ UTILIU TION CAPABILITY DEVELOPMENT (OUCD)	909.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7266-DA, 910142	FLIGHT TRAINING & PLANNING FACILITIES-REAL TIME DATA SYSTEMS	TRANSITION DEFINITIW	900.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7206-DA, 920034	SPACE STATION TRAINING FACILITY-SPACE STATION TRAINING FACILITY HARDWARE INTG	OPERATIONS/ UTILIU TION CAPABILITY DEVELWHENT (OUCD)	3400.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7207-DA, 920036	SPACE STATION CONTROL CENTER- SPACE STATION CONTROL CENTER HARDWARE PLAN SYSTEM	OPERATIONS/ UTILIU TION CAPABILITY DEVELWHENT (OUCD)	367.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7257-EA, 920104	FLIGHT DATA SYSTEMS-DISPLAY & CONTROL HARDWARE PURCHASE	ASSEMBLY HARDWARE/ SUBSYSTEMS	300.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7257-EA, 920106	FLIGHT DATA SYSTEMS-ADVANCED DEVELOPMENT SYSTEM LAB	ASSEMBLY HARDWARE/ SUBSYSTEMS	500.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7265-EA, 920130	NAVIGATION, CONTROL & AERONAUTICS SYSTEM-GUIDANCE NAVIGATION & CONTROL EMULATOR TESTBED	ASSEMBLY HARDWARE/ SUBSYSTEMS	640.0
SPACE STATION	JOHNSON SPACE CENTER LOCATION 7285-EA, 920156	SOFTWARE SUPPORT ENVIRONMENT	MANAGEMENT AND INTEGRATION	804.0

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
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**** With the Space Station configuration under continuing review, details concerning revised ADPE requirements are not presently available.
These acquisitions are consistent with the previous baseline program. ****

SPACE STATION	KENNEDY SPACE CENTER LOCATION 7624-FD, 890058	SPACE STATION SOFTWARE DEVELOPMENT FACIL-SPACE STATION SOFTWARE DEVELOPMENT FACILITY	OPERATIONS/ UTILIZATION CAPABILITY DEVELOPMENT (OUCD)	2610.0
SPACE STATION	KENNEDY SPACE CENTER LOCATION 7624-FB, 900030	SPACE STATION TEST, WNT. 6 MON. SYS-SPACE STATION TEST CONTROL & MONITOR SYSTEM(TCMS)	OPERATIONS/ UTILIZATION CAPABILITY DEVELOPMENT (OUCD)	13763.0
SPACE STATION	KENNEDY SPACE CENTER LOCATION 7608-KA, 920024	DIGITAL OPERATIONAL INTERCOH SYSTEH, DEV-DIGITAL OPERATIONAL INTERCOM SYSTEH, DEV	OPERATIONS/ UTILIZATION CAPABILITY DEVELOPMENT (OUCD)	415.0

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
SPACE APPLICATIONS	AMES RESEARCH CENTER LOCATION 21ED-03, 920012	INFORMATION AND COMMUNICATIONS (NSI)-HARDWARE PURCHASES EDC	DATA SYSTEMS	297.6
SPACE APPLICATIONS	LANGLEY RESEARCH CENTER LOCATION 2303-60, 920028	SPACE DISTRIBUTED S&E COMPUTING-ERBE OPTICAL DISKS	MISSION OPERATIONS AND DATA ANALYSIS	314.0
SPACE APPLICATIONS	GODDARD SPACE FLIGHT CENTER LOCATION 5101-AA, 920014	SPACE AND EARTH SCIENCES COMPUTING CENTE-SPACE AND EARTH SCIENCES COMPUTING CENTER	DATA SYSTEMS	1723.0
SPACE APPLICATIONS	GODDARD SPACE FLIGHT CENTER LOCATION 5101-AB, 920016	NATIONAL SPACE SCIENCE DATA CENTER SYSTE-NATIONAL SPACE SCIENCE DATA CENTER SYSTEM	DATA SYSTEMS	2022.6
SPACE APPLICATIONS	GODDARD SPACE FLIGHT CENTER LOCATION 5103-AN, 920052	EARTH OBSERVING SYS-DATA INFORMATION SYS-EARTH OBSERVING SYS-DATA INFORMATION SYS	EARTH OBSERVING SYSTEM (EOS) ATD	40000.0
SPACE APPLICATIONS	GODDARD SPACE FLIGHT CENTER LOCATION 5103-BJ, 920062	DATA CAPTURE FACILITY-DATA CAPTURE FACILITY	UPPER ATMOSPHERIC RESEARCH SATELLITE (UARS)	300.0
SPACE APPLICATIONS	GODDARD SPACE FLIGHT CENTER LOCATION 5101-AA, 920202	SPACE AND EARTH SCIENCES COMPUTING CENTE-SPACE AND EARTH SCIENCES COMPUTING CENTER	DATA SYSTEMS	3662.0
SPACE APPLICATIONS	GODDARD SPACE FLIGHT CENTER LOCATION 5101-AB, 920204	NATIONAL SPACE SCIENCE DATA CENTER SYSTE-NATIONAL SPACE SCIENCE DATA CENTER SYSTEM	DATA SYSTEMS	425.0

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
SPACE APPLICATIONS	JET PROPULSION LABORATORY LOCATION 5511-AA, 920014	ADMINISTRATIVE APPLICATIONS SYSTEMS-IBM 3090-200 APP	APPL SYSTEMS ANALYSES AND STUDIES	1109.0
SPACE APPLICATIONS	JET PROPULSION LABORATORY LOCATION 5511-CN, 920016	COMMUNICATIONS AND NETWORK EQUIPMENT-INSTITUTIONAL LOCAL AREA NETWORK	APPL SYSTEMS ANALYSES AND STUDIES	450.0
SPACE APPLICATIONS	JET PROPULSION LABORATORY LOCATION 5517-SS, 920072	ENGINEERING SERVICES SUPPORT SYSTEM-CAD/CAE WORKSTATIONS AND PERIPHERAL EQUIPMENT	APPL SYSTEMS ANALYSES AND STUDIES	900.0
SPACE APPLICATIONS	JET PROPULSION LABORATORY LOCATION 5517-TP, 920078	TECHNICAL DATA PROC. SUPPORT SYSTEMS-SUN COMPATIBLE WORKSTAT. FOR HIRIS SOFTWARE DEV.	SHUTTLE/SPACELAB PAYLOAD DEVELOPMENT	261.0
SPACE APPLICATIONS	JET PROPULSION LABORATORY LOCATION 5517-TP, 920084	TECHNICAL DATA PROC. SUPPORT SYSTEMS-DATA BUFFER DISK FOR HIRIS	SHUTTLE/SPACELAB PAYLOAD DEVELOPMENT	300.0

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
COMMERCIAL USE OF SPACE	STENNIS SPACE CENTER LOCATION 6406-42, 920026	STL/SYSTEM V-STL/SYSTEM V HARDWARE, NETWK, & MKRSTA	COMMERCIAL USE OF SPACE	400.0

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
PLANETARY EXPLORATION	JET PROPULSION LABORATORY LOCATION 5516-DP, 900050	FLIGHT PROJ. DEVELOPMENT & PROTOTYPE SYS-NOT SELECTED; MARS OBSERVER GROUND DATA PROC	MISSION OPERATIONS & DATA ANALYSIS	557.0
PLANETARY EXPLORATION	JET PROPULSION LABORATORY LOCATION 5500- , 920012	JPL - ADP ACTIVITY-Actions with cumulative costs Less than \$1M	COMET RENDEZVOUS ASTEROID FLYBY (CRAF)/CASSINI	2557.0
PLANETARY EXPLORATION	JET PROPULSION LABORATORY LOCATION 5511-GS, 920018	GENERAL TECHNICAL SUPPORT SYSTEMS-WORKSTATIONS TO SUPPORT CIT SUPERCOMPUTER	MISSION OPERATIONS & DATA ANALYSIS	700.0
PLANETARY EXPLORATION	JET PROPULSION LABORATORY LOCATION 5516-DP, 920046	FLIGHT PROJ. DEVELOPMENT & PROTOTYPE SYS; MARS OBSERVWORKSTATIONS	MISSION OPERATIONS & DATA ANALYSIS	384.0
PLANETARY EXPLORATION	JET PROPULSION LABORATORY LOCATION 5516-SE, 920048	FLIGHT PROJ. SCIENCE & ENG. SYSTEMS-UNISYS MODEL 2200/201	MISSION OPERATIONS & DATA ANALYSIS	252.0
PLANETARY EXPLORATION	JET PROPULSION LABORATORY LOCATION 5516-SE, 920050	FLIGHT PROJ. SCIENCE & ENG. SYSTEMS-WORKSTATIONS FOR FPO MULTI MISSION SUPPORT TEAM	MISSION OPERATIONS & DATA ANALYSIS	616.0
PLANETARY EXPLORATION	JET PROPULSION LABORATORY LOCATION 5516-SE, 920052	FLIGHT PROJ. SCIENCE & ENG. SYSTEMS-SUPPORT EQUIP FOR COMET RENDEVOUS	COMET RENDEZVWS ASTEROID FLYBY (CRAF)/CASSINI	268.0
PLANETARY EXPLORATION	JET PROPULSION LABORATORY LOCATION 5516-S0, 920056	FLIGHT PROJ. OPERATIONAL SYSTEMS-MIPS GLL ADAPTATION HW ACQ (MSTP)	MISSION OPERATIONS & DATA ANALYSIS	1954.0
PLANETARY EXPLORATION	JET PROPULSION LABORATORY LOCATION 5516-S0, 920068	FLIGHT PROJ. OPERATIONAL SYSTEMS-WORKSTATIONS FOR MULTI-MISSION S/W TRANS.	MISSION OPERATIONS & DATA ANALYSIS	1730.0

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
 SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
PHYSICS AND ASTRONOMY	AMES RESEARCH CENTER LOCATION 210M-00, 890242	SCIENCE AND APPLICATIONS AIRCRAFT DIVISION SYSTEM REPLACEMENT CHHADA	AIRBORNE RESEARCH	541.0
PHYSICS AND ASTRONOMY	GODDARD SPACE FLIGHT CENTER LOCATION 5103-AJ, 920048	ASTRONOMY AND SOLAR PHYSICS DATA ANALYSIS-ASTRONOMY AND SOLAR PHYSICS DATA ANALYSIS	ASTROPHYSICS MISSION OPERATIONS & DATA ANALYSIS	255.0
PHYSICS AND ASTRONOMY	GODDARD SPACE FLIGHT CENTER LOCATION 5106-BD, 920094	SHUTTLE POCG INTERFACE FACILITY SYSTEM-SHUTTLE POCG INTERFACE FACILITY SYSTEM	HUBBLE SPACE TELESCOPE (HST) OPERATIONS AND SERVICING	1075.0
PHYSICS AND ASTRONOMY	MARSHALL SPACE FLIGHT CENTER LOCATION 6203-00, 920018	HUNTSVILLE OPERATIONS SUPPORT CNTR, HOSC-HVL OPNS SPT CEN/PERIPHERAL PROCESS SYS UPGRADE	ADV. X-RAY ASTROPHYSICS FACIL (AXAF) OPERATIONS & SERVICING	1105.0

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF ~~MAOR~~ ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
LIFE SCIENCES	AMES RESEARCH CENTER LOCATION 21SP-00, 920048	LIFE SCIENCES PROJECTS OFFICE- HARDWARE PURCHASE V059	HUMAN SPACE FLIGHT AND SYSTEMS ENGINEERING	1287.6
LIFE SCIENCES	JOHNSON SPACE CENTER LOCATION 7261-SA, 920118	LIFE SCIENCES FLIGHT EXPERIMENTS PROGRAM-UPGRADE LIFE SCIENCES COMP AIDED DESIGN/ENG'RING	HUMAN SPACE FLIGHT AND SYSTEMS ENGINEERING	410.0

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT	MARSHALL SPACE FLIGHT CENTER LOCATION 6201-00, 890012	SYS DEV & IMPLMTN, MIS MULTIPLE SYSTEMS-MGMT INFORMATION SYS NODE UPGRADE/REPLACEMENTS	OPERATIONS SUPPORT	1130.0
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT	MARSHALL SPACE FLIGHT CENTER LOCATION 6201-XX, 890014	SYS DEV & IMP, MIS MULTI SYS PERIPHERALS-MGMT INFORMATION SYS PERIPHERALS AND TERMINALS	OPERATIONS SUPPORT	3839.0
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT	MARSHALL SPACE FLIGHT CENTER LOCATION 6201-01, 890178	ENGINEERING ANALYSIS & DATA SYSTEM, EADS-ENGINEERING ANALYSIS & DATA SYSTEM	RESEARCH & TEST OPERATIONS	18938.0
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT	STENNIS SPACE CENTER LOCATION 6400- , 920014	SSC • ADP ACTIVITY-CTF/ALS PROJECT HARDWARE	ADVANCED LAUNCH SYSTEM(ALS) • PROPULSION	1500.0
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT	STENNIS SPACE CENTER LOCATION 6400- , 920016	SSC • ADP ACTIVITY-PROGRAM SUPPORT ADP EQUIPMENT PURCHASES	OPERATIONS SUPPORT	1322.0
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT	JOHNSON SPACE CENTER LOCATION 7203-DA, 920030	MISSION CONTROL CENTER-MISSION CONTROL CENTER PURCHASE HARDWARE	MULTI-PURPOSE OPERATIONS CONTROL CENTER	686.0
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT	JOHNSON SPACE CENTER LOCATION 7211-PA, 920058	ENGINEERING COMPUTATION FACILITY-ACQUIRE CLASS VI COMPUTER CAPABILITY	RESEARCH & TEST OPERATIONS	7025.0
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT	KENNEDY SPACE CENTER LOCATION 7604-P3, 890028	COMPUTER AIDED DESIGN/ ENGINEERING SYSTEM-COMPUTER AIDED DESIGN/ENGINEERING SYSTEM	LAUNCH SYSTEMS OPERATIONS	459.0

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF MAJOR ADP EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1992 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION BUILDING LOCATION, AND ADP/EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY(92) OBLIGATIONS (\$ IN THOUSANDS)
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT	KENNEDY SPACE CENTER LOCATION 7612-02, 900046	PAYLOAD DATA MANAGEMENT SYSTEM-PAYLOAD DATA MANAGEMENT SYSTEM	MULTIMISSION & PAYLOAD SUPPORT EQUIP	6900.0
SPACE TRANSPORTATION CAPABILITY DEVELOPMENT	KENNEDY SPACE CENTER LOCATION 7631-LC, 920042	ADVANCED LAUNCH OPERATIONS SYSTEM-ADVANCED LAUNCH OPERATIONS SYTEH	ADVANCED LAUNCH SYSTEM: ALS) • PROWLS ION	300.0