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# Budget Estimates

FISCAL YEAR **1985**

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National Aeronautics and Space Administration  
Washington, D.C. 20546

Volume III  
Research and Program Management  
Special Analyses

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1985 ESTIMATES

VOLUME III

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## RESEARCH AND PROGRAM MANAGEMENT

### FISCAL YEAR 1985 ESTIMATES

#### GENERAL STATEMENT

The Research and Program Management appropriation funds the performance and management of research, technology and test activities at NASA installations, and the planning, management and support of the many and varied contractor research and development tasks necessary to meet the Nation's ongoing objectives in aeronautical and space research. Objectives of the efforts funded by the Research and Program Management appropriation are to (1) provide the technical and management capability of the civil service staff needed to conduct the full range of programs for which NASA is responsible, (2) provide base maintenance of facilities and manage their use in support of research and development programs, and (3) provide effective and efficient technical and administrative support for the research and development programs. For 1985, an appropriation of **\$1,331,000,000** is requested.

The 22,000 permanent and temporary civil service personnel at eight major installations and Headquarters are funded by the Research and Program Management appropriation. This civil service workforce is NASA's most important resource and is vital to future space and aeronautics research activities. Seventy percent of the Research and Program Management appropriation is needed to provide for salaries and related costs of this civil service workforce. About two percent is for travel, critical to manage successfully the Agency's in-house and contracted programs. The remaining amount of the Research and Program Management appropriation provides for the research, test and operational facility support, and for related goods and services necessary to operate the NASA installations and to accomplish NASA's approved missions efficiently and effectively.

NASA field centers report to the Program Associate Administrator responsible for the major portion of their technical programs. The principal roles assigned 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: Manage the integrated Space Shuttle program, including Orbiter production and operation; astronaut and mission specialist selection and training; STS Operations including mission planning, operational procedures and flight control; and application of remote sensing to agricultural assessments and other Earth resources uses.

Kennedy Space Center: Launch of Space Shuttle flights; the ground operational phase of the Space Transportation System; and the preparation and launch of payloads on the Space Shuttle and expendable launch vehicles.

Marshall Space Flight Center: Manage the Space Shuttle main engine, solid rocket booster and external tank projects; management of NASA's activities on the Spacelab project; management of large automated spacecraft projects such as the Space Telescope; and experiments in materials processing in space.

National Space Technology Laboratories: Support Space Shuttle engine procurement and testing; regional Earth resources research and technology transfer; and support functions for other Government agencies located there.

Office of Space Science and Applications

Goddard Space Flight Center: Develop and operate the Earth orbital flight experiments and automated spacecraft to conduct scientific investigations and demonstrate practical applications; the management of the tracking and data acquisition activities for Earth orbital missions; management of the Delta launch vehicle program; management and launch of sounding rockets and balloons; and operation of an instrumented flight range for aeronautical and space research. The Wallops Facility is an operational element and component installation of the Goddard Space Flight Center.

Office of Aeronautics and Space Technology:

Ames Research Center: Develop short haul aircraft and rotorcraft research and technology, computational fluid dynamics, planetary probe research, life sciences, aeronautical flight research and testing, as well as providing an alternate landing site for Space Shuttle operational missions at the Dryden Flight Research Facility, an operational element and component installation of Ames.

Langley Research Center: Develop long haul aircraft research and technology, emphasizing fuel conservation, safety and environmental effects; aerospace structures technology; environmental quality monitoring by remote sensing; and advanced space systems technology.

Lewis Research Center: Develop and maintain aeronautical and space propulsion research and technology; space communications research and technology; space energy systems research and technology; and development of the Centaur cryogenic upper stage for use in the Space Shuttle and management of the Centaur expendable launch vehicle program.

The 1985 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, include:

1. Personnel—and Related Costs (\$935,928,000): Includes salaries and benefits, the government's contribution to medicare for NASA permanent and temporary civil service employees, and for personnel of other Government agencies detailed to NASA. This category also supports personnel 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.

2. Travel (\$28,000,000): Includes the cost of transportation, per diem, and related travel expenses of civil service employees who travel for the direction, coordination and management of all NASA program activities including overseas launch and tracking sites; for contract management; for flight mission support; for meetings and technical seminars and symposia; and for permanent and temporary relocations. Payments to interagency motor pools are included under Operation of Installation (Management and Operations).

3. Operation of Installation (\$367,072,000): Provides a broad range of services, supplies, and equipment in support of each center's institutional activities. These are divided into three major subfunctional areas: Facilities Services, covering the cost of rental of real property, maintaining and repairing institutional facilities and equipment, and the cost of custodial services and utilities; Technical Services, covering 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, covering the cost of administrative communications, printing, transportation, medical, supply, and related services. The amounts by major subcategory are as follows:

- A. Facilities Services (\$198,679,000): Includes rental of real property; the cost of maintenance, repair and related activities for facilities and equipment; custodial services; minor modifications and alterations; and utilities services.
- B. Technical Services (\$57,765,000): Includes the cost of general purpose automatic data processing for management activities; education and informational programs; shops and other essential technical services.
- C. Management and Operations (\$110,628,000): Includes the cost of administrative communications; printing and reproduction; administrative supplies; general purpose materials and equipment; transportation of equipment and supplies (including payments to interagency motor pools); medical services and other support.

**SUMMARY OF THE BUDGET PLAN BY FUNCTION**

	1983 <u>Actual</u>	1984		1985
		Budget Estimate	Current Estimate	Budget Estimate
		(Thousands of Dollars)		
I. Personnel and Related Costs.....	881,497	883,785	912,946	935,928
II. Travel.....	23,491	25,700	25,700	28,000
III. Operation of Installation.....	292,356	338,015	319,854	367,072
A. Facilities Services.....	(152,889)	(181,113*)	(170,829)	(198,679)
B. Technical Services.....	(52,026)	(58,135*)	(52,504)	(57,765)
C. Management and Operations....	<u>(87,441)</u>	<u>(98,767*)</u>	<u>(96,521)</u>	<u>(110,628)</u>
Total.....	<u>1,197,344</u>	<u>1,247,500</u>	<u>1,258,500</u>	<u>1,331,0</u>

\*The Budget Estimate has been revised to reflect the Base Operations Contract (BOC) at Kennedy Space Center. A more detailed discussion of the effect of BOC is included in the KSC section.

**SUMMARY OF CHANGES FROM THE 1984 BUDGET ESTIMATE TO THE 1984 CURRENT ESTIMATE**

Of the 1984 Research and Program Management request of \$1,247,500,000, \$1,238,500,000 has been appropriated. Supplemental appropriations of \$20,000,000 are being requested to cover partially the \$28,300,000 cost of civil service pay and benefits raises and cost increases in 1984. If \$20 million is appropriated, the 1984 plan for R&PM will be \$1,258,500,000. The changes from the original request are summarized as follows:

(Thousands of Dollars)

1984 Budget <del>Rate</del> .....		\$1,247,500
Congressional Action.....		<u>-9,000</u>
Appropriated.....		\$1,238,500
Supplemental <del>Request</del> .....		20,000
(Gross cost of 1984 pay <del>increases</del> ).....	(28,300)	
(Absorbed through savings, deferrals, etc. in other <del>costs</del> ).....	(-8,300)	
1984 Current <del>Rate</del> .....		<u>\$1,258,500</u>

The \$17.3 million reduction from the 1984 plan including the cost of pay and benefit increases (the \$9.0 million appropriation reduction and the \$8.3 million absorption of increased pay and benefits costs) will be accommodated largely through deferring and delaying expenditures in all areas of R&PM. In Personnel and Related Costs savings will be achieved through alteration in the timing of career development adjustments, the mix of temporary effort and in the way overtime and holiday premiums are used. In Operation of Installation, cost reductions will be achieved by the delay and deferral of the purchases of supplies, materials, equipment and contractual effort. The largest single alteration will be in the Standard Level User Charge (SLUC) paid to GSA for 1984. Because of changes brought about through legislation, the 1984 SLUC payment will be \$2.4 million less than planned. All of the SLUC savings are applied to meeting the \$17.3 million reduction in the 1984 plan. These reductions place a burden on NASA in providing adequate institutional support to the research and development programs; but the actions planned are designed to mitigate any adverse impact as much as possible.

In 1983 NASA was able to recruit a larger number of recently graduated ("fresh-out") scientists and engineers than in the past few years because of the stability in the civil service ceiling. This infusion of "fresh-outs" has reversed the upward rise in the average age of the NASA technical workforce, and if continued, will help keep the technical workforce vital, and contribute to the long-term health of that workforce.

### BASIS OF THE 1985 ESTIMATE

The 1985 budget estimate of \$1,331,000,000, an increase of \$72,500,000 over the 1984 current estimate, provides for: the personnel and related costs of 22,000 full-time equivalent civil service workyear; a minimum level of travel to support Agency missions and programs, with a modest increase to allow greater attendance by NASA scientists and engineers at technical seminars and symposia; support service contractor at the anticipated wage-rates; utility usage consistent with programmatic requirements at projected rates; and supplies, materials, equipment and other minor contracts and services at anticipated price levels. In addition, the 1985 request contains a \$10 million augmentation in operational maintenance designed to bring actual maintenance more in line with the needs of the NASA physical plant. The Research and Program Management appropriation request for 1985, by functional category is summarized as follows:

1. Personnel and Related Costs (\$935,928,000): The 1985 estimate for Personnel and Related Costs is based on the same level as 1984. The increase of \$22,982,000 in Personnel and Related Costs funding from 1984 to 1985 is a result of the following: the full-year costs of the 1984 pay and benefits increase (which is in effect for only three-fourth of a year in 1984); the alteration in the mix between reimbursed and direct costs of civil service time in the expendable launch vehicle program; the normal costs associated with within-grades, career development, merit pay, etc; the additional paid day in FY 1985; and a partial offset as part of the President's plan to reduce the size and cost of the GS/GM 11-15 workforce Government-wide.
2. Travel (\$28,000,000): Because the vast majority of NASA funds are spent out of house, travel for both programmatic and management purposes is integral to the effective and economical accomplishment of program objectives. In addition, because NASA's civil service workforce is so heavily technical (over 50 percent of NASA's permanent personnel are degreed scientists and engineers) travel to scientific and technical meetings, seminars and symposia is important for the interchange of information. In 1985, the \$2,300,000 increase in travel over 1984 is made up of two parts: the increase associated with the expected costs of travel; and an augmentation of \$800,000 in scientific and technical development travel to allow for more frequent attendance at scientific and technical meetings and symposia. This increase will provide the funding to allow, on the average, each NASA scientist and engineer to attend one such meeting about every two years.
3. Operation of Installation (\$367,072,000): The 1985 plan provides for anticipated changes in the price levels of support service contractor wage rates and utility rates, the alteration in the funding plans from reimbursable launch vehicles activities, and in the price levels for supplies, materials,

equipment and minor contracts. In addition, there is an augmentation of \$10 million in operational maintenance activities in the Facilities Service subfunction. This augmentation will provide for a more adequate level of such activities consistent with the current investment in the NASA physical plant. A small increase in Operation of Installation funding results from the reduction in reimbursements received from expensable launch vehicle operations. The amounts by subcategory are as follows:

- A. Facilities Services (\$198,679,000): The 1985 estimate, an increase of \$27,850,000 over the 1984 current estimate, covers anticipated rate and price increases for utilities, support contractor wage rates, supplies, materials, equipment and minor contractual effort; and the augmentation in operational maintenance activities of \$10 million.
- B. Technical Services (\$57,765,000): The \$5,261,000 increase in 1985 covers anticipated support service contractor wage-rates and the costs of supplies, materials, equipment and minor contractual effort.
- C. Management and Operations (\$110,628,000): The \$14,107,000 increase in this subcategory is needed to provide for the increased costs of supplies, materials, equipment and minor contractual effort, the anticipated change in support service contractor wage-rates, and to offset the reduction in reimbursements received.

In summary, the 1985 budget requirement of \$1,331,000,000 is to provide for 22,000 full-time equivalent civil service workyears and to support the activities at eight NASA-installations and Headquarters, consistent with the research and development and construction of facilities program plans.

#### GOVERNMENT-WIDE MANAGEMENT IMPROVEMENT INITIATIVE

The FY 1985 budget request reflects the impact of several government-wide management improvement initiatives. These include reductions in the number of personnelists, the greater use of private sector services in making travel accommodations, improved coordination of administrative ADP systems implementation, review of in-house printing operations and improved cash management. NASA will continue to participate in these and other management improvement initiatives that are developed, and will improve the productivity of its workforce and operations.

## DETAIL OF CONTENTS BY FUNCTION

The content of each functional category is explained in greater detail in this section, and the specific requirements for each installation are covered in their respective sections of this volume.

### I- PERSONNEL AND RELATED COSTS

#### A. COMPENSATION AND BENEFITS:

##### 1. Compensation:

- a. Permanent Positions: This part of Personnel and Related Costs covers the salaries of the full-time permanent civil service workforce and is the largest part 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 students participating in cooperative training, summer employment, youth opportunity, and temporary clerical support are covered in this category.
- c. Reimbursable Detailees: In accordance with existing agreements, NASA reimburses the parent Federal organization for the salaries and related costs of persons detailed to NASA.
- d. Overtime and Other Compensation: Overtime, holiday, post and night differential, and hazardous duty pay are included in this category. Also included are incentive awards for outstanding achievement and superior performance awards.

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

B. SUPPORTING COSTS:

1. Transfer of Personnel: Relocation costs, such as the expenses of selling and buying a home, and the movement and storage of household goods are provided under this category.
2. Office of Personnel Management Services: The Office of Personnel Management is reimbursed for certain activities such as security investigations on new hires, recruitment advertising, and career-maturity surveys.
3. Personnel Training: Training is provided within the framework of the Government Employees Training Act of 1958. Part of the training costs consists of courses offered by other Government agencies, and the remainder provides 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 the need for 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 at both Government-sponsored and nongovernment-sponsored seminars. 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 U.S. community. Many of the Government-sponsored meetings are working panels convened to solve certain problems for the benefit of the Government.

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 in and around the Installations; travel of unpaid members of research advisory committees; and initial duty station, permanent change of assignment, and other family travel expenses. Payments to interagency motor pools are included in the Operation of Installation function (Management and Operations subfunction).

**III. 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 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 for which NASA must provide rental payments to the General Services Administration in accordance with P.L. 92-313. Also included in this item is rental of trailers required to accommodate special short-term needs.
2. Maintenance and Related Activities: Maintenance and related activities include the recurring day-to-day maintenance of facilities (ground, buildings, structures, etc.) and equipment which is accomplished by non-Civil Service personnel. 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, whether accomplished by civil service personnel or contractors. In the cost of equipment, related maintenance and other services are reflected for office, shop, laboratory and other facilities equipment as well as administrative internal communications and television monitoring equipment.

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 appropriation.
- 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 staffs 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 material.

- c. Shop and Support Services: Shop and support services include general fabrication shops, reliability and quality assurance activities, safety, photographic services, graphics, and audio-visual material.

C. Management and Operations:

1. Administrative Communications: Included in this category are costs of leased lines not dedicated to a specific program or project, 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. 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.

DISTRIBUTION OF EQUIVALENT CIVIL SERVICE WORKYEARS BY INSTALLATION

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
Johnson Space Center .....	3. 255	3. 259	3. 209	3. 209
Kennedy Space Center .....	2. 093	2. 090	2. 082	2. 082
Marshall Space Flight Center .....	3. 338	3. 251	3. 250	3. 250
National Space Technology Laboratories .....	105	103	107	107
Goddard Space Flight Center.....	3. 609	3. 586	3. 599	3. 599
Ames Research Center.....	2. 027	2. 000	2. 021	2. 021
Langley Research Center .....	2. 821	2. 815	2. 835	2. 835
Lewis Research Center .....	2. 520	2. 453	2. 591	2. 591
Headquarters .....	<u>1. 434</u>	<u>1. 443</u>	<u>1. 423</u>	<u>1. 423</u>
Subtotal. Full-Time Permanent Civil Service....	21. 202	21. 000	21. 117	21. 117
Other than full-time permanent workyears .....	<u>1. 044</u>	<u>1. 000</u>	<u>883</u>	<u>883</u>
Total. Ceiling Controlled Civil Service.....	<u>22. 246</u>	<u>22, 000</u>	<u>22. 000</u>	<u>22. 000</u>

SUMMARY OF BUDGET PLAN BY INSTALLATION

(Thousands of Dollars)

Johnson Space Center .....	195. 161	204. 616	205. 382	214. 105
Kennedy Space Center .....	161. 271	173. 472	169. 215	180. 849
Marshall Space Flight Center .....	184. 266	186. 663	188. 962	195. 264
National Space Technology Laboratories .....	6. 345	9. 302	9. 793	10. 905
Goddard Space Flight Center .....	180. 590	183. 726	187. 217	199. 290
Ames Research Center .....	107. 220	108. 835	114. 636	123. 116
Langley Research Center.....	132. 702	139. 081	139. 872	148. 037
Lewis Research Center.....	118. 769	121. 857	130. 413	140. 503
Headquarters.....	<u>111. 020</u>	<u>119. 948</u>	<u>113. 010</u>	<u>118. 931</u>
Total.....	<u>1.197. 344</u>	<u>1.247. 500</u>	<u>1.258. 500</u>	<u>1.331. 000</u>

DISTRIBUTION OF PERMANENT CIVIL SERVICE WORKYEARS BY PROGRAM

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
RESEARCH AND DEVELOPMENT... ..	<u>11,446</u>	<u>11,265</u>	<u>11,600</u>	<u>11,988</u>
Space Station.....	248	---	376	600
Space Transportation Capability Development.....	1,764	1,978	1,702	1,835
Space Science and Applications.....	<u>4,236</u>	<u>4,124</u>	<u>4,251</u>	<u>4,287</u>
Physics and astronomy.....	2,077	2,060	2,249	2,284
Life sciences.....	289	266	271	271
Planetary exploration.....	198	187	189	171
Space applications.....	<u>1,672</u>	<u>1,611</u>	<u>1,542</u>	<u>1,561</u>
Technology Utilization.....	<u>51</u>	<u>46</u>	<u>51</u>	<u>50</u>
Aeronautics and Space Technology.....	<u>5,118</u>	<u>5,086</u>	<u>5,188</u>	<u>5,184</u>
Aeronautical research and technology.....	3,696	3,686	3,780	3,762
Space research and technology.....	<u>1,340</u>	<u>1,400</u>	<u>1,408</u>	<u>1,422</u>
Energy technology.....	82	---	---	---
Tracking and Data Acquisition.....	<u>29</u>	<u>31</u>	<u>32</u>	<u>32</u>
SPACE FLIGHT., CONTROL AND DATA COMMUNICATIONS.....	<u>4,893</u>	<u>4,751</u>	<u>4,707</u>	<u>4,321</u>
Shuttle Production and Operational Capability.. ...	1,185	1,063	1,063	767
Space Transportation Operations.....	2,933	2,936	2,882	2,828
Space and Ground Network, Communications and Data Systems.....	<u>775</u>	<u>752</u>	<u>762</u>	<u>726</u>
Subtotal, Direct.....	16,339	16,016	16,307	16,309
<u>CENTER MANAGEMENT AND OPERATIONS SUPPORT.....</u>	<u>4,863</u>	<u>4,984</u>	<u>4,810</u>	<u>4,808</u>
Subtotal, full-time permanents.....	21,202	21,000	21,117	21,117
Other than full-time permanents.....	<u>1,044</u>	<u>1,000</u>	<u>883</u>	<u>883</u>
Total, Permanent Positions.....	<u>22,246</u>	<u>22,000</u>	<u>22,000</u>	<u>22,000</u>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1985 ESTIMATES

RESEARCH AND PROGRAM MANAGEMENT

DISTRIBUTION OF BUDGET PLAN BY FUNCTION BY INSTALLATION

(Thousands of Dollars)

FUNCTION	Total NASA	Johnson Space Center	Kennedy Space Center	Marshall Space Flight Center	National Space Technology Laboratories	Goddard Space Flight Center	Ames Research Center	Langley Research Center	Lewis Research Center	Headquarter!
<u>Personnel and Related Costs</u>										
1983 Actual.....	881,497	145,615	86,466	141,380	4,431	145,615	83,626	106,887	95,295	72,182
1984 Budget... ..	883,785	145,648	88,408	139,103	4,489	144,464	81,957	108,351	98,009	73,356
1984 Current.....	912,946	148,439	88,344	143,691	4,623	149,689	87,170	111,478	104,157	75,355
1985 Estimate.....	935,928	151,041	90,137	144,451	4,735	154,955	90,592	115,058	108,264	76,695
<u>Travel</u>										
1983 Actual.....	23,491	4,031	1,972	3,762	158	3,434	2,160	2,127	1,837	4,010
1984 Budget... ..	25,700	4,773	2,063	3,720	151	3,885	2,212	2,325	2,086	4,485
1984 Current.....	25,700	4,448	2,256	4,001	170	3,676	2,391	2,294	1,979	4,485
1985 Estimate.....	28,000	4,971	2,688	4,211	170	3,935	2,493	2,525	2,178	4,829
<u>Operation of Installation</u>										
1983 Actual.....	292,356	45,515	72,833	39,124	1,756	31,541	21,434	23,688	21,637	34,828
1984 Budget... ..	338,015	54,195	83,001	43,840	4,662	35,377	24,666	28,405	21,762	42,107
1984 Current.....	319,854	52,495	78,615	41,270	5,000	33,852	25,075	26,100	24,277	33,170
1985 Estimate.....	367,072	58,093	88,024	46,602	6,000	40,400	30,031	30,454	30,061	37,407
<u>TOTAL</u>										
1983 Actual.....	1,197,344	195,161	161,271	184,266	6,345	180,590	107,220	132,702	118,769	111,020
1984 Budget... ..	1,247,500	204,616	173,472	186,663	9,302	183,726	108,835	139,081	121,857	119,948
1984 Current.....	1,258,500	205,382	169,215	188,962	9,793	187,217	114,636	139,872	130,413	113,010
1985 Estimate.....	1,331,000	214,105	180,849	195,264	10,905	199,290	123,116	148,037	140,503	118,931

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED APPROPRIATION LANGUAGE

RESEARCH AND PROGRAM MANAGEMENT

For necessary expenses of research in government laboratories management of programs and other activities of the National Aeronautics and Space Administration, not otherwise provided for including uniforms or allowances therefor, as authorized by law (5 U.S.C. 5901-5902); awards; lease, hire, maintenance and operation of administrative aircraft; purchase (not to exceed [twenty-seven] thirty for replacement only) and hire of passenger motor vehicles; and maintenance and repair of real and personal property, and not in excess of **[\$75,000]** \$100,000 per project for construction of new facilities and additions to existing facilities, repairs, and rehabilitation and modification of facilities. [ \$1,258,500:] \$1,331,000 *Provided*. That contracts may be entered into under this appropriation for maintenance and operation of facilities, and for other services, to be provided during the next fiscal year: *Provided further*. That not to exceed \$35,000 of the foregoing amount shall be available for scientific consultations or extraordinary expense, to be expended upon the approval or authority of the Administrator and his determination shall be final and conclusive (42 U.S.C. 2451, et. seq., Department of Housing and Urban Development—Independent Agencies Appropriation Act 1984.)

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**  
**RESEARCH AND PROGRAM MANAGEMENT**  
**PROGRAM AND FINANCING**  
(in thousands of dollars)

	Budget Plan			Obligations		
	1983 actual	1984 estimate	1985 estimate	1983 actual	1984 estimate	1985 estimate
Identification code 80-0103-0-1-999						
Program by activities:						
Direct program:						
1. Space transportation systems.....	493,592	453,200	473,800	493,536	453,200	473,800
2. Scientific investigations in space.....	184,022	213,900	225,800	184,022	213,900	225,800
3. Space and terrestrial applications.....	120,134	120,900	132,100	120,134	120,900	132,100
4. Space research and technology.....	91,304	108,200	121,600	91,304	108,200	121,600
5. Aeronautical research and technology...	247,324	300,800	314,400	247,324	300,800	314,400
6. Energy technology.....	5,235	---	---	5,235	---	---
7. Supporting activity.....	55,789	61,500	63,300	55,789	61,500	63,300
Subtotal direct program.....	<u>1,197,400</u>	<u>1,258,500</u>	<u>1,331,000</u>	<u>1,197,344</u>	<u>1,258,500</u>	<u>1,331,100</u>
Total reimbursable program.....	<u>44,473</u>	<u>50,900</u>	<u>40,345</u>	<u>44,473</u>	<u>50,900</u>	<u>40,345</u>
10.00 Total obligations.....	<u>1,241,873</u>	<u>1,309,400</u>	<u>1,371,345</u>	<u>1,241,817</u>	<u>1,309,400</u>	<u>1,371,345</u>
Financing:						
Offsetting collections from:						
11.00 Federal funds.....				24,634	28,626	29,445
14.00 Non-Federal sources.....				19,839	22,274	10,900
21.40 Unobligated balance, start of year.....				-79	---	---
24.40 Unobligated balance, end of year.....				---	---	---
25.00 Unobligated balance lapsing.....				135	---	---
39.00 Budget authority.....				1,197,400	1,258,500	1,331,000
Budget authority:						
40.00 Appropriation.....				<b>1,197,400</b>	<b>1,238,500</b>	<b>1,331,000</b>
<b>44.20</b> Supplemental for civilian pay raises.....					20,000	
Relation of obligations to outlays:						
71.00 Obligations incurred, net.....				1,197,344	1,258,500	1,331,000
72.40 Obligations balance, start of year.....				133,266	89,931	92,931
74.40 Obligated balance, end of year.....				-89,931	-92,931	-92,931
77.00 Adjustments in expired accounts.....				-1,116	---	---
99.00 Outlays, excluding pay raise supplemental.....				1,239,562	1,235,500	1,331,000
91.20 Outlays from civilian pay raise supplemental.....					20,000	

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1985 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 1,620 acres. The Center also utilizes an additional 54,080 acres at the White Sands Test Facility, Las Cruces, New Mexico. The total capital investment of the Lyndon B. Johnson Space Center, including fixed assets in progress and contractor-held facilities at various locations and the White Sands Test Facility, as of September 30, 1983 was \$981,801,000.

CENTER ROLES AND MISSIONS

The Johnson Space Center 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 for the conduct of manned space flight missions. This need continued as the Nation proceeded toward more ambitious undertakings such as the Apollo program, the Skylab program, the Apollo-Soyuz Test Project and the current Space Shuttle program. To meet this responsibility, JSC has developed unique areas of recognized technical excellence within the civil service staff and facilities of superior merit; that is, major technical facilities which constitute a National resource. The principal and supporting roles are:

PRINCIPAL

Manned Vehicles - development of manned space vehicles and associated supporting technology, including:

Space Shuttle - development of the Orbiter and lead Center for management of the Shuttle system; providing sustaining engineering and logistic support for Space Transportation System (STS) hardware, including Shuttle configuration management, Shuttle sustaining engineering and Orbiter operational procurement.

Environmental and Crew Support Systems - develop and demonstrate Environmental Control and Life Support Subsystems and Extravehicular Activity (EVA) systems suitable for the Space Transportation Systems and other 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 - focus is on studies to define advanced transportation and orbital systems.

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

Space Station - System definition and engineering, integration, and technology.

Life Sciences:

Medical Research - establish human baseline data, investigate and develop countermeasures to solve space medicine problems, and develop information techniques and equipment to support medical operation and medical experiments.

Food Systems Technology - develop nutritional requirements and food processing systems in support of human space flight.

Spacelab Payload - development of Spacelab life sciences research capability through common operating research equipment development; definition and development of in-flight biomedical experiments.

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

Resource Observations - provide a discipline base for resource observations applications, including airborne experiments and space-based flight sensors, such as the application of Landsat and other data to agricultural crop forecasting.

SUPPORTING

Space Research and Technology - management of the Orbiter Experiments Program: definition and development of experiments in areas consistent with other JSC space roles.

Distribution of Civil Service Workyears

	1983 <u>Actual</u>	1984		1985 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
<b><u>RESEARCH AND DEVELOPMENT</u></b> .....	<b><u>796</u></b>	<b><u>773</u></b>	<b><u>875</u></b>	<b><u>1,097</u></b>
Space Station.....	<u>100</u>	<u>---</u>	<u>150</u>	<u>200</u>
Space Transportation Capability Development.....	<u>408</u>	<u>500</u>	<u>481</u>	<u>653</u>
Space Science and Applications.....	<u>236</u>	<u>218</u>	<u>192</u>	<u>192</u>
Physics and Astronomy.....	10	11	11	11
Life Sciences.....	119	97	99	99
Planetary Exploration.....	23	26	23	23
Space Applications.....	84	a4	59	59
Technology Utilization.....	<u>1</u>	<u>4</u>	<u>1</u>	<u>1</u>
Aeronautics and Space Technology.....	<u>51</u>	<u>51</u>	<u>51</u>	<u>51</u>
Aeronautical.....	5	5	5	5
Space.....	46	46	46	46
<b><u>SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS</u></b> .....	<b><u>2,026</u></b>	<b><u>1,957</u></b>	<b><u>1,897</u></b>	<b><u>1,675</u></b>
Shuttle Production and Operational Capability.....	965	887	887	619
Space Transportation Operations.....	1,061	1,070	1,010	1,056
Total, direct workyears.....	2,822	2,730	2,772	2,772
<b><u>CENTER MANAGEMENT AND OPERATIONS SUPPORT</u></b> .....	<b><u>433</u></b>	<b><u>529</u></b>	<b><u>437</u></b>	<b><u>437</u></b>
Total, full-time workyears.....	3,255	3,259	3,209	3,209
Other than full-time.....	<u>156</u>	<u>136</u>	<u>113</u>	<u>113</u>
Total, workyears.....	<u>3,411</u>	<u>3,395</u>	<u>3,322</u>	<u>3,322</u>

SUMMARY OF RESOURCES REQUIREMENTS

Funding Plan BY Function-

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related Costs.....	145,615	145,648	148,439	151,041
II. Travel.....	4,031	4,773	4,448	4,971
III. Operation of Installation.....	45,515	54,195	52,495	58,093
A. Facilities Services.....	(23,777)	(28,177)	(28,610)	(31,536)
B. Technical Services.....	(6,081)	(7,728)	(6,891)	(7,571)
C. Management and Operations.....	<del>(15,657)</del>	<u>(18,290)</u>	<u>(16,994)</u>	(18,986)
Total, fund requirements.....	..... <u>195,161</u>	<u>204,616</u>	<u>205,382</u>	<u>214,105</u>

PROGRAM DESCRIPTION

**RESEARCH AND DEVELOPMENT**

Permanent Civil  
Service Workyears

SPACE STATION..... 200

Space Station effort will consist of definition and integration studies, and focused technology activities.

~~SPACE TRANSPORTATION CAPABILITY DEVELOPMENT~~..... 653

The 1985 staffing provides for development, integration, and operations support for Spacelab Payload Operations Control Center (POCC), Upper Stages, and specific payload requirements for optional services.

Support of the Spacelab development effort includes establishing and controlling Shuttle interface with the Spacelab, for overall safety requirements for the Shuttle/Spacelab, and support of the Marshall Space Flight Center in the performance of its assigned responsibilities. JSC is responsible for crew mission training in conjunction with flight hardware and the development and operation of Shuttle/Spacelab simulators and trainers, as well as Spacelab support resident in the Orbiter general purpose computer.

The Advanced Programs activities at JSC are planned and administered in a manner designed to support future agency programs. The Center conducts in-house and contracted activities at both the major systems and support technology level. Major systems studies are designed to identify total system concepts including requirements, implementation methods, and programmatic analysis. Supporting technology activities are conducted to insure readiness of the advanced sub-systems necessary for implementation of advanced programs. Major emphasis at JSC over the past several years has been on satellite services to improve utilization of the Orbiter.

PHYSICS AND ASTRONOMY..... 11

JSC is assigned mission management responsibilities for the Earthward-looking remote sensing mission OSTA-3, OSTA-5, and OSTA-7. These responsibilities include the mission planning, real time mission control, mission requirements definition, and experiment integration. The Center will also have mission management responsibility for dedicated Life Sciences Spacelab missions.

LIFE SCIENCES..... 99

The Center has the lead role in evaluating human physiological changes associated with the space environment and providing effective countermeasures to assure crew health and optimal performance, e.g., the

space adaption syndrome (SAS) activity which focuses on investigating the potential problems astronauts have in adjusting to the weightless environment of space. The scientific activities are to define and develop biomedical experiments for life sciences payloads. These experiments are also designed to utilize the space environment to accomplish medical and biological research.

The medical activities provide for contingencies in flight involving onboard health services, training for crewmen, ground-based support, and evaluation of proposed crew members. The objectives are supportive of the Center's responsibility for assuring astronaut 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, operations, laboratory support, and clinical medicine.

The bioengineering activities include dedicated Life Sciences Spacelab experiments and integration for human experiments. To this end, science experiments have been selected, and experiment hardware development has been initiated. JSC has mission management responsibility for the life sciences payloads, which includes systems management and engineering of the payload equipment and operation of the payload during flight.

Permanent Civil  
Service Workyears

PLANETARY EXPLORATION..... 23

The Center supports the Agency's planetary exploration program in the area of geosciences where a strong, active research group is required to support future programs, provide curatorial support, assist in information dissemination and interact with outside scientists. To provide this support, the research group makes an active contribution to our knowledge of 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 is an important role for the geoscience group which is involved in extensive interaction with the planetary science community.

SPACE APPLICATIONS..... 59

The earth observations discipline is divided into two major areas: technology development and applications projects and flight projects. JSC's responsibility entails the conduct and implementation of major tasks in each of these areas.

Technology development and applications projects use remotely-sensed data to understand the Earth processes from a planetary viewpoint including physical, chemical and biological processes, global

vegetation, water, soil, energy and biogeochemical cycles. Studies of data systems and techniques associated with these and other applications are also being conducted.

Applications Flight Projects responsibilities at JSC center on Shuttle payload instrument development. The Large Format Stereo Camera is being developed for flight on the Shuttle. Responding to airborne measurement requirements, JSC develops and implements an aircraft sensors plan. Involved is the testing, maintenance, and operation of a wide variety of remote sensors to provide data to investigators.

Permanent Civil  
Service Workyears

TECHNOLOGY UTILIZATION..... 1

The Technology Utilization program transfers new knowledge and innovative technology resulting from NASA's research and development programs for application to industry, medicine, and the public sector.

AERONAUTICAL RESEARCH AND TECHNOLOGY..... 5

The Center is continuing its efforts in the fire testing of aircraft interior panels fabricated with newly developed materials. JSC is also investigating the toxicity of the thermodecomposition (pyrolysis) products of several candidate aircraft/spacecraft materials. In addition, JSC is jointly working with the Langley Research Center on a study for the development of advanced information processing systems architecture which will meet the needs of future aircraft and spacecraft flight control systems.

SPACE RESEARCH AND TECHNOLOGY..... 46

Systems and design studies are being performed to: develop technology, fabricate, and test components of a Synthetic Aperture Imaging Radar research fuel cell and electrolysis cell technology to demonstrate suitability to large orbital energy conversion and storage requirements; collect data (using the Shuttle Development Flight Instrumentation and instrumentation developed by the Orbiter Experiments Program) that will augment the research and technology base for future transportation systems design; collect and analyze flight mechanics data for the determination of aerodynamic coefficients from Orbiter flight data; develop automation technology applicable to the Space Transportation System; develop berthing/docking systems technology required for future large space systems; and design, fabricate, and test advanced thermal protection systems. **Also** underway are studies to develop and design a more efficient environmentally controlled life support system; to develop technologies to increase the effectiveness of man-machine interactions in space; and to collect and analyze data on the hypervelocity impact properties of composite materials used in spacecraft structures. The Center will also manage the integration of OEX hardware into Shuttle Orbiters.

SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY.....

619

The Space Shuttle Program Office of JSC has program management responsibility for program control, overall systems engineering, and Space Shuttle system integration, providing management of the "Lead Center" functions as related to the Space Shuttle program and the overall systems management and integration of all elements of the program. The Space Shuttle Orbiter Project Office provides overall management of the production of the Orbiter system. This includes management of various elements of the total Orbiter system; e.g., structures, propulsion, power, and avionics and to lower elements within the subsystems. Activities consistent with a phased delivery of the total Orbiter fleet, and procurement of necessary initial flight and ground support equipment will be continued.

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 the flight system and the flight to ground system. 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 operational information.

Although major Space Shuttle flight system elements have been individually managed through designated Shuttle element project offices and related provisions contractors, a relatively large quantity of supporting equipment is supplied to the program through other elements of JSC. Examples of such equipment are: extravehicular mobility unit, portable oxygen system, closed circuit television, survival radio sets, dosimetry, crew equipment, photographic camera systems, bioinstrumentation.

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 environmental test chamber; analysis and evaluation of the Orbiter hydraulics system, auxiliary power unit, orbital maneuvering system components, reaction control system engine valve leak detection techniques; analysis vehicle attachment and separation systems; analysis of total Shuttle systems, Shuttle/payload interface, crew station evaluation, and Shuttle airlock evaluation, etc; 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 operational performance of the Space Shuttle is dependent on the proper

functioning of integrated electronic equipment. Collectively, these are termed the Integrated Avionics System. Avionics provide the Shuttle pilots and crew with the total assessment and command capability necessary to manage, fly, and operate the vehicle. Because of the critical nature of this system, very close attention is given to the identification of performance requirements and integrated performance.

A variety of avionic elements are included within the Shuttle system, each of which requires 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 control and recovery interface, power and control, and external tank propellant control and instrumentation.

The MCC is being upgraded to provide the ability to separate a secure data string for Department of Defense Shuttle mission support.

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

Permanent Civil  
~~Service Workyears~~

SPACE TRANSPORTATION OPERATIONS..... 1,056

Space Transportation Operations staffing provides for Shuttle operational flight program management including vehicle system integration; MCC operations; crew equipment and crew training; and flight and mission planning and operations.

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 mission control center and network systems requirements, and operations input to the planning for the selection and operation of Shuttle payloads.

Operations flight design includes: the identification of operational requirements for the design of planned and improved spacecraft systems; the development of flight techniques for utilization of these systems; 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. As in OFT, the software activities for operational flights also include the continued development, definition, and verification support of the guidance, targeting, and navigation systems software requirements in the Orbiter and MCC. Software changes for Orbiter improvements will upgrade capabilities and performance.

Specific flight planning activity encompasses the flight design, flight analysis, and software 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 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.

Reconfiguration tools (hardware and software systems) to permit support of the high flight rate of the 1980's will be 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 will require management and utilization of a very high volume of data. Therefore, automated tools are essential to support this pace of training. In addition, simulator system upgrades are continuously being made to keep up with the changes to the Orbiters.

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 because of the 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 which now comprise the Software Development Laboratory and the support of the Software Production Facility.

Permanent Civil  
Service Workyears

CENTER MANAGEMENT AND OPERATIONS SUPPORT.....

437

Center Management and Operations Support is provided to all JSC organizations which cannot be identified exclusively to a single program or project. 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, Patent Counsel, Equal Opportunity, Technical Planning, and Public Affairs.

Management Support - Those who will provide 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, 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.

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RESOURCE REQUIREMENTS BY FUNCTION

	1983	1984		1985
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
<b>I. <u>PERSONNEL AND RELATED COSTS</u>.....</b>	<b><u>145,615</u></b>	<b><u>145,648</u></b>	<b><u>148,439</u></b>	<b><u>151,041</u></b>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Full-time permanent.....	123,777	122,637	124,738	125,335
b. Other than full-time permanent.....	2,364	2,622	2,042	2,072
c. Reimbursable <b>detailees</b> .....	3,213	3,400	3,635	4,235
d. Overtime and other compensation.....	<u>1,591</u>	<u>1,385</u>	<u>1,977</u>	<u>1,999</u>
Subtotal, Compensation.....	130,945	130,044	132,392	133,641
2. <u>Benefits</u> .....	<u>13,917</u>	<u>14,684</u>	<u>15,187</u>	<u>16,496</u>
subtotal, Compensation and Benefits...	144,862	144,728	147,579	150,137
B. <u>Supporting Costs</u>				
1. Transfer of personnel.....	125	250	250	263
2. Personnel training.....	<u>628</u>	<u>670</u>	<u>610</u>	<u>641</u>
subtotal, Supporting Costs.....	<u>753</u>	<u>920</u>	<u>860</u>	<u>904</u>
Total, Personnel and Related Costs.....	<u>145,615</u>	<u>145,648</u>	<u>148,439</u>	<u>151,041</u>

Explanation of Fund Requirements

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
A. <u>Compensation and Benefits</u> .....	<u>144,862</u>	<u>144,728</u>	<u>147,579</u>	<u>150,137</u>
1. <u>Compensation</u> .....	<u>130,945</u>	<u>130,044</u>	<u>132,392</u>	<u>133,641</u>
a. Full-time permanent.....	123,777	122,637	124,738	125,335

The current estimate for 1984 reflects a change from the 1984 budget estimate due to the recent pay raise and a reduction of permanent workyears.

Basis of Cost for Full-time Workyears

In 1985, the cost of full-time workyears will be \$125,335,000, an increase of \$597,000 over 1984. The increase is calculated as follows:

Cost of full-time workyears in 1984.....	124,738
Cost increases in 1985.....	+4,340
Within grade and career advances:	
Full year effect of 1984 actions.....	+1,060
Partial year effect of 1985 actions.....	+1,385
Full year effect of 1984 pay increases.....	+1,416
One more paid day in 1985.....	+479
Cost decreases in 1985.....	-3,743
Turnover savings and abolished positions:	
Full year effect of 1984 actions.....	-1,624
partial year effect of 1985 actions.....	-1,484
Alteration in the method of calculating salaries paid.....	-102
Reduction related to the Government-wide initiative to reduce the number of GS/GM 11-15 positions.....	-533
Cost of full-time workyears in 1985.....	<u>125,335</u>

	1983 <u>Actual.</u>	1984		1985
		<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.....	2,364	2,622	2,042	2,072
2. Workyears .....	193	194	157	158

The distribution of 1985 workyears is as follows:

Distribution of Other than Full-Time Workyears

<u>Program</u>	<u>Workyears</u>
Ceiling programs.....	113
Developmental programs.....	(81)
Summer programs.....	(13)
Other temporary programs.....	(19)
Youth opportunity programs....	<u>45</u>
Total.....	<u>158</u>

c. Reimbursable detailees.....	3,213	3,400	3,635	4,235
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The military personnel detailed to the Johnson Space Center on a reimbursable basis are individuals experienced in manned space flight and related fields. Each individual performs a function essential and critical to current and future programs. The increase from the 1984 budget estimate to the 1984 current estimate is the 1984 pay raise. The increase in the 1985 estimate reflects the addition of new astronaut trainees to support the increased Shuttle flight rate.

d. Overtime and other compensation.....	1,591	1,385	1,977	1,999
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Overtime in 1985 will be used primarily in support of Shuttle flights; e.g., crew training, trajectory optimization, data reduction integration laboratory, and related support activities. The increase from the 1984 budget estimate to the 1984 current estimate reflects 1383 experience and the increased Shuttle flight rate.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
2. <u>Benefits</u> .....	<u>13,917</u>	<u>14,684</u>	<u>15,187</u>	<u>16,496</u>

The following are the amounts of contribution by category:

Civil Service Retirement Fund.....	8,712	8,778	8,856	9,115
Employee life insurance.....	345	362	355	356
Employee health insurance.....	3,034	3,557	3,790	4,341
Workmen's compensation.....	474	600	600	600
FICA.....	70	70	213	665
Medicare.....	1,238	1,307	1,363	1,409
Other benefits.....	<u>44</u>	<u>10</u>	<u>10</u>	<u>10</u>
Total.....	<u>13,917</u>	<u>14,684</u>	<u>15,187</u>	<u>16,496</u>

The increase from the 1984 budget estimate to the 1984 current estimate is due primarily to the reduction of permanent personnel positions offset by the recent pay raise and FICA for new employees. The Workmen's Compensation estimates for 1984 and 1985 reflect estimates based on Department of Labor billings. The increase from 1984 to 1985 is primarily due to the effect of the recent pay raise, the government's share of health insurance cost, and new employee FICA.

B. <u>Supporting Costs</u> .....	<u>753</u>	<u>920</u>	<u>860</u>	<u>904</u>
1. <u>Transfer of personnel</u> .....	125	250	250	263

Transfer of personnel includes movement of household goods, subsistence and temporary expenses, real estate and miscellaneous moving expenses related to change of duty stations. The increase in the 1985 reflects expected increases in transportation rates.

2. <u>Personnel training</u> .....	628	670	610	641
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The purpose of the JSC training program is to continue the development of skills and knowledge of civil service employees in order to maintain a state of the art technology to more efficiently support JSC roles and missions. The increase from 1984 to 1985 reflect a **small** increase in the level of training as well as an increase in projected tuition and other training costs.

	1983 Actual	1984		1985
		Budget Estimate	Current Estimate	Budget Estimate
II. <u>TRAVEL</u> .....	<u>4,031</u>	<u>4,773</u>	<u>4,448</u>	<u>4,971</u>

(Thousands of Dollars)

Summary of Fund Requirements

A. Program Travel.....	3,290	4,312	3,636	3,959
B. Scientific and Technical Development Travel.....	287	221	316	490
C. Management and Operations Travel.....	<u>454</u>	<u>240</u>	<u>496</u>	<u>522</u>
Total, Travel.....	<u>4,031</u>	<u>4,773</u>	<u>4,448</u>	<u>4,971</u>

Explanation of Fund Requirements

A. <u>Program Travel</u> .....	<u>3,290</u>	<u>4,312</u>	<u>3,636</u>	<u>3,959</u>
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Program Travel is specifically required for accomplishment of the Center's mission and accounts for approximately 80 percent of the travel budget for 1985. The 1984 and 1985 travel supports the planned increase of STS operational missions. This includes the increased activities, both domestic and foreign, related to future STS payloads from the private sector. Travel will be required to support operations activity including launch, mission support, coordination of engineering and technical activities, and support of payload technical integration. The decrease from the 1984 budget estimate to the 1984 current estimate reflects 1983 experience and the number of STS operational missions. The 1985 estimate reflects expected increases in transportation costs.

B. <u>Scientific and Technical Development Travel</u> .....	<u>287</u>	<u>221</u>	<u>316</u>	<u>490</u>
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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. In addition to anticipated increases in per diem and travel rates, \$155,000 is included in 1985 as part of the NASA-wide increase in funds for greater participation by JSC scientists and engineers in technical meetings and symposia.

	1983 Actual	1984		1985
		Budget Estimate	Current Estimate	Budget Estimate
C. <u>Management and Operations Travel</u> .....	<u>454</u>	<u>240</u>	<u>496</u>	<u>522</u>

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 increases from the 1984 budget estimate to the 1984 current- estimate and the 1985 estimate reflect 1983 experience and expected increases in transportation costs.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
III. <u>OPERATION OF INSTALLATION</u> .....	<u>45,515</u>	<u>54,195</u>	<u>52,495</u>	<u>58,093</u>

Summary of Fund Requirements

A. Facilities Services.....	23,777	28,177	28,610	31,536
B. Technical Services.....	6,081	7,728	6,891	7,571
C. Management and Operations.....	<u>15,657</u>	<u>18,290</u>	<u>16,994</u>	<u>18,986</u>
Total, Operation of Installation.....	<u>45,515</u>	<u>54,195</u>	<u>52,495</u>	<u>58,093</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 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, and related services.

The decrease from the 1984 budget estimate to the 1984 current estimate is primarily due to the delay and deferral of activities **and** a rephrasing of support contractor funding plans to accommodate the Congressional reduction in the 1984 request and partial absorption of 1984 increased pay costs. The increase in 1985 includes rate increases for energy, support contracts, administrative communications, and an operational maintenance initiative.

	1983 <u>Actual</u>	<u>1984</u>		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
A. <u>FACILITIES SERVICES</u> .....	<u>23,777</u>	<u>28,177</u>	<u>28,610</u>	<u>31,536</u>

The Johnson Space Center is located on 1,620 acres with a complex of laboratory and office buildings, as well as test facilities. This encompasses 2,822,616 gross square feet of building space in 91 primary buildings including eleven major technical facilities. There are also an additional 37 secondary buildings. This physical plant supports an average daily on-site population of approximately 8,224 personnel plus an additional 3,835 personnel located off-site at nearby facilities and Ellington Air Force Base. These budget estimates also include resources associated with the physical plant requirements of the White Sands Test Facility and for facilities used at Ellington Air Force Base.

Summary of Fund Requirements

1. <u>Maintenance and Related Services</u> .....	<u>5,985</u>	<u>8,753</u>	<u>8,586</u>	<u>9,903</u>
2. <u>Custodial Services</u> .....	<u>4,166</u>	<u>5,167</u>	<u>5,131</u>	<u>5,323</u>
3. <u>Utility Services</u> .....	<del>12,626</del>	<u>14,257</u>	<u>14,893</u>	<u>16,310</u>
Total, Facilities Services.....	<u>23,777</u>	<u>28,177</u>	<u>28,610</u>	<u>31,536</u>

Explanation of Fund Requirements

1. <u>Maintenance and Related Services</u> .....	<u>6,985</u>	<u>8,753</u>	<u>8,586</u>	<u>9,903</u>
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This activity involves routine maintenance and facilities support for JSC at Houston, as well as White Sands Test Facility and Ellington Air Force Base, and includes such activities as support for utility systems; administrative office alterations and painting; mowing and edging of 620 acres of improved land and mowing another 694 acres of unimproved land; cultivation, mulching, fertilizing, insect control, and care of trees and shrubs; engineering design, drafting, and specifications preparation for construction of facilities; minor construction and repair projects; and other facility and system design and modification tasks. The change from the 1984 budget estimate to the 1984 current estimate is primarily due to support contractor rates being lower than expected. The increase from 1984 to 1985 reflects not only anticipated support service contractor wage rate increases and expected 1985 price levels for supplies, materials, equipment and other contractual effort, but an increase of \$800,000 as part of the NASA-wide augmentation in

Operational Maintenance effort. This augmentation will provide a level of activity more consistent with the National investment in the JSC physical plant.

2. <u>Custodial Services</u> .....	<u>4,166</u>	<u>5,167</u>	<u>5,131</u>	<u>5,323</u>
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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 to 2.55 million square feet of floor space (including highly specialized cleanroom services); and fire protection services such as maintenance of alarms and fixed fire fighting equipment, and industrial safety and inspection. The change from the 1984 budget estimate to the 1984 current estimate reflects 1983 experience offset by the replacement of a fire truck. The increase in 1985 is due, for the most part, to expected support contract rate increases.

3. <u>Utility Services</u> .....	<del>12,626</del>	<u>14,257</u>	<u>14,893</u>	<u>16,310</u>
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This category includes purchased utilities and support contractor effort for the operation and maintenance of the utility distribution system at JSC. The increase from the 1984 budget estimate to the 1984 current estimate is higher utility consumption related to Shuttle mission activities offset by utility rates lower than expected. The 1985 increase is utility and support contract rate increases.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
B. <u>TECHNICAL SERVICES</u> .....	<u>6,081</u>	<u>7,728</u>	<u>6,891</u>	<u>7,571</u>

Summary of Fund Requirements

1. <u>Automatic Data Processing</u> .....	<u>3,777</u>	<u>4,480</u>	<u>3,515</u>	<u>4,027</u>
a. <u>Equipment</u> .....	697	619	326	665
b. <u>Operations</u> .....	3,080	3,861	3,189	3,362
2. <u>Scientific and Technical Information</u> .....	<u>1,405</u>	<u>2,448</u>	<u>2,333</u>	<u>2,459</u>
3. <u>Shop and Support Services</u> .....	<u>899</u>	<u>800</u>	<u>1,043</u>	<u>1,085</u>
Total, Technical Services.....	<u>6,081</u>	<u>7,728</u>	<u>6,891</u>	<u>7,571</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u> .....	<u>3,777</u>	<u>4,480</u>	<u>3,515</u>	<u>4,027</u>
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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 personnel. The ADP systems supported include institutional management, finance and accounting, procurement, contract status and tracking, personnel management, and utility tracking. The decrease from the 1984 budget estimate to the 1984 current estimate is the deferred realignment of programmers to help accommodate the pay raise absorption. In 1985 the increase is due primarily to support contract rate increases and purchases of replacement equipment.

2. <u>Scientific and Technical Information</u> .....	<u>1,405</u>	<u>2,448</u>	<u>2,333</u>	<u>2,459</u>
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This activity provides for a public affairs educational and informational program and support to the Center in provision of 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 from the 1984 budget estimate to the 1984 current estimate is mainly due to a reduction in support contract workyears offset by rate increases. The increase in 1985 reflects expected contract rate increases.

	1983	1984		1985	
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>	—
		(Thousands of Dollars)			
3. <u>Shop and Support Services</u> .....	<u>899</u>	<u>800</u>	<u>1,043</u>	<u>1,085</u>	

These funds provide for a support contractor who provides JSC graphics and photographic services. Graphic materials are prepared for use in presentations and senior management reviews. Various kinds of film are processed and reproductions and reprints made. An increase in support contract workyears is the reason for the increase between the 1984 budget and 1984 current estimates. The increase in 1985 reflects support contract rate increases.

	1983 <u>Actual</u>	<u>1984</u>		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
C. <u>MANAGEMENT AND OPERATIONS</u> .....	<u>15,657</u>	<u>18,290</u>	<u>16,994</u>	<u>18,986</u>

(Thousands of Dollars)

Summary of Fund Requirements

1. <u>Administrative Communications</u> .....	5,337	6,121	6,082	6,876
2. <u>Printing and Reproduction</u> .....	220	240	220	247
3. <u>Transportation</u> .....	2,933	2,783	2,705	2,898
4. <u>Installation Common Services</u> .....	<u>7,167</u>	<u>9,146</u>	<u>7,987</u>	<u>8,965</u>
Total, Management and Operations.....	<u>15,657</u>	<u>18,290</u>	<u>16,994</u>	<u>18,986</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u> .....	<u>5,337</u>	<u>6,121</u>	<u>6,082</u>	<u>6,876</u>
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Communications support for JSC and WSTF consists of local and long distance telephone service, and other communications services. Local service includes Centrex lines and telephones at JSC and WSTF. Long distance service includes the cost for FTS, 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 reduction between the 1984 budget and current estimates is due to more recent estimates of the impact of deregulation and divestiture on local telephone rates. The increase in 1985 is the full year impact of divestiture and deregulation.

2. <u>Printing and Reproduction</u> .....	<u>220</u>	<u>240</u>	<u>220</u>	<u>247</u>
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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 60 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 52,000,000 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

1984 budget estimate to the current estimate reflects 1983 experience. The increase in 1985 reflects expected increases in supplies and materials costs.

	1983 Actual	1984		1985
		Budget Estimate (Thousands of Dollars)	Current Estimate	Budget Estimate
3. <u>Transportation</u> .....	<u>2,933</u>	<u>2,783</u>	<u>2,705</u>	<u>2,898</u>

Transportation includes administrative aircraft maintenance and fuel costs, lease of passenger vehicles and trucks, including GSA drivers and dispatchers and maintenance of vehicles. The decrease from the 1984 budget estimate to the 1984 current estimate is due primarily to maintenance for the administrative aircraft accomplished in 1983 rather than 1984. The 1985 increase is due to an increase in aircraft maintenance plus escalation of supply and equipment costs.

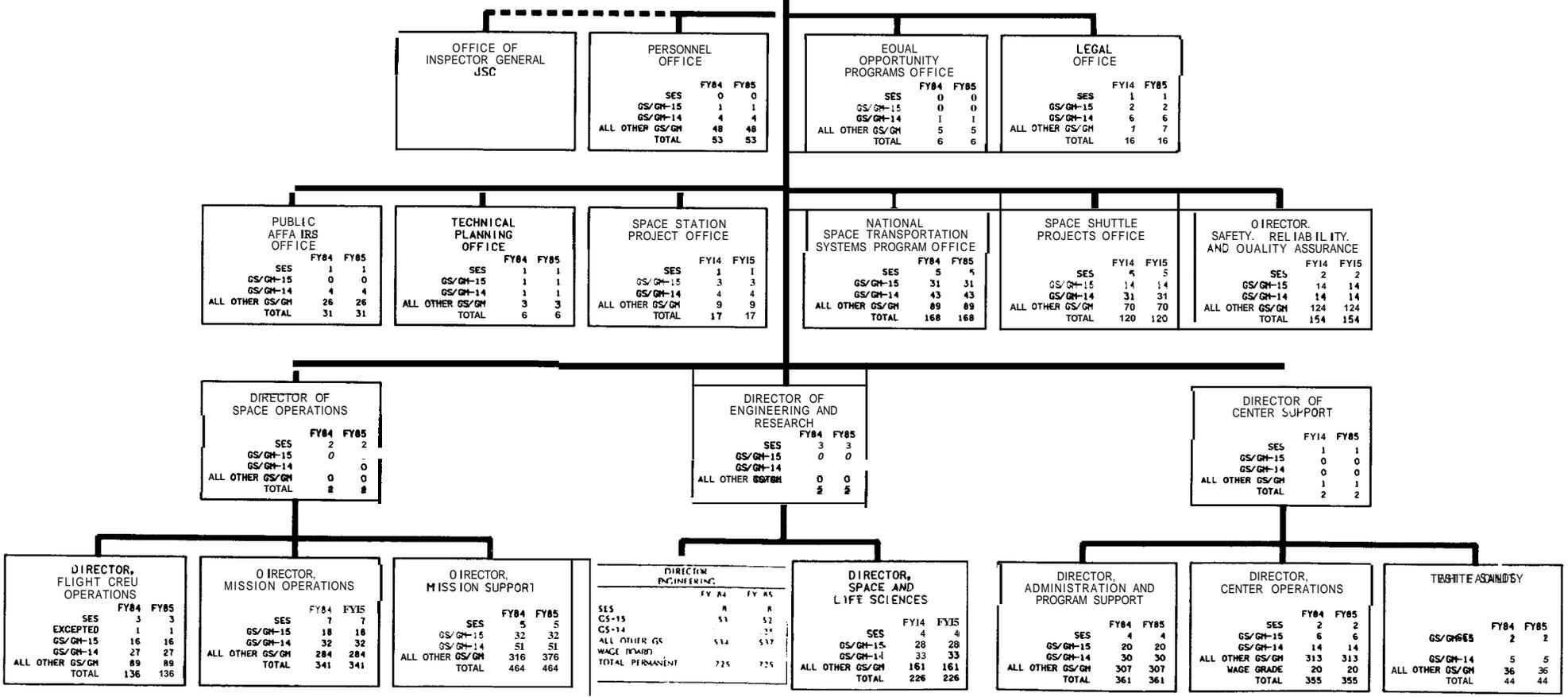
4. <u>Installation Common Services</u> .....	<u>7,167</u>	<u>9,146</u>	<u>7,987</u>	<u>8,965</u>
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These services support Center management and staff activities, provide medical services, and cover various installation support services. Center management and staff functions include legal, personnel, procurement, and EEO activities. Medical services provided include occupational medicine and environmental health, consisting of the operation of the JSC on-site clinic; emergency assistance at Ellington Air Force Base (EAFB); providing physicals for JSC personnel at Downey, California; medical consultation and crew test support; industrial hygiene; radiological health; and an environmental health laboratory. Installation support services include administrative supplies, materials and equipment at the Center and at White Sands Test Facility; identification and cataloging of supply requests, placing orders on the proper Federal Schedule Contracts and maintaining a stock catalog; operation of a central receiving depot for supplies; warehousing; bonded storage and storage of hazardous materials; stock issuance; payments for postal services; shipping and packing of supplies and equipment both locally and for long distance movement; moving and hauling of items within JSC; delivery of supplies, materials and equipment purchased from local suppliers; JSC share of operating costs at EAFB; stenographic services; torts and claims; inspection services; and miscellaneous administrative support. The decrease from the 1984 budget estimate to the 1984 current estimate reflects a reduction in administrative equipment replacement to help accommodate the 1984 pay raise absorption. The increase in 1985 reflects resumption of equipment replacement deferred in 1984, along with support contract rate increases.

# LYNDON B. JOHNSON SPACE CENTER

LSC SUMMARY		
	FY 84	FY 85
SES	50	59
EXCEPTED	1	1
GS-15	241	240
GS-14	430	428
ALL OTHER GS	2489	2492
WAGE BOARD	20	20
TOTAL PERMANENT	1240	1240

DIRECTOR DEPUTY DIRECTOR ASSOCIATE DIRECTOR		
	FY84	FY85
SES	3	3
GS/GM-15	0	0
GS/GM-14	2	0
ALL OTHER GS/GM	3	3
TOTAL	6	6







## RESEARCH AND PROGRAM MANAGEMENT

### FISCAL YEAR 1985 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 (96 acres), and Florida-owned submerged lands with Deed of Dedication (55,795 acres).

Space Shuttle flights began at KSC in 1981 and will begin at Vandenberg Air Force Base, California in 1985. Expendable launch vehicle 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, California, which is located six miles west of Lompoc, California. Activities at Vandenberg are accomplished within a host-tenant agreement with the Air Force.

The NASA capital investment at the Kennedy Space Center, Cape Canaveral Air Force Station, and Vandenberg Air Force Base, including fixed assets in progress and contractor-held facilities as of September 30, 1983, was \$2,563,076,000.

##### 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 free 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 technical facilities developed at KSC represent a recognized national resource. The principal roles of the Center are:

Space Transportation System (STS) Ground Operations - includes Space Shuttle launch preparation, launch, landing and refurbishment, Spacelab and Spacelab payloads ground processing, Cargo/experiment integration and processing, upper stages ground processing, and operation and maintenance of ground support equipment.

Expendable Launch Vehicle Operations - includes launch preparation, checkout and launch for the current inventory of launch vehicles.

**SUMMARY OF RESOURCES REQUIREMENTS**

Funding Plan by Function

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u> (Thousands of Dollars)	
I. Personnel and Related Costs....	86,466	88,408	88,344	90,137
II. Travel.....	1,972	2,063	2,256	2,688
III. Operation of Installation.....	72,833	83,001	78,615	88,024
A. Facilities Services.. ..	(46,915)	(51,440)	(47,787)	(50,464)
B. Technical Services.....	(6,149)	( 7,781)	( 7,656)	( 8,784)
C. Management and Operations..	<u>(19,769)</u>	<u>(23,780)</u>	<u>(23,172)</u>	<u>(28,776)</u>
Total, fund requirements....	<u>161,271</u>	<u>173,472</u>	<u>169,215</u>	<u>180,849</u>

Distribution of Permanent Workyears by Program

	1983 <u>Actual</u>	1984		1985 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
<b><u>RESEARCH AND DEVELOPMENT</u></b> .....	<b><u>363</u></b>	<b><u>380</u></b>	<b><u>427</u></b>	<b><u>530</u></b>
<u>Space Station</u> .....	<u>24</u>	<u>---</u>	<u>75</u>	<u>100</u>
Space Transportation Capability Development.....	216	250	223	297
<u>Space Science and Applications</u> .....	<u>111</u>	<u>113</u>	<u>111</u>	<u>111</u>
Physics and Astronomy.....	108	107	108	108
Life Sciences.....	2	4	2	2
Space Applications.....	1	2	1	1
<u>Technology Utilization</u> .....	<u>7</u>	<u>5</u>	<u>7</u>	<u>7</u>
<u>Aeronautics and Space Technology</u> .....	<u>5</u>	<u>12</u>	<u>11</u>	<u>15</u>
Space.....	5	12	11	15
<b><u>SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS</u></b> .....	<b><u>1,210</u></b>	<b><u>1,165</u></b>	<b><u>1,140</u></b>	<b><u>1,037</u></b>
Shuttle Production and Operational Capability.....	195	154	154	126
Space Transportation Operations.....	1,015	1,011	986	911
Subtotal, direct.....	<u>1,573</u>	<u>1,545</u>	<u>1,567</u>	<u>1,567</u>
<b><u>CENTER MANAGEMENT AND OPERATIONS</u></b> <del>SECRET</del> .....	<b><u>520</u></b>	<b><u>545</u></b>	<b><u>515</u></b>	<b><u>515</u></b>
'ibtal, full-time workyears... ..	2,093	2,090	2,082	2,082
Other than full-time workyears.....	97	98	90	90
Total, permanent workyears.....	<u>2,190</u>	<u>2,188</u>	<u>2,172</u>	<u>2,172</u>

PROGRAM DESCRIPTION

Permanent Civil  
Service Workyears

RESEARCH AND DEVELOPMENT

SPACE STATION..... 100

Space Station effort will consist of definition and integration studies, and focused technology activities.

SPACE TRANSPORTATION CAPABILITY DEVELOPMENT..... 297

The upper stages currently consist of the Inertial Upper Stage (IUS), Centaur, and the Payload Assist Module (PAM). These upper stages are expendable, propulsive stages intended for use in the deployment of Space Shuttle transported payloads to high energy orbits not attainable by the Space Shuttle alone.

Under current plans the PAM has been developed, checked out and mated to a payload by the PAM commercial developer, McDonnell Douglas. KSC has responsibility for integration of the PAM and its payload into the Shuttle payload bay. KSC is currently engaged in modifying the launch site facilities to accommodate the use of the Centaur as a Shuttle upper stage. These modifications, which affect all major launch facilities and in particular the launch pads and mobile launcher platforms, are planned for completion in time to support the Galileo and International Solar Polar missions in 1986.

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. KSC has responsibility for verifying that the Spacelab flight and ground systems are compatible with the Spacelab, with each other, and with safety requirements. The first Spacelab flight unit flew aboard STS-9 in November 1983.

KSC will provide facilities and support to the various developers and experimenters during processing at KSC. KSC, in concert with other NASA organizations must analyze potential payload users' requirements and activities. Based on experience gained during the Expendable Launch Vehicle program, KSC will monitor payload activity from conception; participate in design reviews to ensure compatibility with KSC facilities; and provide support coordination during the payload checkout and launch at KSC.

PHYSICS AND ASTRONOMY..... 108

KSC is responsible for planning and coordinating Level IV integration and launch site support of mission experiments for Spacelab missions. 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.....

2

Kennedy Space Center will continue its support role in the definition, development and integration of biomedical experiments into Space Shuttle payloads 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 life sciences payloads. These experiments are designed to use the environment of space to accomplish medical and biological research for the benefit of man.

SPACE APPLICATIONS.....

1

Space Shuttle launch and landing operation studies are conducted to provide environmental observations, applied research, and data analysis.

TECHNOLOGY UTILIZATION.....

7

The objective of the Technology Utilization program at KSC is to encourage the use of and to expedite the application of new NASA technology to sectors outside the Agency.

SPACE RESEARCH AND TECHNOLOGY.....

15

KSC conducts investigations of improved equipment, software and operational techniques to increase the safety and efficiency of KSC ground systems for present and future space systems.

**SPACE FLIGHT; CONTROL AND DATA COMMUNICATIONS**

SHUTTLE PRODUCTION AND OPERATIONAL CAPABILITY.....

126

With the exception of Launch Pad B and Mobile Launch Platform 3, construction of most new launch support facilities and modifications of most existing facilities are completed. However, KSC will continue the design, modification or acquisition, installation and checkout of equipment and facilities to be used in support of increased launch rate requirements. This includes equipment provided by KSC contractors, as well as equipment to be supplied by development contractors as part of their flight vehicle responsibilities.

The first Space Shuttle landing at KSC is scheduled in 1984. Although installation and checkout of initial operational systems are complete and the ground support equipment installed, there are ongoing new requirements and modifications to existing systems, including the Launch Processing System (LPS).

KSC will continue to upgrade launch Pad B construction activities, Launch Complex 13 modifications, and other modifications to facilities or equipment to meet Space Shuttle requirements. Major facility modifications are currently underway on existing facilities to support the Centaur upper stage program.

Permanent Civil  
Service Workyears

SPACE TRANSPORTATION OPERATIONS.....

911

The operations role at KSC includes the test and checkout of each flight element as it arrives at KSC for flight; the integration of the 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 will be refurbished by KSC in preparation for the next mission. KSC is responsible for retrieval and disassembly, of the expended Solid Rocket Boosters. KSC will also continue the refurbishment of selected existing support equipment for reuse in the Space Shuttle system. KSC is responsible for contingency landing site preparations for ferrying the Orbiter back to KSC.

Orbiter Vehicle (OV) 102, used in the Orbital Flight Test Program, and for the first operational flight was modified during 1983 at KSC for the initial Spacelab mission flown in November 1983. Orbiter Vehicle 099 arrived at KSC in July 1982; Orbiter Vehicle 103 arrived at Kennedy in late 1983; and Orbiter Vehicle 104 is scheduled to arrive in December 1984.

The Center is responsible for the launch preparation, checkout, support coordination during the payload, checkout, and launch of the current inventory of expendable launch vehicles. This includes the Atlas Centaur and Delta vehicles. Launches at both the Eastern Space and Missile Center (ESMC) and Vandenberg Air Force Base (VAFB) are the responsibility of KSC.

CENTER MANAGEMENT AND OPERATIONS SUPPORT.....

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Center Management and Operations Support provides support to all Kennedy Space Center 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, e.g., Legal, Patent Counsel, Equal Opportunity, Public Affairs, and Safety.

Management Support - The part of the KSC civil service workforce that provides 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 - The part of the KSC civil service workforce that provides 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.

RESOURCES REQUIREMENTS BY FUNCTION

	1983 <u>Actual</u>	1984		1985 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
<b>I. <u>PERSONNEL AND RELATED COSTS</u>.....</b>	<b><u>86,466</u></b>	<b><u>88,408</u></b>	<b><u>88,344</u></b>	<b><u>90,137</u></b>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u> .....	85,651	87,606	87,272	89,065
1. <u>Compensation</u>				
a. Full-time.....	72,867	73,689	73,744	74,765
b. Other than full-time.....	1,571	1,590	1,375	1,382
c. Reimbursable detailees.....	46	49	50	52
d. Overtime and other compensation.....	<u>2,421</u>	<u>3,180</u>	<u>2,767</u>	<u>3,017</u>
Subtotal, Compensation .....	76,905	78,508	77,936	79,216
2. <u>Benefits</u> .....	<u>8,746</u>	<u>9,098</u>	<u>9,336</u>	<u>9,849</u>
Subtotal, Compensation and Benefits...	<u>85,651</u>	<u>87,606</u>	<u>87,272</u>	<u>89,065</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel.....	347	230	450	450
2. Personnel training.....	<u>468</u>	<u>572</u>	<u>622</u>	<u>622</u>
Subtotal, Supporting Costs.....	<u>815</u>	<u>802</u>	<u>1,072</u>	<u>1,072</u>
Tbtotal, Personnel and Related Costs....	<u>86,466</u>	<u>88,408</u>	<u>88,344</u>	<u>90,137</u>

Explanation of Fund Requirements

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
A. <u>Compensation and Benefits</u> .....	<u>85,651</u>	<u>87,606</u>	<u>87,272</u>	<u>89,065</u>
1. <u>Compensation</u> .....	<u>76,905</u>	<u>78,508</u>	<u>77,936</u>	<u>79,216</u>
a. Full-time workyears.....	<u>72,867</u>	<u>73,689</u>	<u>73,744</u>	<u>74,765</u>

The current estimate for **1984** reflects a change from the **1984** budget estimate due to the decrease in workyears offset by recent pay raises.

Basis of Cost for Full-time Workyears

In **1985**, the cost of full-time workyears will be **\$74,765,000**, an increase of **\$1,021,000** over **1984**. The increase is calculated as follows:

Cost of full-time workyears in <b>1984</b> .....		<b>\$73,744</b>
Cost increases in <b>1985</b> .....		<b>+3,011</b>
Within-grade and career advances:		
Full year effect of <b>1984</b> actions.....	<b>+695</b>	
Partial year effect of <b>1985</b> actions .....	<b>+965</b>	
Full year effect of <b>1984</b> pay increase.....	<b>+860</b>	
One more paid day in <b>1985</b> .....	<b>+224</b>	
Decreased reimbursements for launch support to commercial users	<b>+267</b>	
Cost decreases in <b>1985</b> .....		<b>-1,990</b>
Turnover savings and abolished positions:		
Full year effect of <b>1984</b> actions.....	<b>-609</b>	
Partial year effect of <b>1985</b> actions.....	<b>-997</b>	
Alteration in the method of calculating salaries paid. ....	<b>-62</b>	
Reduction related to the Government-wide initiative to reduce the number of <b>GS/GM 11-15</b> positions .....	<b>-322</b>	
Cost of full-time workyears in <b>1985</b> .....		<u><b>74,765</b></u>

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
b. Other than full-time				
(1) cost.....	1,571	1,590	1,375	1,382
(2) Workyears. ....	127	130	121	121

(Thousands of Dollars)

The distribution of 1985 workyears is as follows:

Distribution of Other than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Ceiling programs.....	90
Youth opportunity programs.....	31
Total.....	<u>121</u>

The decrease from the 1984 budget estimate to the 1984 current estimate resulted from less workyears offset by the recent pay raise. The increase in 1985 is the full year effect of the 1984 pay increase.

c. Reimbursable detailees.....	46	49	50	52
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The military person detailed to Kennedy Space Center on a reimbursable basis is experienced in shuttle systems engineering. The increase from the 1984 budget estimate to the 1984 current estimate is the recent pay raise. The 1985 budget estimate increase of is the full year effect of the pay raise.

d. Overtime and other compensation .....	2,421	3,180	2,767	3,017
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This item includes overtime, holiday pay, night differential, Sunday premium and incentive awards. The decrease in the 1984 current estimate over the 1984 budget estimate reflects lower overtime use than previously planned partly through change of tour of duty assignments offset by the recent pay raise. In 1985, the increase in overtime and other is due to the planned increase in the launch and landing rate.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
2. <u>Benefits</u> .....	<u>8,746</u>	<u>9,098</u>	<u>9,336</u>	<u>9,849</u>

The following are the amounts of contribution by category:

Civil Service Retirement Fund.....	5,366	5,479	5,638	5,799
Employee life insurance.....	222	235	226	230
Employee health insurance.....	2,002	2,095	2,228	2,499
Workmen's compensation.....	285	309	308	325
FICA.....	42	38	45	45
Medicare.....	788	937	784	836
Other benefits.....	<u>41</u>	<u>5</u>	<u>107</u>	<u>115</u>
Total.....	<u>8,746</u>	<u>9,098</u>	<u>9,336</u>	<u>9,849</u>

Retirement and life insurance increases from 1984 budget estimate to the 1984 current estimate are primarily due to recent pay increases. The Workmen's Compensation current estimate for 1984 and the 1985 estimate are based on Department of Labor billings. The increase from 1984 to the 1985 estimate is due to the full year effect of the 1984 pay raise, Medicare, and the increase in the government's contribution for health insurance.

B. <u>Supporting Costs</u> .....	<u>815</u>	<u>802</u>	<u>1,072</u>	<u>1,072</u>
1. Transfer of personnel.....	347	230	450	450

Transfer of personnel includes actual expenses involved in the movement and storage of employee's household goods, subsistence and temporary expenses, real estate costs, and miscellaneous moving expenses. The increase from the 1984 budget estimate to the 1984 current estimate reflects 1983 experience in moving household goods and real estate costs.

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u> (Thousands of Dollars)	<u>Budget</u> <u>Estimate</u>
2. Personnel training.....	468	572	622	622

The purpose of the KSC training program is to continue the development of skills and knowledge of civil service employess in order to more efficiently support KSC roles and missions. The increase from the 1984 budget estimate to the 1984 current estimate is training employees for their new roles following a reorganization in 1983. New management development programs designed specifically to accommodate KSC's needs are being implemented.

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	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
(Thousands of Dollars)				
<b>II. TRAVEL.....</b>	<b><u>1,972</u></b>	<b><u>2,063</u></b>	<b><u>2,256</u></b>	<b><u>2,688</u></b>

Summary of Fund Requirements

A. Program Travel.....	1,215	1,737	1,428	1,681
B. Scientific and Technical Development Travel	92	45	107	203
C. Management and Operations Travel.....	<u>665</u>	<u>281</u>	<u>721</u>	<u>804</u>
Total, Travel.....	<u>1,972</u>	<u>2,063</u>	<u>2,256</u>	<u>2,688</u>

Explanation of Fund Requirements

A. <u>Program Travel</u> .....	<u>1,215</u>	<u>1,737</u>	<u>1,428</u>	<u>1,681</u>
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Program travel is directly related to the accomplishment of KSC's mission and accounts for approximately 62 percent of the Center's travel budget. Program travel reflects the continued involvement in launch site operations; the design, manufacturing, and testing of ground system equipment, and construction of facilities; and the activation of systems manufactured at off-site locations.

Program Travel decreased from the 1984 budget estimate to the 1984 current estimate primarily due to the reduced number of trips to Dryden Flight Research Facility, the landing site of the initial orbital flights; and the duration of the trips has been shortened because of reduced orbiter turnaround time. The increase in 1985 provides continued support of Spacelab and Payload flights. Also, there are new requirements for Pad B activation, and a site selection team to travel overseas to select contingency landing sites.

B. <u>Scientific and Technical Development Travel</u>	<u>92</u>	<u>45</u>	<u>107</u>	<u>203</u>
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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. This participation allows them to benefit from exposure to technological advances outside KSC, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems

for the benefit of the government. The 1984 budget estimate to the 1984 current estimate includes increased Participation in systems studies associated with future programs. In addition to anticipated increases in per diem and travel rates, \$90,000 is included in 1985 as part of the NASA-wide increase in funds for greater participation by Kennedy scientists and engineers in technical meetings and symposia.

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
C. <u>Management and Operations Travel</u> .....	<u>665</u>	<u>281</u>	<u>721</u>	<u>804</u>

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 personal 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, such as unpaid advisory committee members and pre-employment interviews for NASA SES positions. The increase from the 1984 budget estimate to the 1984 current estimate reflects increased travel to colleges to hire freshout graduates in engineering; increased travel for KSC personnel training, and co-op student travel; extended TDY NASA Career Advanced Development Programs; and permanent change in duty station.

	1983 <u>Actual</u>	1984		1985 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
<b>III. OPERATION OF INSTALLATION.....</b>	<b><u>72,833</u></b>	<b><u>83,001</u></b>	<b><u>78,615</u></b>	<b><u>88,024</u></b>

Summary of Fund Requirements

A. Facilities Services.....	46,915	51,440	47,787	50,464
B. Technical Services.....	6,149	7,781	7,656	8,784
C. Management and Operations.....	<u>19,769</u>	<u>23,780</u>	<u>23,172</u>	<u>28,776</u>
Total, Operation of Installation.....	<u>72,833</u>	<u>83,001</u>	<u>78,615</u>	<u>88,024</u>

Explanation of Fund Requirement

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 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 informational programs and technical shops supporting institutional activities; and Management and Operations, the cost of administrative communications, printing, transportation, medical, supply, and related services.

Kennedy Space Center is located on 139,305 acres and has a complex of facilities made up of test facilities and office buildings, as well as launch operations facilities. This complex encompasses 5,706,987 gross square feet of building space, including 13 major buildings. Also included are 14 technical facilities. Many facilities are utilized on more than one shift. The needs of KSC's component installations at the Eastern Space and Missile Center and Vandenberg Air Force Base (VAFB) are included. The size, complexity and wide geographical dispersion of KSC facilities place heavy demands on this funding category. KSC supports an average daily on-site population, contractor and civil service, of approximately 14,000.

In January 1983, Kennedy awarded a single contract for institutional Base Operations (BOC), culminating several years of planning for the Shuttle operational era. The primary objectives of this planning were to increase the cost effectiveness, efficiency, and accountability of institutional support contractors. To

promote these objectives, the work of several contractors would be consolidated into a single contract, and the contractor would be more responsible for determining the resources needed to perform work. For increased cost effectiveness, the contract would have an incentive fee structure with sharing of cost savings. Prospective bidders were encouraged to propose new approaches.

The contractor has made several changes that differ from our previous budget submissions, primarily the redistribution of workyears among subfunctions to achieve more efficient operations. We have conformed the 1984 budget estimate to these realignments. A large part of the decrease from the 1984 budget estimate to the 1984 current estimate is the expected savings from these actions.

The increase from the 1984 budget estimate to the 1984 current estimate is due to the first full year of workyear reductions achieved by the base operations contractor offset by manpower rate escalation, and utility rates lower than planned. The increase in 1985 includes rate increases for energy support contractors, and administrative communications; and operational maintenance initiatives; and a reduction in the reimbursable offset previously received from Delta program support.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	<u>Budget Estimate</u>
A. <u>FACILITIES SERVICES</u> .....	<u>46,915</u>	<u>51,440</u>	<u>47,787</u>	<u>50,464</u>

Summary of Fund Requirements

1. <u>Rental of Real Property</u> .....	21	20	26	22
2. <u>Maintenance and Related Services</u> .....	6,872	4,567	4,985	6,029
3. <u>Custodial Services</u> .....	21,492	22,657	21,381	22,464
4. <u>Utility Services</u> .....	<u>18,530</u>	<u>24,196</u>	<u>21,395</u>	<u>21,949</u>
Total, Facilities Services.....	<u>46,915</u>	<u>51,440</u>	<u>47,787</u>	<u>50,464</u>

Explanation of Fund Requirements

1. <u>Rental of Real Property</u> .....	<u>21</u>	<u>20</u>	<u>26</u>	<u>22</u>
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This provides for the rental of off-site facilities for news and reception centers for NASA guests attending launches and other major public events.

The increase from the 1984 budget estimate to the 1984 current estimate is for greater host activities for launch and initial landing. The decrease in 1985 is the expected reduction in special guest activities.

2. <u>Maintenance and Related Services</u> .....	<u>6,872</u>	<u>4,567</u>	<u>4,985</u>	<u>6,029</u>
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This activity involves the operation, maintenance, and engineering of institutional facilities, systems, and equipment. It includes ground maintenance, maintenance and repair of all heavy equipment, operation and maintenance at Vandenberg Air Force Base, and the general management and supervision of the operations and maintenance of the power, lighting, HVAC, water and sewer systems. These funds also provide materials and equipment needed to support these functional needs. The increase from the 1984 budget estimate to the 1984 current estimate provides replacement for earth moving and roads maintenance equipment. The increase from 1984 to 1985 reflects not only anticipated support service contractor wage

rate increases and expected **1985** price levels for supplies, materials, equipment and other contractual effort, but an increase of **\$800** as part of the NASA-wide augmentation in Operational Maintenance effort. This augmentation will provide a level of activity more consistent with the National investment in the Kennedy physical plant.

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
3. <u>Custodial Services</u> .....	<u>21,492</u>	<u>22,657</u>	<u>21,381</u>	<u>22,464</u>

This category includes janitorial services, fire protection, and security. Funding provides janitorial services to two million square feet of KSC's floor areas, including highly specialized services to clean room areas and orbiter support equipment; conducting fire drills and fire inspections of facilities and equipment; and fighting fires. Security protection of personnel and property of KSC involves: support of hazardous tests and operations; badging of all on-site personnel and official visitors; safeguarding flight hardware and other items of high intrinsic value; protection classified information; and 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 contractor performing the function.

The decrease from the **1984** budget estimate to the **1984** current estimate is due to the first full year of support contract rate and workyear reductions achieved by the base operations contractor. The increase in **1985** is contractor rate increases and manpower increases for increased launches and Pad B facility support.

4. <u>Utility Services</u> ....., .....	<u>18,530</u>	<u>24,196</u>	<u>21,395</u>	<u>21,949</u>
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The major utility at KSC is electrical energy purchased from Florida Fewer and Light Company through an Air Force contract. Fuel oil is purchased from a local supplier. Steam service is provided by the Air Force at the Eastern Space and Missile Center. Water services are purchased from the City of Cocoa and sewage treatment is accomplished on-site. Utility plant operations and maintenance and utility distribution systems maintenance are provided by a support contractor at KSC, and by the Air Force at the ESMC. At the Vandenberg Air Force Base, utilities are purchased through the Air Force.

The increase from the **1984** budget estimate to the **1984** current estimate is due to utility rates lower than previously planned, offset by a small increase in energy consumption. The **1985** increase provides for estimated utility and support contractor rate increases.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
B. <u>TECHNICAL SERVICES</u> .....	<u>6,149</u>	<u>7,781</u>	<u>7,656</u>	<u>8,784</u>

Summary of Fund Requirements

1. <u>Automatic Data Processing</u> .....	<u>4,833</u>	<u>6,207</u>	<u>6,053</u>	<u>7,040</u>
a. Equipment.....	680	329	339	700
b. Operations.....	4,153	5,878	5,714	6,340
2. <u>Scientific and Technical Information</u> .....	<u>690</u>	<u>970</u>	<u>970</u>	<u>1,077</u>
a. Library.....	546	667	667	682
b. Education and information.....	144	303	303	395
3. <u>Shop and Support Services</u> .....	<u>626</u>	<u>604</u>	<u>633</u>	<u>667</u>
Total, Technical Services.....	<u>6,149</u>	<u>7,781</u>	<u>7,656</u>	<u>8,784</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u> .....	<u>4,833</u>	<u>6,207</u>	<u>6,053</u>	<u>7,040</u>
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A support contractor provides programming services for payroll, general accounting, supply, procurement, preventive maintenance, contract surveillance, personnel, security, resources and financial management reports and related management information. The contractor also provides for the development and maintenance of general management ADP programs which include the lease, purchase, and maintenance of ADP equipment, and programming and operations services.

The decrease from the 1984 budget estimate to the 1984 current estimate is due to first full of workyear reductions achieved by the base operations contractors. The 1985 increase is due to anticipated contractor rate and workyear increases.

2. <u>Scientific and Technical Information</u> .. .. .	<u>690</u>	<u>970</u>	<u>970</u>	<u>1,077</u>
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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 program.

A support contractor operates the library facilities, which provide technical and management books and periodicals; and military, federal, and professional society specifications and standards. The contractor also operates a STS and Spacelab documents repository which catalogs, classifies, and indexes documents; and provides document reference and distribution services.

Public Affairs support provides for the gathering and dissemination of information about the agency's program to the mass communications media, the general public, and the educational community at the elementary and secondary levels.

	<u>1983</u>	<u>1984</u>		<u>1985</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)		
3. <u>Shop and Support Services</u> .....	<u>626</u>	<u>604</u>	<u>633</u>	<u>667</u>

These funds provide for the Eastern Space and Missile Center to provide photographic services for NASA's Public Affairs Office and any other institutional support at KSC.

The increase from the 1984 budget estimate to the 1984 current estimate and the increase in 1985 is expected Eastern Space and Missile Center rate increases.

	1983 Actual	Budget Estimate (Thousands of Dollars)	1984 Current Estimate (Thousands of Dollars)	1985 Budget Estimate
C. <u>MANAGEMENT AND OPERATIONS</u> .....	<u>19,769</u>	<u>23,780</u>	<u>23,172</u>	<u>28,776</u>

Summary of Fund Requirements

1. <u>Administrative Communications</u> .....	1,953	2,046	2,181	2,385
2. <u>Printing and Reproduction</u> .....	1,173	985	1,019	1,091
3. <u>Transportation</u> .....	5,359	4,519	4,519	5,050
4. <u>Installation Common Services</u> .....	<u>11,284</u>	<u>16,230</u>	<u>15,453</u>	<u>20,250</u>
Total, Management and Operations.....	<u>19,769</u>	<u>23,780</u>	<u>23,172</u>	<u>28,776</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u> .....	<u>1,953</u>	<u>2,046</u>	<u>2,181</u>	<u>2,385</u>
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These funds provide for the costs of local telephone service, Federal Telecommunications System (FTS), long distance tolls, and special communication services in support of all NASA civil service and institutional contractor personnel located at KSC, ESMC, and VAFB. NASA contractors and other institutions who conduct official business with KSC are widely dispersed throughout the United States. KSC utilizes FTS and other leased lines to minimize costs. Special services include teletype, wire news services and lease and maintenance of various small electrical/electronic systems such as printers which support major communications systems.

The support contractor performs 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.

The increase from the 1984 budget estimate to the 1984 current estimate reflects a greater impact of the AT&T divestiture and deregulation than previously planned. The 1985 increase reflects expected contractor and purchased communication services rate increases.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	<u>Budget Estimate</u>
2. <u>Printing and Reproduction</u> .....	<u>1,173</u>	<u>985</u>	<u>1,019</u>	<u>1,091</u>

This category includes printing services which are performed by the Government Printing Office (GPO) and minor commercial firms contracted by GPO. These items include KSC forms reproduction, the KSC house organ, the KSC telephone directory, and Public Affairs brochures and miscellaneous launch support material. Also included are printing and copier services at VAFB.

The increase from the 1984 budget estimate to the 1984 current estimate is due to the realignment of functions based on the work breakdown structure of the new Base Operations Contract. The reduction in 1985 is due to reducing printing equipment purchases, offset by anticipated rates increases.

3. <u>Transportation</u> .....	<u>5,359</u>	<u>4,519</u>	<u>4,519</u>	<u>5,050</u>
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Funding covers the transportation management function, performed by a support contractor, which includes coordination, check, inspection, and document control of all shipments, delivery of in-bound shipments, and the operation of heavy equipment. The maintenance of KSC's administrative aircraft is also included, as well as 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 increase in 1985 is anticipated support contractor rate vehicle maintenance increases.

4. <u>Installation Common Services</u> ..	<u>11,284</u>	<u>16,230</u>	<u>15,453</u>	<u>20,250</u>
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These funds provide for management and logistics services, mail and distribution services, medical services, and a wide variety of minor contracts for special and one-time services. The support contractor provides management for the following areas: procurement, resources, maintenance, logistics, energy, data and information, staffing and training, planning and scheduling, and safety. These includes the estimating, planning, budgeting, authorizing, controlling, accumulating, and reporting of all costs and manpower associated with contract activities; and the necessary management, supervisory, engineering, technical, and administrative personnel required to plan, initiate, and perform the services and operations. Includes the establishment and management of a comprehensive safety program. The development of both short and long-range work plans, emergency plans and schedules in support of KSC base operations. Includes the development and implementation of a maintenance program for all institutional government furnished and contractor acquired systems, facilities and equipment. Also, the contractor will implement and manage energy conservation projects, programs, audits, and inspections on institutional facilities to insure conformance to energy conservation policy and to identify new energy initiatives in such areas as modifications, operational changes, and energy studies and awareness. The support contractor also provides

a broad range of logistics services included receipt, storage, and issue of supplies and equipment, as well as maintaining various supply management systems. Mail and distribution services, provided by the support contractor include distribution of interoffice mail, classified document control, operation of the KSC branch post office, and postal services charges.

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 employees; and a variety of physical examinations and special programs for health maintenance, applied research, and job certification for civil service and contractor personnel. The contractor has also been charged with ensuring compliance with Occupational Safety and Health Administration standards. The medical program operates 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. These include: monitoring hypergolic substances and other toxins; the maintenance of a centerwide 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.

This category also covers lease, maintenance, and purchase of administrative equipment. Rentals are primarily for special purpose office equipment more economical to lease than purchase. Maintenance is provided for all government-owned administrative equipment in active service. Purchases are largely replacements of office machines such as typewriters and calculators. Office supplies and equipment are provided to all civil service and institutional contractor personnel.

Tort claims, notary public fees, court reporting costs, patent counsel representation, and support costs associated with equal job opportunity activities are also covered in this function.

The decrease from the **1984** budget estimate to the **1984** current estimate is due to the first full year of workyear reductions achieved by the base operations contractor. The increase in **1985** is due to anticipated contractor rates and reductions in the reimbursable offset previously received from Delta program support.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
JOHN F. KENNEDY SPACE CENTER

FISCAL YEAR 1985 ESTIMATE

STAFFING SUMMARY		
	FY84	FY85
SES	52	52
UNV-15	130	129
UNV-14	205	207
OTHER UNV'S	4	105
NO	4	4
TOTAL	295	297

CHIEF DIRECTOR		
	FY84	FY85
SES	3	3
UNV-15	1	1
UNV-14	3	3
OTHER UNV'S	-	-
NO	-	-
TOTAL	7	8

PUBLIC AFFAIRS OFFICE		
	FY84	FY85
SES	1	1
UNV-15	1	1
UNV-14	2	2
OTHER UNV'S	27	27
NO	-	-
TOTAL	31	31

SICP COUNSEL		
	FY84	FY85
SES	1	1
UNV-15	1	1
UNV-14	2	2
OTHER UNV'S	4	4
NO	-	-
TOTAL	8	8

EXECUTIVE MANAGEMENT OFFICE		
	FY84	FY85
SES	1	1
UNV-15	1	1
UNV-14	3	3
OTHER UNV'S	20	20
NO	4	4
TOTAL	20	20

EMPLOYEE OPPORTUNITY PROGRAM OFFICE		
	FY84	FY85
SES	-	-
UNV-15	-	-
UNV-14	1	1
OTHER UNV'S	4	4
NO	-	-
TOTAL	5	5

ADMINISTRATIVE OFFICE		
	FY84	FY85
SES	1	1
UNV-15	1	1
UNV-14	4	4
OTHER UNV'S	15	15
NO	-	-
TOTAL	21	21

PERSONNEL OFFICE		
	FY84	FY85
SES	-	-
UNV-15	1	1
UNV-14	8	8
OTHER UNV'S	21	21
NO	-	-
TOTAL	30	30

COMPUTATION		
	FY84	FY85
SES	2	2
UNV-15	4	4
UNV-14	76	76
OTHER UNV'S	104	104
NO	-	-
TOTAL	186	186

SPACE STATION & MANPOWER PROJECTS OFFICE		
	FY84	FY85
SES	2	2
UNV-15	8	8
UNV-14	11	11
OTHER UNV'S	21	21
NO	-	-
TOTAL	42	42

SPECIAL AGENT & PROTECTIVE SERVICES		
	FY84	FY85
SES	1	1
UNV-15	5	5
UNV-14	7	7
OTHER UNV'S	20	20
NO	-	-
TOTAL	33	33

DIRECTOR OF SHUTTLE OPERATIONAL & APPLICATIONS		
	FY84	FY85
SES	3	3
UNV-15	4	4
UNV-14	2	2
OTHER UNV'S	37	37
NO	-	-
TOTAL	46	46

DIRECTOR OF SHUTTLE SUPPORT OPERATIONS		
	FY84	FY85
SES	2	2
UNV-15	10	10
UNV-14	75	75
OTHER UNV'S	204	205
NO	-	-
TOTAL	291	292

DIRECTOR OF CONSTRUCTION & EQUIPMENT		
	FY84	FY85
SES	2	2
UNV-15	4	4
UNV-14	8	7
OTHER UNV'S	76	72
NO	-	-
TOTAL	90	85

DIRECTOR OF SHUTTLE OPERATIONAL & APPLICATIONS		
	FY84	FY85
SES	2	2
UNV-15	5	5
UNV-14	3	3
OTHER UNV'S	4	4
NO	-	-
TOTAL	14	14

DIRECTOR, LAUNCH & LAUNCH OPERATIONS		
	FY84	FY85
SES	1	1
UNV-15	2	2
UNV-14	10	9
OTHER UNV'S	40	41
NO	-	-
TOTAL	53	53

DIRECTOR, SHUTTLE PROJECTS MANAGEMENT		
	FY84	FY85
SES	1	1
UNV-15	2	2
UNV-14	7	7
OTHER UNV'S	42	40
NO	-	-
TOTAL	52	50

DIRECTOR, PROJECT MANAGEMENT		
	FY84	FY85
SES	1	1
UNV-15	4	4
UNV-14	13	13
OTHER UNV'S	36	35
NO	-	-
TOTAL	54	53

DIRECTOR, SHUTTLE OPERATIONAL & APPLICATIONS		
	FY84	FY85
SES	1	1
UNV-15	5	5
UNV-14	12	12
OTHER UNV'S	15	15
NO	-	-
TOTAL	33	33

DIRECTOR, SHUTTLE ENGINEERING		
	FY84	FY85
SES	1	1
UNV-15	12	12
UNV-14	26	25
OTHER UNV'S	161	162
NO	-	-
TOTAL	200	200

DIRECTOR, INFORMATION SYSTEMS		
	FY84	FY85
SES	1	1
UNV-15	2	2
UNV-14	75	74
OTHER UNV'S	112	114
NO	-	-
TOTAL	190	191

DIRECTOR, LAUNCH SUPPORT SERVICES		
	FY84	FY85
SES	1	1
UNV-15	2	2
UNV-14	76	76
OTHER UNV'S	111	111
NO	-	-
TOTAL	190	190

DIRECTOR, MECHANICAL & FACILITIES ENGINEERING		
	FY84	FY85
SES	1	1
UNV-15	5	5
UNV-14	15	15
OTHER UNV'S	74	73
NO	-	-
TOTAL	95	94

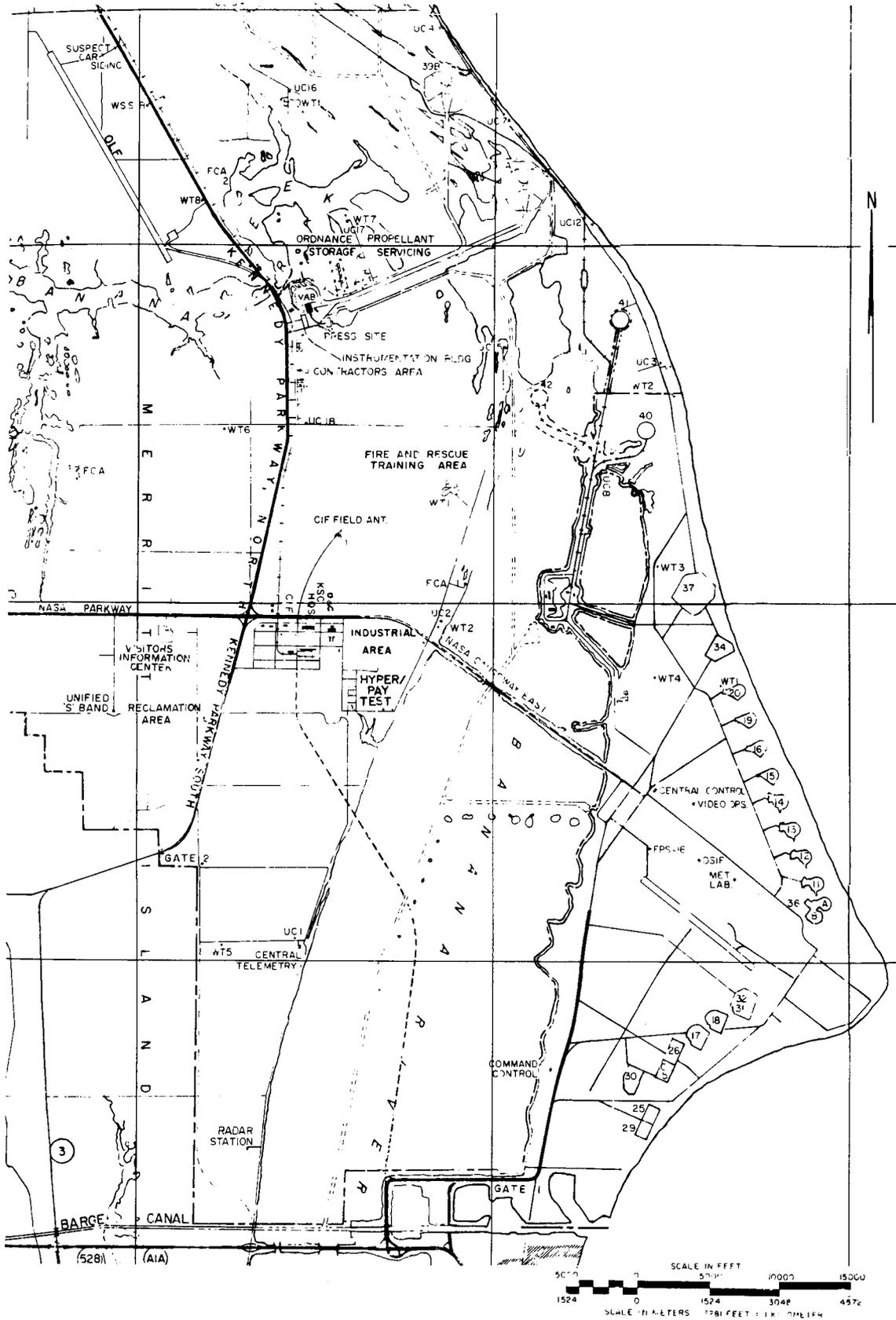
DIRECTOR, ELECTRONIC ENGINEERING		
	FY84	FY85
SES	1	1
UNV-15	4	4
UNV-14	15	15
OTHER UNV'S	75	72
NO	-	-
TOTAL	95	92

DIRECTOR, SHUTTLE OPERATIONS		
	FY84	FY85
SES	1	1
UNV-15	4	4
UNV-14	17	16
OTHER UNV'S	128	127
NO	-	-
TOTAL	150	148

DIRECTOR, SHUTTLE OPERATIONAL & APPLICATIONS		
	FY84	FY85
SES	1	1
UNV-15	2	2
UNV-14	15	12
OTHER UNV'S	36	34
NO	-	-
TOTAL	54	50

JOHN F. KENNEDY SPACE CENTER, NASA  
 FISCAL YEAR 1985 ESTIMATES  
 LOCATION PLAN

RPM 2-25



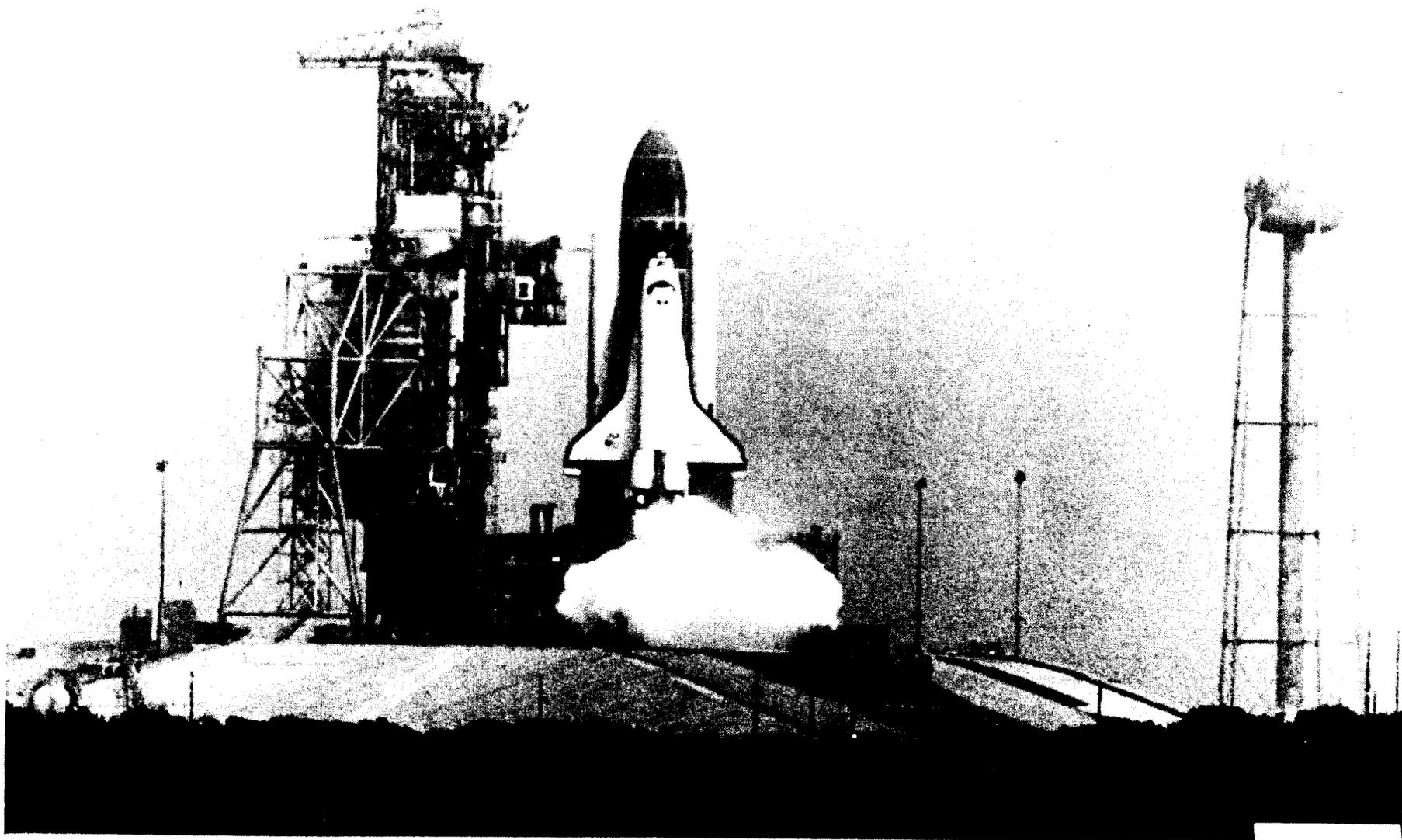


JOHN F. KENNEDY SPACE CENTER  
AERIAL VIEW



RPM 2-27

SPACE SHUTTLE



RPM 2-28

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1985 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, on Army property at the Redstone Arsenal. The Center occupies 1,841 acres under a non-revocable use permit from the Army. The Huntsville location is connected by deep water access to its component Michoud Assembly Facility via the Tennessee, Ohio, and Mississippi Rivers.

The Michoud Assembly Facility is located 15 miles east of New Orleans, Louisiana, where the External Tank for the Space Shuttle is being produced, and where activities for other Federal agencies are conducted. The Michoud Facility occupies 832 acres and provides 3,634,344 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 Slidell Computer Complex, located at Slidell, Louisiana, 20 miles northeast of the Michoud Assembly Facility, occupies 14 acres and provides centralized computer services for MSFC, Michoud, other NASA Centers, and associated contractors, as well as other government agencies.

A number of individual facilities at MSFC and its component installations are unique within NASA, the Nation. The combined capability 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 Marshall Space Flight Center and its installations in Louisiana, including fixed assets in progress, and contractor-held facilities at various locations as of September 30, 1983 was \$807,670,000.

Research Aeronautics and Space Administration  
Washington, D.C. 20546

LIBRARY

## CENTER ROLES AND MISSIONS

The Marshall Space Flight Center serves as one of NASA's primary centers for the design and development of Space Transportation Systems, orbital systems, scientific and applications payloads, and other systems for present and future space exploration. MSFC has the principal role within NASA for rocket propulsion systems. The Center also has a principal role for the design and development of manned vehicle systems; for Spacelab mission management and payload definition; for design and development of large, complex, and specialized automated spacecraft; and management of space processing activities. MSFC has a primary role within NASA for the development and processing of space science and applications experiments. In addition, MSFC conducts a vigorous research and technology program and is involved in the study and definition of future programs, including significant roles contributing to the development of large, complex space structures, space propulsion systems, materials engineering, materials processing in space, power systems; guidance and control, fundamental electronics, and payload systems analysis and integration.

In addition to on-site activities at Huntsville, Alabama, MSFC manages the Michoud Assembly Facility at New Orleans and the Computer Complex at Slidell, Louisiana. Resident offices are maintained at other centers and in conjunction with major industrial sites in various locations throughout the nation, and in Europe for the Spacelab program. The principal and supporting roles are:

### PRINCIPAL

Propulsion Systems - design, develop, and procure major propulsion-oriented systems and subsystems. Current focus is on Space Transportation Systems, including Space Shuttle Main Engine (SSME), Solid Rocket Booster, External Tank, Inertial Upper Stage in cooperation with the Air Force, monitoring of the payload assist module commercially developed and produced by McDonnell Douglas, and also the transfer orbit stage being commercially developed by Orbital Sciences Corp. Advanced program efforts are focused on the definition of unmanned launch vehicles, utilizing existing technology, and the advanced SSME technology program being jointly conducted with the Lewis Research Center.

Manned Space Vehicle Development - design, development, and procurement of manned vehicle systems as assigned.

- Spacelab - focus is on program management, systems engineering, program and engineering interface with European Space Agency, procurement, activation of the operational era system, and sustaining engineering.
- Advanced Development - technology advances focused on advanced missions.

Space Transportation System (STS) Sustaining Engineering: - provide sustaining engineering for STS hardware and software to maintain a design which fulfills the original design intent throughout the life of the STS

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Space Transportation System (STS) Sustaining Engineering - provide sustaining engineering for STS hardware and software to maintain a design which fulfills the original design intent throughout the life of the STS

program, decrease the unit cost of manufacturing through design improvement and upgrade operational performance capabilities through product improvement redesign.

Spacelab Payload Development and Mission Management - management of Spacelabs 1, 2, and 3; partial payload missions as assigned, and definition and development of combinations of payloads, facilities, experiments and instruments for space science and applications missions as assigned.

Specialized Automated Spacecraft - design and development of large, complex and/or specialized automated spacecraft as assigned. Current focus is on spacecraft systems and experiment integration for Space Telescope. Studies are being conducted on potential future missions such as the Advanced X-Ray Astrophysics Facility, Orbital Maneuvering Vehicle, and Gravity Probe-B mission.

Space Platform Studies - free-flying platform concepts with attached payloads or docked to a space station which would provide power, communications, stabilization, and supporting services.

Space Station - studies of space station mission requirements and technology definition.

Space Processing - developing space processing discipline base, enlisting user interest in potential applications, and developing and managing space processing experiments.

#### SUPPORTING

Space Structures and Materials - contributing to the development of large, complex space structures and materials technology base.

Propulsion Technology - developing and evaluating alternate propulsion systems, techniques, and propellants for advanced launch systems and spacecraft.

SUMMARY OF RESOURCES REQUIREMENTS

Funding Plan By Function

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of	<u>Current</u> <u>Estimate</u> Dollars)	<u>Budget</u> <u>Estimate</u>
I. Personnel and Related Costs.....	141,380	139,103	143,691	144,451
11. Travel.....	3,762	3,720	4,001	4,211
111. Operation of Installation.....	39,124	43,840	41,270	46,602
A. Facilities Services.....	(17,587)	(21,216)	(19,776)	(23,214)
B. Technical Services.....	(7,869)	(8,329)	(8,091)	(8,815)
C. Management and Operations .....	<u>(13,668)</u>	<u>(14,295)</u>	<u>(13,403)</u>	<u>(14,573)</u>
Total, fund requirements .....	<u>184,266</u>	<u>186,663</u>	<u>188,962</u>	<u>195,264</u>

Distribution of Permanent Workyears by Program

	1983 <u>Actual</u>	1984		1985 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
<b><u>RESEARCH AND DEVELOPMENT</u></b> .....	<b><u>2,359</u></b>	<b><u>1,992</u></b>	<b><u>2,235</u></b>	<b><u>2,208</u></b>
Space Station.....	<u>109</u>	<u>---</u>	<u>125</u>	<u>150</u>
Space Transportation Capability Development.....	<u>993</u>	<u>1,053</u>	<u>830</u>	<u>726</u>
Space Science and Applications.....	<u>1,095</u>	<u>1,021</u>	<u>1,124</u>	<u>1,145</u>
Physics and astronomy.....	861	756	904	926
Life sciences.....	2	1	2	2
Space applications.....	232	264	218	217
Technology utilization.....	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>
Aeronautics and Space Technology.....	<u>156</u>	<u>156</u>	<u>150</u>	<u>181</u>
Aeronautics.....	6	6	3	3
Space....	150	150	147	178
<b><u>SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS</u></b> .....	<b><u>454</u></b>	<b><u>495</u></b>	<b><u>495</u></b>	<b><u>522</u></b>
Space Transportation Operations.....	454	495	495	522
Subtotal, direct workyears.....	<u>2,813</u>	<u>2,731</u>	<u>2,730</u>	<u>2,730</u>
<b><u>CENTER MANAGEMENT AND OPERATIONS SUPPORT</u></b> .....	<b><u>525</u></b>	<b><u>520</u></b>	<b><u>520</u></b>	<b><u>520</u></b>
Total, full-time workyears.....	3,338	3,251	3,250	3,250
Other than Full-Time.....	<u>113</u>	<u>130</u>	<u>100</u>	<u>100</u>
Total, workyears.....	<u><u>3,451</u></u>	<u><u>3,381</u></u>	<u><u>3,350</u></u>	<u><u>3,350</u></u>

PROGRAM DESCRIPTION

RESEARCH AND DEVELOPMENT

Permanent Civil  
Service Workyears

SPACE STATION..... 150

Space Station effort will consist of definition and integration studies, and focused technology activities.

SPACE TRANSPORTATION CAPABILITY DEVELOPMENT..... 726

Space Transportation Capability Development includes Spacelab, Inertial Upper States, and Advanced Programs.

Spacelab

FY 1985 activities include continuation of program management; completion of final deliveries on follow-on production hardware procured from the European consortium; integration of ESA and NASA provided hardware and software; completion of transition and transfer of Spacelab design engineering maintenance from Europe; and mission integration and preparation for three Spacelab flights. Also, the development of the capability to fly mixed cargoes will be completed with demonstration missions using Igloo Pallet, MDM Pallet, and Hitchhiker configurations.

Inertial Upper Stages (IUS)

FY-85 activities include the IUS-I anomaly modification block changes installed and acceptance tested on three IUS vehicles for TDRS missions. Two IUS/TDRS missions are planned for FY-85 which will require; (1) a series of readiness reviews conducted to assure the flight readiness of the IUS prior to launch, (2) the conduct of joint integrated flight simulations prior to each launch, (3) the launch and flight operations support, and (4) the post flight evaluation of the IUS performance. Any IUS anomalies will be subjected to investigation and appropriate resolution as necessary.

Payload Assist Module (PAM)

FY 85 activities include monitoring the PAM D and PAM D-II programs to insure compatibility with the STS. Also serve as agent for UNISAT for PAM D-II's to be purchased from McDonnell Douglas, ensuring capability to meet customer technical and schedule requirements.

Transfer Orbit Stage (TOS)

FY 1985 activities include monitoring the TOS development and providing interface data to Orbital Science Corporation (OSC), the commercial development organization, to insure compatibility with the STS.

Advanced Programs

The Advanced Programs effort at MSFC includes the definition and implementation of in-house and contracted system studies to establish the fundamental planning and decision making data needed prior to proposing future space programs. Major FY 1985 advanced study activities include: (1) platforms and facilities in low-earth and geosynchronous orbit such as space station, tethered satellite systems application and geostationary platform; (2) orbital services such as satellite servicing applications and in-orbit assembly, maintenance and repair; and (3) advanced transportation including reusable evolutionary upper stages and shuttle derived launch vehicle systems.

Permanent Civil  
Service Workyears

PHYSICS AND ASTRONOMY.....

926

The Center provides leadership in the Agency's Space Science program for the Space Telescope, Spacelab payload development and mission management, including flight experiment development, and provides supporting research and technology efforts to identify the new technologies required for future missions.

Space Telescope

The objective of the Space Telescope (ST) project is to launch a high quality optical 2.4-meter telescope system by the Space Shuttle for use by the astronomical community in conjunction with NASA. MSFC is the lead center for the management of the Space Telescope project and has overall implementation responsibility to the Office of Space Science and Applications for meeting cost, schedule, and technical performance of the project. MSFC is responsible for directing all NASA and contractor efforts, establishing and maintaining effective project management activities, and for preparing and maintaining the detailed technical specifications which will define the requirements for all elements of the project. This includes technical assessment and evaluation of contracted activities for system engineering, design and development, assembly and verification, and maintenance and refurbishment. In FY 1985, verification and acceptance of the Scientific Instruments and Optical Telescope Assembly will be completed and delivered to Lockheed Missiles and Space Corporation for integration into the ST. Assembly and verification of the Support Systems Module will be completed and the Space Telescope will be ready for delivery to KSC for launch in FY 1986.

Spacelab Payload Mission Management

In FY 1985, MSFC will be responsible for managing the implementation activities of Spacelab Missions 2, 3, and a group of dedicated Space Plasma Lab Missions, as well as certain partial payload missions, including OAST-1, three Astro missions, a group of Materials Science Lab missions, Sunlab mission, a group of Earth Observations Missions, and several Oribter mid-deck payloads. MSFC is also responsible for in-house development of selected experiments and equipment 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 FY 1985, MSFC will continue to manage the mission planning and definition activities, as well as development of the required instruments and supporting hardware/software. Spacelab Missions 2, 3 and 0-1, Materials Science Lab-1 and 2 Missions, and EOM-1 are scheduled for launch in FY 1985. Interfaces will continue to be maintained during FY 1985 with the appropriate NASA program offices, the Principal Investigators, and other appropriate groups to assure accomplishment of the scientific objectives of the 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 OSSA supporting research and technology activities at MSFC are oriented to develop new technologies required for future science and applications missions. The principal science areas are Astrophysics and Solar Terrestrial. In 1985, definition study efforts for the Advanced X-Ray Astrophics Facility and technology support leading to planned development activities in subsequent years will continue. The major emphasis for the Gravity Probe-B activity will be in the area of advanced technology development. The principal application area is in atmospheric research, which supports the definition efforts of future STS payloads.

Permanent Civil  
Service Workyears

LIFE SCIENCES.....

2

The Life Sciences effort involves the investigation and development of concepts and technologies required to operate long duration life sciences experiments in space.

SPACE APPLICATIONS.....

217

MSFC activities are concentrated in two major space applications assignments. These assignments are materials processing in space and atmospheric supporting research.

Materials Processing in Space

The Materials Processing in Space 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 FY 1985, the Materials Processing in Space program at the MSFC will continue to embody research and development activities in such areas as: (1) crystal growth, (2) containerless processing, (3) fluid and chemical processing, and (4) solidification of metals and alloys. Continuing activities include ground based research, engineering and scientific analyses, advanced studies, and management of definition, design, development, and operation of materials processing experiments, apparatus, and payloads.

Atmospheric Supporting Research

Theoretical, field, and laboratory experimental research will be conducted in the global weather, severe storms, and local weather areas. Efforts will be concentrated on improving understanding of severe storms, mesoscale and global scale weather systems.

Permanent Civil  
Service Workyears

TECHNOLOGY UTILIZATION.....

6

The Technology Utilization program transfers new knowledge and innovative technology, resulting from NASA's R&D programs for application in industry, medicine, and other public sector areas. MSFC civil service engineering and science personnel provide a source of technical skills necessary to accomplish technology transfer to the public sector.

AERONAUTICAL RESEARCH AND TECHNOLOGY.....

3

The Aeronautical Research and Technology activities are concerned with aircraft operational safety. The major activities in 1985 will be to continue studies of atmospheric conditions having adverse effects on aircraft operation and design, perform gust correlations, investigate the dissipation of fog, and continue studies and technology related to clear air turbulence. Studies will be conducted on the application of infrared lasers for measuring atmospheric flow structure.

SPACE RESEARCH AND TECHNOLOGY..... 178

The Space Research and Technology activities at MSFC are in materials and structures, photovoltaic energy conversion, power system management, controls and human factors, space data and communications, chemical propulsion, and spacecraft systems technology. The primary effort in FY 1985 will be on developing technology for high performance propulsion systems and large space systems for the future; e.g., space power.

SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS

SPACE TRANSPORTATION OPERATIONS..... 522

Shuttle Operations provides the Standard Operational Support Services for the Space Shuttle in the Shuttle Operations phase which started with STS-5, launched in November 1982. During 1985, eleven operational flights are planned. Primary activities for FY 85 will include the production, overhaul and acquisition of hardware for operational flights. The flight hardware program element provides for the procurement of external tank (ET), solid rocket motors, booster hardware, and propellants; spare components for the main engine; sustaining engineering and logistics support for external tank, solid rocket booster, and main engine flight hardware elements; and maintenance and operations of flight crew equipment. Included in the funding request for external tanks, solid rocket motors and boosters are the long-lead time raw materials, subassemblies, and subsystems necessary to sustain the production of elements in a consistent manner with the increasing flight rate. 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.

SSME testing will continue at the National Space Technology Laboratories and at the Santa Susana Facility to conduct the engine life extension program, engine acceptance testing, green running of components, and anomaly resolution. SRB will conduct development test number 6, complete manufacturing of two filament wound case (FWC) development motors, receive the initial delivery on the 136-foot diameter main parachutes, complete the design and testing of the drogue parachutes for the FWC, and complete the incorporation of TVC/structural protection design including external into hardware. ET effort will continue toward increasing the manufacturing/tooling capability to support the 24 per year flight rate.

CENTER MANAGEMENT AND OPERATIONS SUPPORT ..... 520

Center Management and Operations Support is provided to all MSFC 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 immediate staff, e.g., Patent Counsel, Legal, Patent Counsel, Equal Opportunity, Public Affairs, and Safety.

Management Support - Those who provide management and support services to 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.

RESOURCES REQUIREMENTS BY FUNCTION

	1983	1984		1985
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
<b>I. <u>PERSONNEL AND RELATED COSTS</u>.....</b>	<b><u>141,380</u></b>	<b><u>139,103</u></b>	<b><u>143,691</u></b>	<b><u>144,451</u></b>
<u>Basis of Fund Requirements</u>				
<b>A. <u>Compensation and Benefits</u></b>				
<b>1. <u>Compensation</u></b>				
a. Full-time permanent... ..	123,085	120,827	123,804	123,515
b. Other than full time permanent....	1,605	1,870	1,930	1,947
c. Overtime and other compensation.....	<u>1,088</u>	<u>989</u>	<u>1,182</u>	<u>1,312</u>
Subtotal, Compensation....	125,778	123,686	126,916	126,774
<b>2. <u>Benefits</u>.....</b>	<u>14,740</u>	<u>14,468</u>	<u>15,981</u>	<u>16,547</u>
Subtotal, Compensation and Benefits....	<u>140,518</u>	<u>138,154</u>	<u>142,897</u>	<u>143,321</u>
<b>B. <u>Supporting Costs</u></b>				
1. Transfer of personnel....	284	330	206	501
2. Personnel training.....	<u>578</u>	619	<u>588</u>	<u>629</u>
Subtotal, Supporting Costs.....	<u>862</u>	<u>949</u>	<u>794</u>	<u>1,130</u>
<b>Total, Personnel and Related Costs.....</b>	<b><u>141,380</u></b>	<b><u>139,103</u></b>	<b><u>143,691</u></b>	<b><u>144,451</u></b>

Explanation of Fund Requirements

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	<u>Budget Estimate</u>
A. <u>Compensation and Benefits</u> .....	<u>140,518</u>	<u>138,154</u>	<u>142,897</u>	<u>143,321</u>
1. <u>Compensation</u> .. .. .	<u>125,778</u>	<u>123,686</u>	<u>126,916</u>	<u>126,774</u>
a. Full-time permanent. ....	123,085	120,827	123,804	123,515

The increase from the 1984 budget estimate to the 1984 current estimate is due to the recent pay increases offset by a reduction in workyears. The increase in 1985 is the full year effect of the 1984 pay increase.

Basis of Cost for Full-time Workyears

In 1985 the cost of full-time workyears will be \$123,515,000, a decrease of \$289,000 from 1984. This decrease is calculated as follows:

Cost of full-time workyears in 1984.....	123,804
Cost increases in 1985.....	+4,066
Within grade and career advances:	
Full year effect of 1984 actions.....	+1,019
Partial year effect of 1985 actions.....	+1,198
Full year effect of 1984 pay increases.....	+1,376
One more paid day in 1985.....	+473
Cost decreases in 1985.....	-4,355
Turnover savings and abolished positions:	
Full year effect of 1984 actions.....	-2,090
Partial year effect of 1985 actions.....	-1,626
Alteration in the method of calculation of salaries paid.....	-119
Reduction related to the Government-wide initiative to reduce the number of GS/GM 11-15 positions .....	-520
Cost of full-time workyears in 1985.....	<u>123,515</u>

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
b. Other than full-time permanent				
(1) Cost.....	1,605	1,870	1,930	1,947
(2) Workyears .....	160	163	153	153

The distribution of 1985 workyears is as follows:

Distribution of Other than Full-Time Workyears

<u>Program</u>	<u>Workyears</u>
Ceiling programs.....	100
Developmental programs.....	(61)
Summer programs.....	(7)
Other temporary programs.....	(32)
Youth opportunity programs.....	<u>53</u>
Tbtal.....	<u>153</u>

The decrease from the 1984 budget estimate to the 1984 current estimate reflects the effect of changes in the skill mix.

c. Overtime and other compensation .....	1,088	989	1,182	1,312
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The 1984 current estimate is slightly higher than the 1984 budget estimate due primarily to Sunday premium pay for forty-hour tour workers, offset by lower estimate for overseas allowances.

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of	<u>Current</u> <u>Estimate</u> Dollars)	<u>Budget</u> <u>Estimate</u>
2. <u>Benefits</u> .....	<u>14,740</u>	<u>14,468</u>	<u>15,981</u>	<u>16,547</u>

The following are the amounts of contribution by category:

Civil Service Retirement Fund.. .....	8,624	8,541	8,830	8,897
Employee life insurance.....	360	385	366	390
Employee health insurance.....	3,310	3,028	3,709	4,000
Workmen's compensation .....	1,150	1,151	1,525	1,543
FICA..... .....	51	61	71	297
Medicare.....	1,230	1,302	1,386	1,414
Other benefits. ....	<u>15</u>	<u>0</u>	<u>14</u>	<u>6</u>
Total.....	<u>14,740</u>	<u>14,468</u>	<u>15,981</u>	<u>16,547</u>

The 1984 current estimate is higher than the 1984 budget estimate due to the increase in Workmen's Compensation, the recent pay increase, and health insurance costs. The increase in 1985 is primarily for health insurance and FICA.

B. <u>Supporting Costs</u> .....	<u>862</u>	<u>949</u>	<u>794</u>	<u>1,130</u>
1. Transfer of personnel..... .....	284	330	206	501

The estimate provides for relocation costs, such as the expenses related to the selling and buying of a home and the movement of household goods. The decrease from the 1984 budget estimate to the 1984 current estimate reflects changes in hiring plans. The increase in 1985 is primarily transportation rate increases.

2. Personnel training.....	578	619	588	629
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The purpose of the MSFC training program is the development of skills and knowledge of civil service employees in order to more efficiently support MSFC's roles and missions in the Space Program. The benefits to be derived by NASA include: enhancement of scientific and engineering leadership in the scientific community; maintenance of a high degree of professional competency with the administrative and clerical work

force; and development of needed skills and knowledge required in MSFC mission activities; and extending the MSFC work force. The decrease from the 1984 budget estimate to the 1984 current estimate reflects a revised training plan consistent with program activity. The increase in 1985 reflects tuition cost increases.

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	1983 Actual	1984 Budget Estimate	1984 Current Estimate	1985 Budget Estimate
II. <u>TRAVEL</u> .....	<u>3,762</u>	<u>3,720</u>	<u>4,001</u>	<u>4,211</u>

Basis of Fund Requirements

A. Program Travel.....	3,324	3,401	3,529	3,574
B. Scientific and Technical Development Travel.....	66	59	80	240
C. Management and Operations Travel.....	372	260	392	397
Total, Travel.....	<u>3,762</u>	<u>3,720</u>	<u>4,001</u>	<u>4,211</u>

Explanation of Fund Requirements

A. <u>Program Travel</u> .....	<u>3,324</u>	<u>3,401</u>	<u>3,529</u>	<u>3,574</u>
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Program travel is directly related to the accomplishment of the Center's mission and in 1985 is approximately 86 percent of the MSFC total. Travel requirements include those for ongoing programs such as the STS Operations, Spacelab, Inertial Upper Stage, Space Telescope, 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 increase in 1985 is primarily due to increased cost of travel.

B. <u>Scientific and Technical Development Travel</u> .....	<u>66</u>	<u>59</u>	<u>80</u>	<u>240</u>
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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 for the maintenance of technical excellence, derived from exposure to technological advances outside MSFC, as well as to present both accomplishments and concerns to their associates. These meetings are principally working panels convened to solve problems for the benefit of the Government. The increases in 1984 current estimate from the 1984 budget estimate is primarily due to the projected increase in the cost of air fares. In addition to anticipated increases in per diem and travel rates, \$155,000 is included as part of the NASA-wide increase in funds for greater participation by MSFC scientists and engineers in technical meetings and symposia.

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
C. <u>Management and Operations Travel</u> .....	<u>372</u>	<u>260</u>	<u>392</u>	<u>397</u>

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. Local travel includes travel in and around the official station of the employee, including 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 preemployment interviews for NASA SES positions. The increase from the 1984 budget estimate to the 1984 current estimate reflects increased management activity related to the development of new programs plus the projected increase in the cost of transportation.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
<b>III. OPERATION OF INSTALLATION.....</b>	<b><u>39,124</u></b>	<b><u>43,840</u></b>	<b><u>41,270</u></b>	<b><u>46,602</u></b>
<u>Summary of Fund Requirements</u>				
A. Facilities Services.....	17,587	21,216	19,776	23,214
B. Technical Services.....	7,869	8,329	8,091	8,815
C. Management and Operations.....	<u>13,668</u>	<u>14,295</u>	<u>13,403</u>	<u>14,573</u>
Total, Operation of Installation.....	<u>39,124</u>	<u>43,840</u>	<u>41,270</u>	<u>46,602</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: (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, printing, transportation, medical, supply, and related services.

The decrease reflected in the 1984 current estimate from the budget estimate is based primarily on less than anticipated rate increases in utilities and administrative communications. The 1985 budget estimate provides for expected increases in support contract and utility rates, an operational maintenance initiative, replacement equipment, and supplies and materials.

<b>A. FACILITIES SERVICES.....</b>	<b><u>17,587</u></b>	<b><u>21,216</u></b>	<b><u>19,776</u></b>	<b><u>23,214</u></b>
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The Marshall Space Flight 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 3,800,000 gross square feet of building space. This physical plant houses an average daily on-Center population of approximately 4,800 personnel.

	1983 Actual	1984		1985
		Budget Estimate (Thousands of Dollars)	Current Estimate	Budget Estimate
<u>Summary of Fund Requirements</u>				
1. <u>Maintenance and Related Services</u> .....	<u>3,923</u>	<u>5,382</u>	<u>5,415</u>	<u>7,299</u>
a. Facilities.....	3,5 17	4,566	4,688	6,593
b. Equipment.....	406	8 16	727	706
2. <u>Custodial Services</u> .....	<u>3,938</u>	<u>4,3 12</u>	<u>4,205</u>	<u>4,439</u>
3. <u>Utility Services</u> .....	<u>9,726</u>	<u>11,522</u>	<u>10,156</u>	<u>11,476</u>
Total, Facilities Services.....	<u>17,587</u>	<u>21,216</u>	<u>19,776</u>	<u>23,214</u>

Explanation of Fun Requirements

1. <u>Maintenance and Related Services</u> .....	<u>3,923</u>	<u>5,382</u>	<u>5,415</u>	<u>7,299</u>
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This activity involves maintenance and operation of a total of **204** facilities (building, structures, and trailers) with **3.8** million square feet of floor space. Also involved are **1,841** acres of land, one million square yards of surfaced areas, and several special structures and systems. The **1984** current estimate reflects a slight increase in supplies and materials replenishment. The increase from FY **1984** to FY **1985** reflects not only anticipated support service contractor rate increases and expected FY **1985** price levels for supplies, materials, equipment and other contractual effort, but an increase of **\$1,700,000** as part of the NASA-wide augmentation in Operational Maintenance effort. This augmentation will provide a level of activity more consistent with the National investment in the **MSFC** physical plant.

2. <u>Custodial Services</u> .....	<u>3,938</u>	<u>4,312</u>	<u>4,205</u>	<u>4,4 39</u>
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Custodial services include janitorial services, security services, fire protection, trash removal, sanitary landfill operations, and related supplies and materials. Janitorial service is provided to about **3** million square feet of facility space and trash removal for approximately **115** separate locations. Security and fire protection services include 24-hour coverage of **MSFC** property, law enforcement, and motor vehicle registration and control. The decrease from the **1984** budget to the **1984** current estimate is due to lower than planned supplies and materials replenishment. The increase from the **1984** current estimate to the **1985** value is based on expected contractor and Redstone Arsenal rate increases.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
3. <u>Utility Services</u> .....	<u>9,726</u>	<u>11,522</u>	<u>10,156</u>	<u>11,476</u>

This function provides for the cost of electricity, steam, natural gas, water, and sewage disposal service provided by Redstone Arsenal, on a reimbursable basis. It also provides for the propane and burner fuel to generate steam for heating and cooling. The decrease from the 1984 budget estimate to the 1984 current estimate reflects the 1983 rate experience. The increase in 1985 is based on expected utility rates.

B. <u>TECHNICAL SERVICES</u> .....	<u>7,869</u>	<u>8,329</u>	<u>8,091</u>	<u>8,815</u>
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Summary of Fund Requirements

1. <u>Automatic Data Processing</u> .....	<u>5,079</u>	<u>5,338</u>	<u>5,199</u>	<u>5,694</u>
a. <u>Equipment</u> .....	1,390	882	1,239	1,456
b. <u>Operations</u> .....	3,689	4,456	3,960	4,238
2. <u>Scientific and Technical Information</u> .....	<u>1,056</u>	<u>1,135</u>	<u>1,148</u>	<u>1,232</u>
a. <u>Library</u> .....	949	1,006	1,011	1,085
b. <u>Education and information</u> .....	107	129	137	147
3. <u>Shop and Support Services</u> .....	<u>1,734</u>	<u>1,856</u>	<u>1,744</u>	<u>1,889</u>
<u>Total, Technical Services</u> .....	<u>7,869</u>	<u>8,329</u>	<u>8,091</u>	<u>8,815</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u> .....	<u>5,079</u>	<u>5,338</u>	<u>5,199</u>	<u>5,694</u>
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Funds provide centralized systems analysis, programming, 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. Equipment maintained

includes IBM 4341, FR-80 microfiche system, systems software support, and a key-to-disc which collects, controls, organizes, and edits raw data for input into the IMB 4341.

This function also provides for the development and utilization of computer techniques and systems programming of all digital computers and associated equipment. Also included is associated auxiliary support equipment such as film processors, xerox microfiche printers, xerox forms copiers, punch card accounting machines, and Univac 4020 terminals. This activity includes the operation of two large magnetic tape libraries; receipt, control, and distribution of program and data processing products; and testing and cleaning of magnetic tapes.

The decrease from the 1984 budget estimate to the 1984 current estimate is computer hardware deferred to remain within budget allowances. The increase from the 1984 current estimate to the 1985 budget estimate is for an additional computer station to support administrative activities;

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
2. <u>Scientific and Technical Information</u> .....	<u>1,056</u>	<u>1,135</u>	<u>1,148</u>	<u>1,232</u>

This activity provides for the cost sharing operation of the Redstone Scientific Information Center library (RSIC) on Redstone Arsenal 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. Operation of the RSIC by the Army is under direction of a joint MSFC/Army Redstone scientific information board, with shared costs.

These funds also provide for the preparation of reproducible pages for publication of NASA technical manuscripts and related documents and MSFC's share of the operation of the MSFC Visitor Information Center located at the Alabama Space and Rocket Center. The increase in 1985 reflects higher rates for essentially the same level of service.

3. <u>Shop and Support Service</u> .....	<u>1,734</u>	<u>1,856</u>	<u>1,744</u>	<u>1,889</u>
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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 decrease from the 1984 budget estimate to the 1984 current estimate reflects the lower support contract rate experience in 1983. The increase in 1985 is due to expected increases in support contract rates.

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u> (Thousands of Dollars)	<u>Budget</u> <u>Estimate</u>
C. <u>MANAGEMENT AND OPERATIONS</u> .....	<u><del>13,668</del></u>	<u>14,295</u>	<u>13,403</u>	<u>14,573</u>

Summary of Fund Requirements

1. <u>Administrative Communications</u> .....	<u>4,213</u>	<u>4,507</u>	<u>3,970</u>	<u>4,256</u>
2. <u>Printing and Reproduction</u> .....	<u>479</u>	<u>431</u>	<u>464</u>	<u>500</u>
3. <u>Transportation</u> .....	<u>4,402</u>	<u>3,810</u>	<u>3,705</u>	<u>4,144</u>
4. <u>Installation Common Services</u> .....	<u>4,574</u>	<u>5,547</u>	<u>5,264</u>	<u>5,673</u>
Total, Management and Operations.....	<u><del>13,668</del></u>	<u>14,295</u>	<u>13,403</u>	<u>14,573</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u> .....	<u>4,213</u>	<u>4,507</u>	<u>3,970</u>	<u>4,256</u>
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Communications support for MSFC consists of local telephone service, long distance telephone service and various kinds of other non-telephone communications. The MSFC central exchange provides local telephone service. Long distance telephone service is provided by the GSA. Included are such items as long distance commercial tolls and the autodin network for ordering supplies and materials. In addition, these funds provide for the use of Weeden Mountain radio transmission facilities, support of the emergency warning system, and operation of MSFC's fire surveillance system. The decrease in the 1984 current estimate from the budget estimate is the realignment of teleconferencing services to reflect the program support changes. The 1985 increase reflects expected rate increases in local services and long distance tolls and support contractor rate increases.

2. <u>Printing and Reproduction</u> .....	<u>479</u>	<u>431</u>	<u>464</u>	<u>500</u>
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A portion of MSFC's printing and reproduction requirements are met by an on-site reproduction plant. In addition to the on-site reproduction plant, MSFC purchases reproduction services from the Government Printing Office, the Army, and private firms. Purchased printing is an overflow requirement that

cannot be handled within the on-site workload or capability. The increase from the 1984 budget to the 1984 current estimate reflects higher supplies and materials cost. The increase from the 1984 current estimate to 1985 is expected supplies and material rate increases.

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
(Thousands of Dollars)				
3. <u>Transportation</u> .....	<u>4,402</u>	<u>3,810</u>	<u>3,705</u>	<u>4,144</u>

Transportation includes operation and maintenance 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, general special purpose trailers and vehicles, equipment such as cranes, tractors, generators and welders; and intermediate and major inspections. Freight charges for shipment of materials and equipment by both surface and air transportation are also included. The decrease from the 1984 budget estimate to the 1984 current estimate reflects less than anticipated increases in fuel rates and a small reduction in support contractor workyears. The increase in 1985 is due to support contract rate increases, overhaul of aircraft components, and replacement of vehicles.

4. <u>Installation Common Services</u> ..	<u>4,574</u>	<u>5,547</u>	<u>5,264</u>	<u>5,673</u>
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This activity provides administrative support to Center management and staff activities, medical services, and various other installation support services.

Center management and staff functions include patent counsel services, tort claims, and equal opportunity activities. Medical services provides 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 illnesses and injuries.

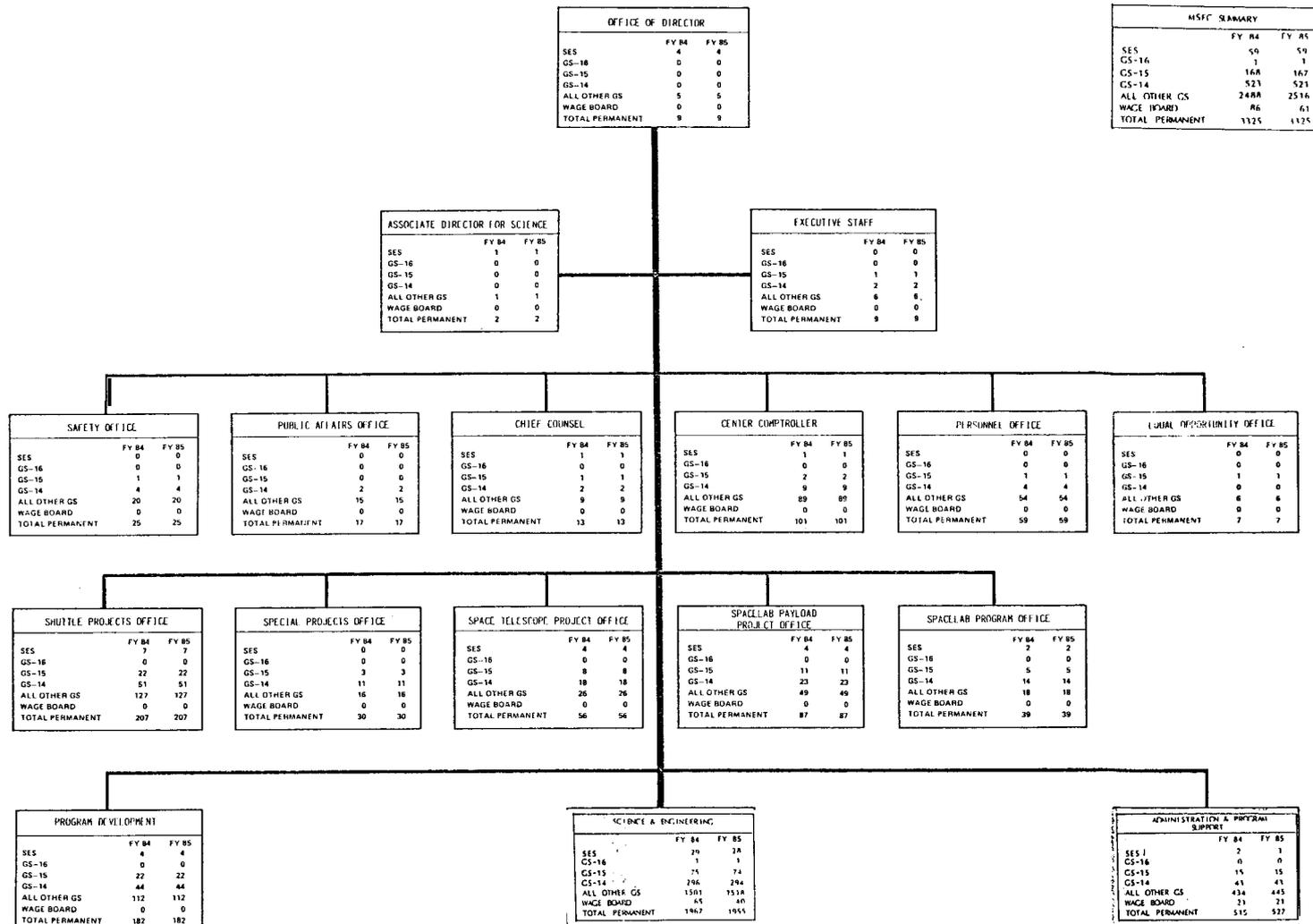
Installation support services include maintenance and repair of office equipment, equipment rental, acquisition of supplies and materials and other miscellaneous services such as: (1) receiving supplies, materials, and equipment; (2) distributing supplies, materials, equipment, and program-critical hardware; (3) preparing supplies, materials, and equipment for shipment; and (4) warehousing of raw materials.

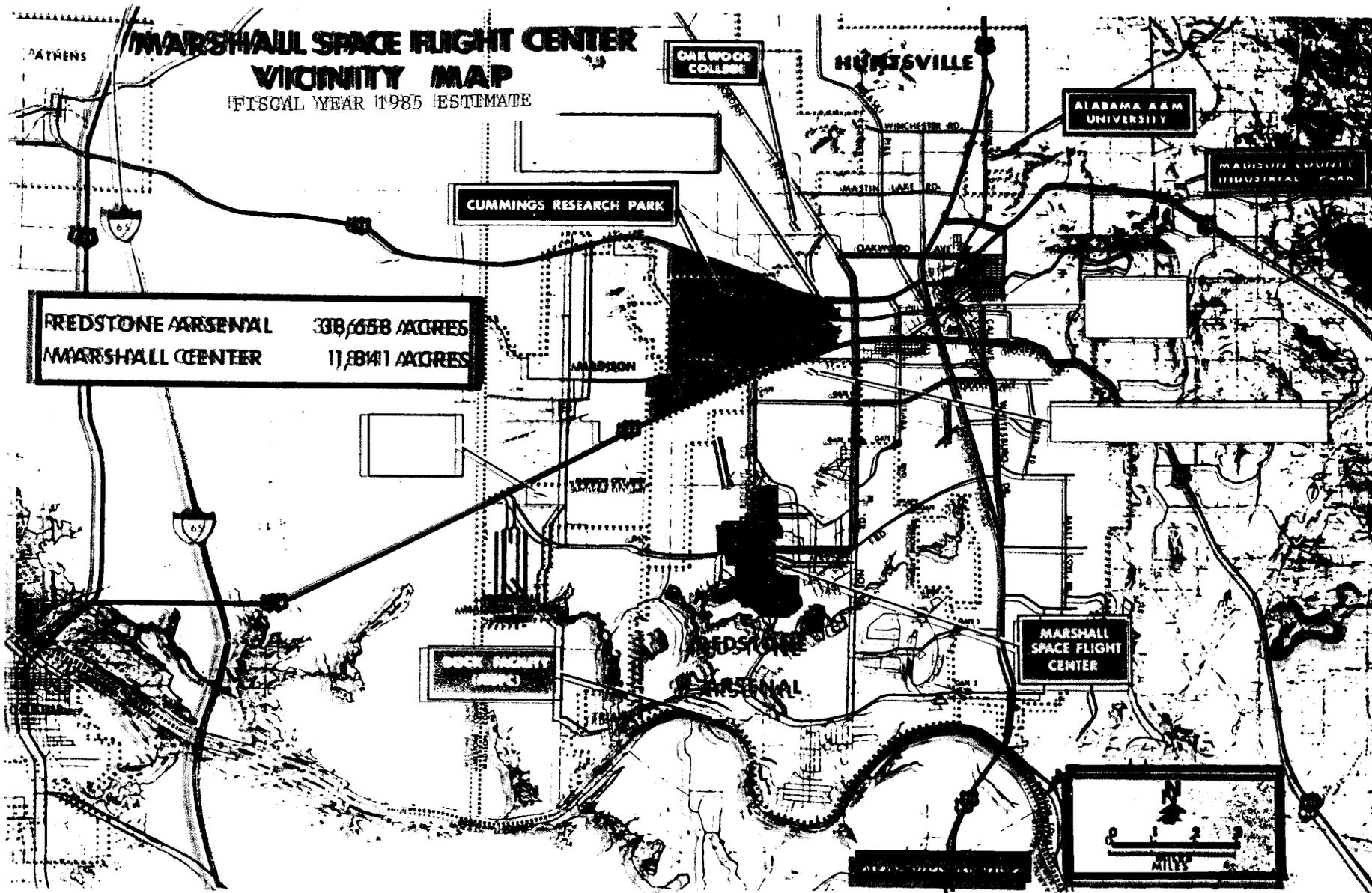
Also provided are such services as the disposal of toxic waste, inspection of hazardous cargo prior to entry to Redstone Arsenal; receipt, storage, and issuance services for hazardous substances such as explosives, pyrotechnics and solid rocket motors; minor services such as laundry, furniture repair, toxic disposal, postage, and acquisition of supplies and materials.

The decrease from the 1984 budget estimate to the 1984 current estimate is due to reduced replacement equipment purchases. The increase in 1985 is primarily for the replenishment of supplies and materials inventories, plus the expected increase in support contract rates.

# NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

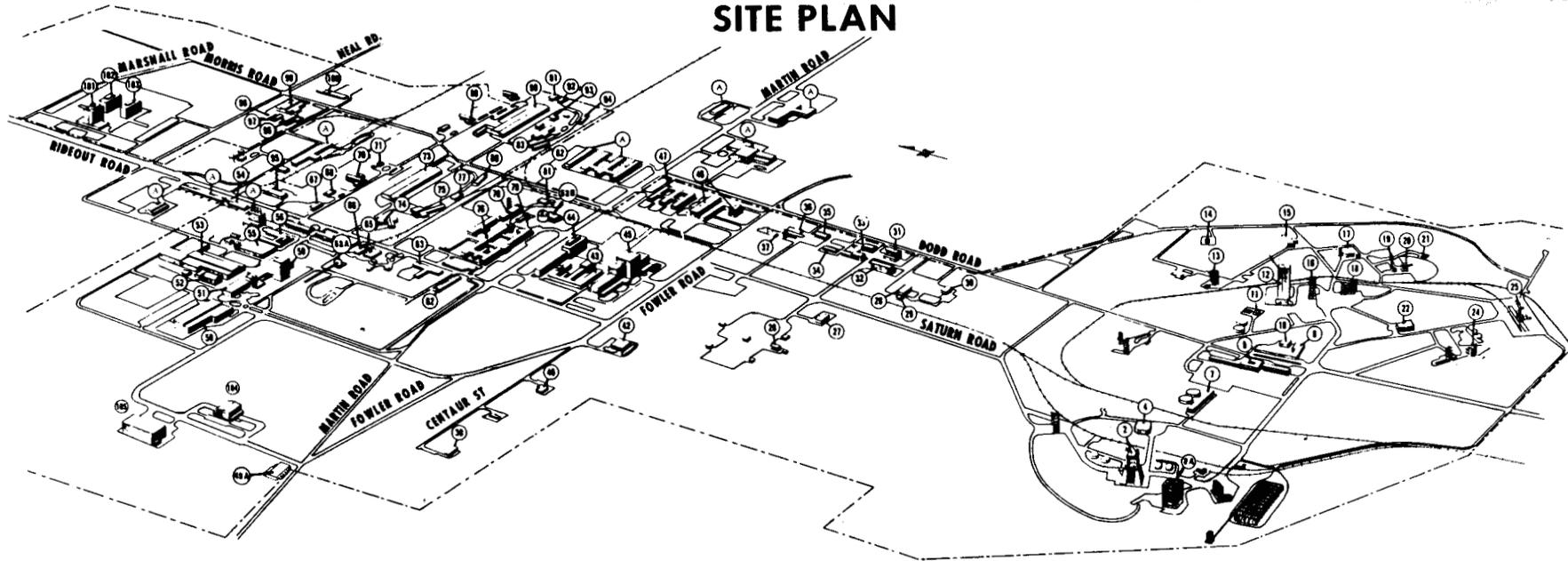
## GEORGE C. MARSHALL SPACE FLIGHT CENTER





FISCAL YEAR 1985 ESTIMATE

# MARSHALL SPACE FLIGHT CENTER SITE PLAN



## HEADQUARTERS AREA

95	4207	COMMUNICATIONS FACILITY
96	4241	SHOP AND STORAGE BUILDING
97	S-4244	STORAGE BUILDING
98	S-4251	EQUIPMENT SHED
99	4250	OFFICE AND SHOP BUILDING
00	4249	OFFICE BUILDING
01	4200	OFFICE BUILDING
02	4202	OFFICE BUILDING
03	4201	OFFICE BUILDING

## LAB AND SUPPORT AREA

38	4628	LABORATORY TESTING FACILITY
40	4623	NON-DESTRUCTIVE EVALUATION LABORATORY
42	4605	MATERIALS LABORATORY
43	4612	OFFICE AND ENGINEERING BUILDING
44	4610	STRUCTURES AND MECHANICS LABORATORY
45	4619	SHOP AND CALIBRATION LABORATORY
46	4650	COMPUTER FACILITY
47	4663	WATER POLLUTION CONTROL FACILITY
49A	4740	ENGINEERING AND DEVELOPMENT LABORATORY
50	4708	SURFACE TREATMENT FACILITY
51	4760	NEUTRAL BUOYANCY FACILITY
52	S-4706	FABRICATION AND MACHINE SHOP
53	4705	HIGH REYNOLDS FACILITY
53A	4775	CELESTIAL & OPTICAL SENSORS FACILITY
53B	4467	

54	4723	TRAINING FACILITY
55	4711	DEVELOPMENTAL PROCESSES LABORATORY
56	4712	OFFICE BUILDING
59	4707	SHOP AND ASSEMBLY BUILDING
62	S-4747	AIR COMPRESSOR BUILDING
63	4746	CALIBRATION LABORATORY
65	4732	BI-SONIC WIND TUNNEL FACILITY
66	4733	IMPULSE BASE FLOW FACILITY
67	4306	OFFICE BUILDING
68	4312	OFFICE BUILDING
70	4313	SHOP BUILDING
71	4332	ENVIRONMENTAL TEST LABORATORY
73	4471	STORAGE AND OFFICE BUILDING
74	4485	OFFICE BUILDING
75	4491	OFFICE AND LABORATORY BUILDING
76	4487	LABORATORY AND OFFICE BUILDING
77	S-4479	STORAGE SHED
78	4476	ENVIRONMENTAL TEST FACILITY
79	S-4436	AUTOMATION CHECKOUT BUILDING
80	4492	ELECTRICAL SYSTEMS LABORATORY BUILDING
81	4475	HAZARDOUS OPERATIONS LABORATORY
82	4493	SHOP AND STORAGE BUILDING

83	4483	VEHICLE MAINTENANCE SHOP
86	4353	PHOTO LAB
90	4481	SPACE SCIENCES LABORATORY
91	S-4498	STORAGE BUILDING
92	S-4499	STORAGE BUILDING
93	4482	TRANSPORTATION SUPPORT BUILDING
94	4494	CENTER ACTIVITIES BUILDING
104	4752	MULTIPURPOSE HIGH BAY FACILITY
105	4755	HIGH BAY ASSEMBLY FACILITY

12	4550	STRUCTURAL TEST FACILITY
13	4522	PROF. S COMPONENT TEST STAND
14	4530	PROPULSION SYSTEMS COMPONENT TEST STAND
15	4561	SHOP AND LABORATORY BUILDING
16	4557	STRUCTURAL TEST FACILITY
17	4583	TEST AND DATA RECORDING FACILITY
18	4548	PROPULSION SYSTEMS COMPONENT TEST FACILITY
19	S-4539	TEST STAND SUPPORT BUILDING
24	4540	MODEL PROPULSION SYSTEMS TEST STAND (ACOUSTIC)
21	4541	TEST STAND CONTROL BUILDING
22	4570	BLOCKHOUSE AND CABLE TUNNELS

## TEST AREA

### WEST AREA

2	4670	PROPULSION & STRUCTURAL TEST FACILITY
4	4674	BLOCKHOUSE
7	4674	PUMP HOUSE
8	4674	OFFICE BUILDING
8A	4674	STRUCTURAL TEST FACILITY

### EAST AREA

9	4566	DOCUMENTATION REPOSITORY
10	4567	PUMP AND BOILER HOUSE
11	S-4549	DEIONIZED WATER PLANT

26	4646	OFFICE BUILDING
27	4648	HIGH PRESSURE TEST FACILITY
28	S-4659	HP GN <sub>2</sub> FACILITY
29	S-4660	BOILER PLANT
30	S-4647	COMPRESSOR BUILDING
31	S-4655	MULTI PURPOSE HIGH BAY FACILITY
32	S-4656	HYDRAULIC EQUIPMENT DEVELOPMENT FACILITY
33	S-4653	COMPONENTS SERVICE BUILDING
34	4678	OFFICE AND STORAGE BUILDING
35	S-4654	OFFICE BUILDING
35	S-4651	SHOP BUILDING
37	4649	MULTI PURPOSE HIGH BAY FACILITY

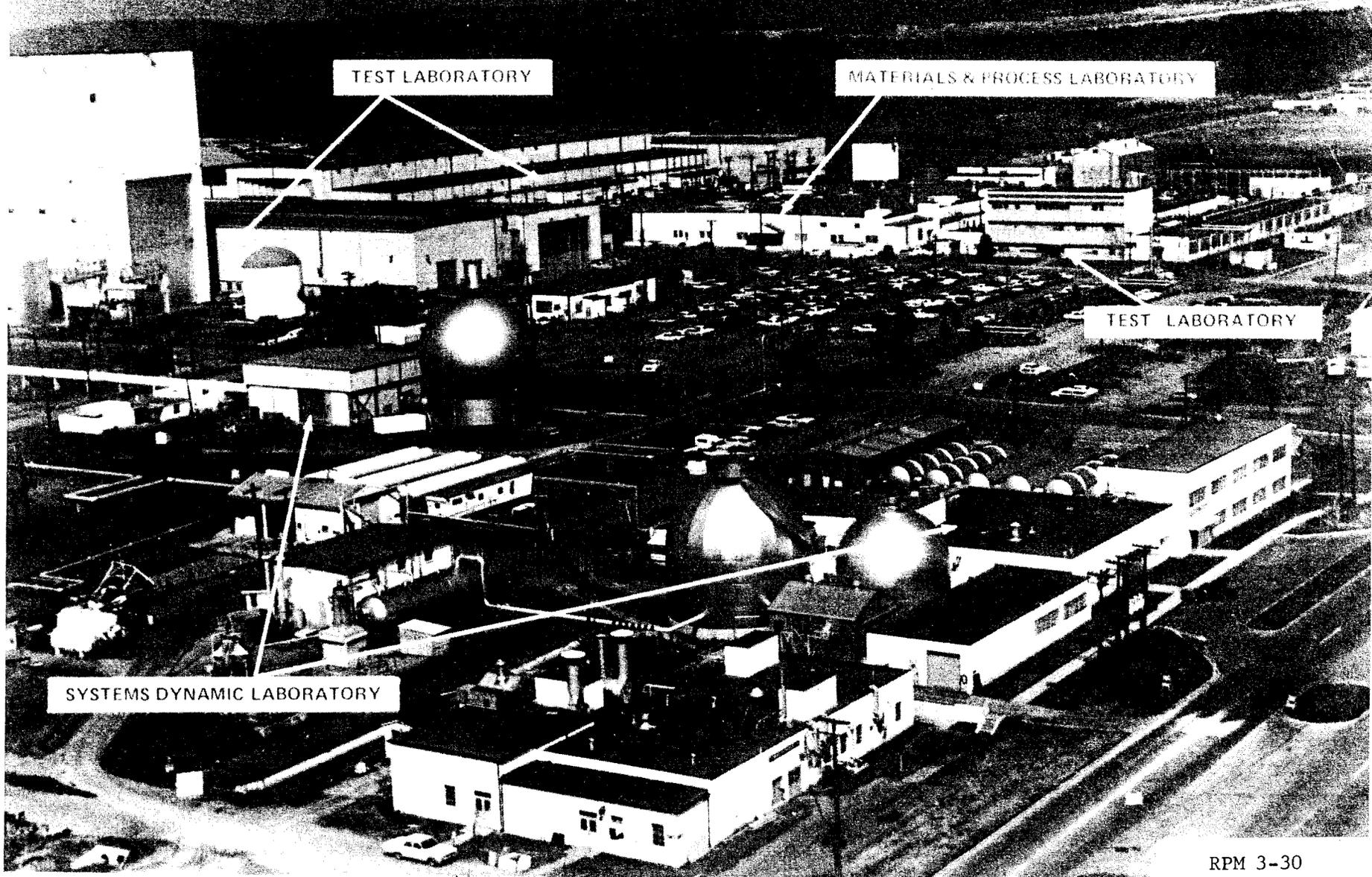


**GEORGE C. MARSHALL SPACE FLIGHT CENTER**

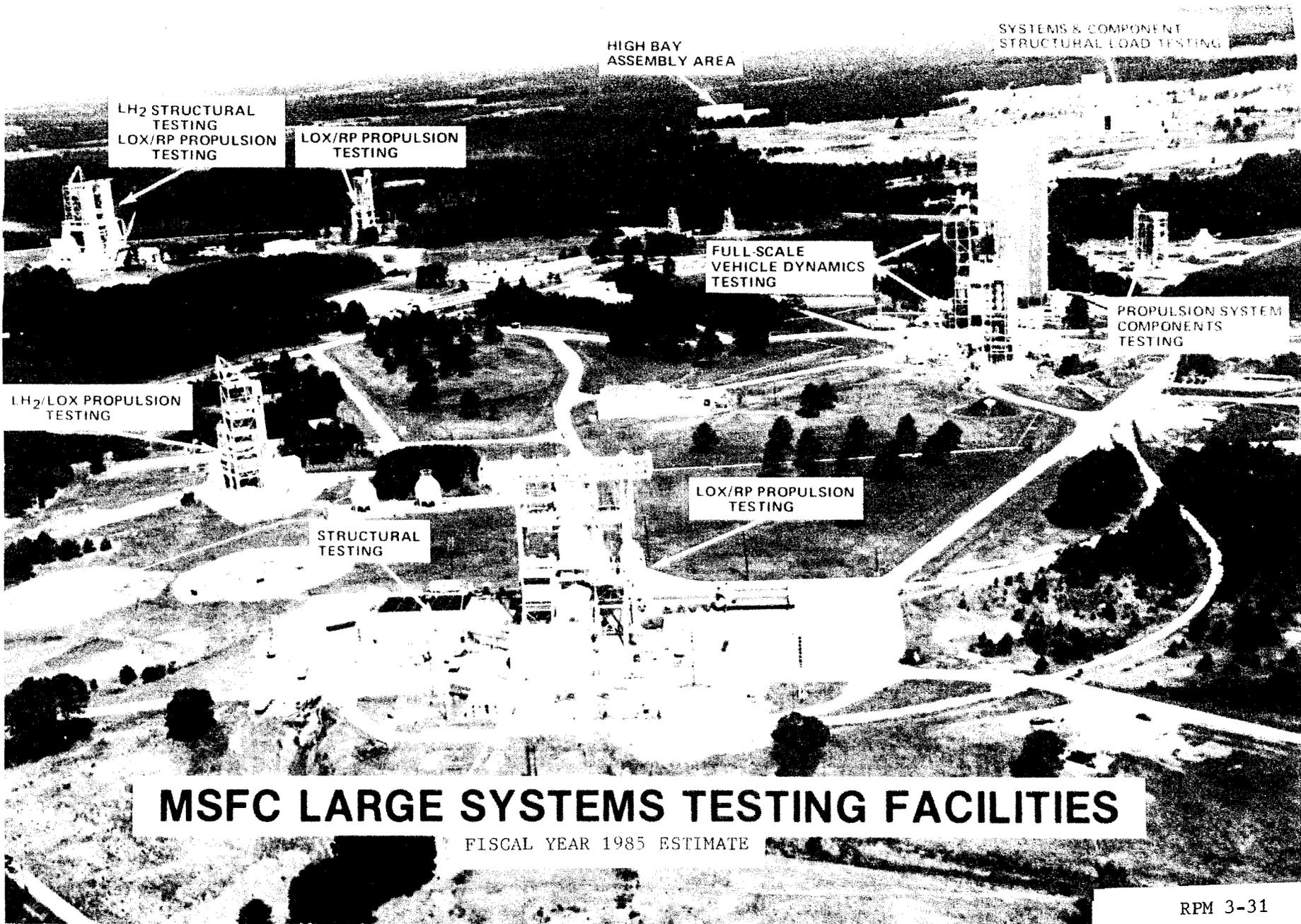
FISCAL YEAR 1985 ESTIMATE

RPM 3-29

FISCAL YEAR 1985 ESTIMATE  
SCIENCE & ENGINEERING AREA MSFC, HUNTSVILLE



RPM 3-30



LH<sub>2</sub> STRUCTURAL TESTING  
LOX/RP PROPULSION TESTING

LOX/RP PROPULSION TESTING

HIGH BAY ASSEMBLY AREA

SYSTEMS & COMPONENT STRUCTURAL LOAD TESTING

FULL SCALE VEHICLE DYNAMICS TESTING

PROPULSION SYSTEM COMPONENTS TESTING

LH<sub>2</sub>/LOX PROPULSION TESTING

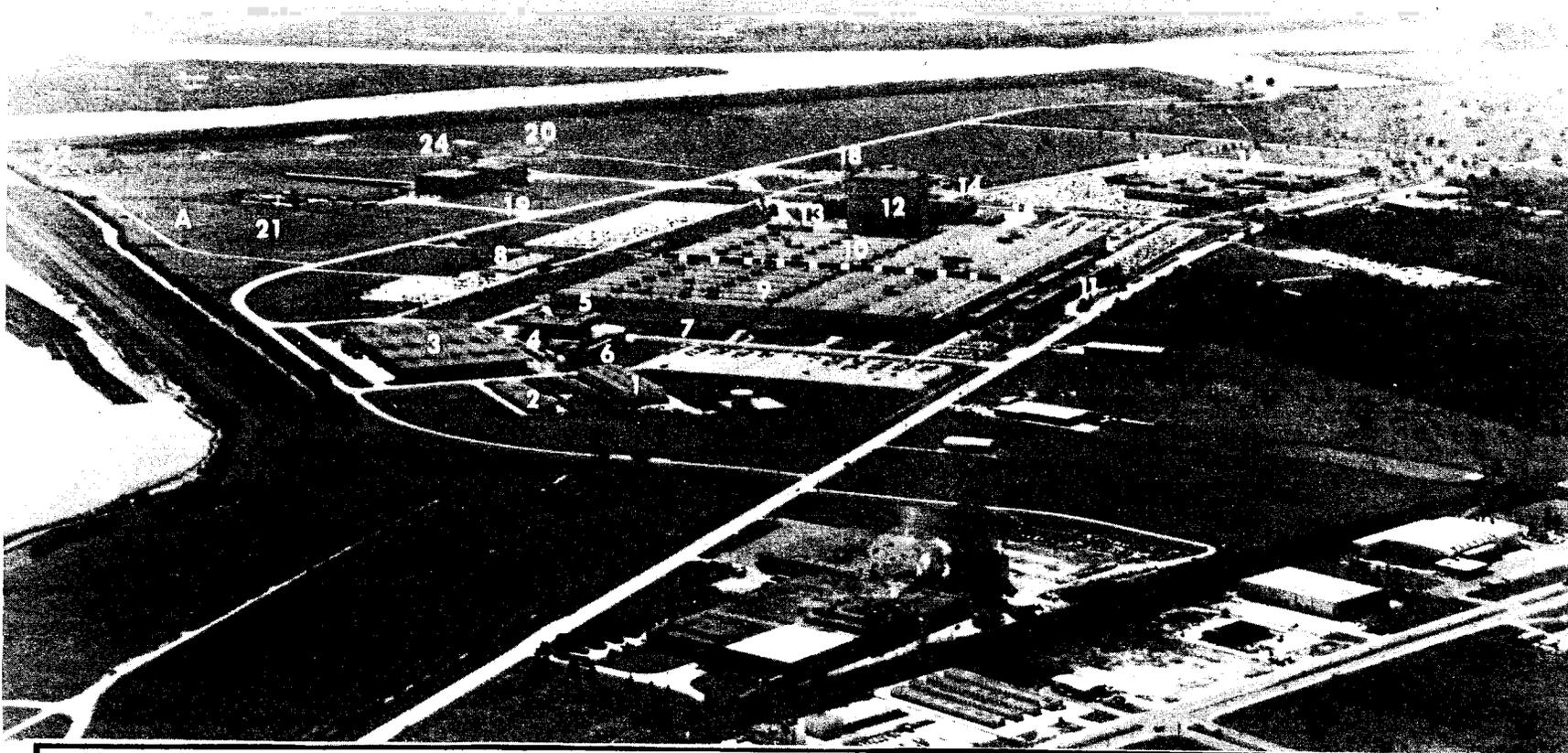
LOX/RP PROPULSION TESTING

STRUCTURAL TESTING

# MSFC LARGE SYSTEMS TESTING FACILITIES

FISCAL YEAR 1985 ESTIMATE

FISCAL YEAR 1985 ESTIMATE  
MICHOU D ASSEMBLY FACILITY



- |                              |                                  |                                 |
|------------------------------|----------------------------------|---------------------------------|
| 1. MAINTENANCE SUPPLY        | 9. FABAREA                       | 17. CAFETERIA                   |
| 2. HAZARDOUS MATLS STORAGE   | 10. FABAREA                      | 18. CONTRACTOR SERVICES BLDG.   |
| 3. COMPONENT SUPPLY          | 11. ENGINEERING BUILDINGS        | 19. TEST & CHECK OUT            |
| 4. BOILER PLANT & FUEL TANKS | 12. VERT ASSY & HYDROSTATIC TEST | 20. SALVAGE YARD                |
| 5. BATTERY CHARGING          | 13. SYSTEMS ENGINEERING BLDG.    | 21. HIGH PRESSURE TEST FACILITY |
| 6. COOLING TOWER             | 14. HANGAR                       | 22. MAIN PUMPING STATION        |
| 7. LABORATORY                | 15. MAINTENANCE                  | 23. BARGE DOCK                  |
| 8. CHEMICAL WASTE RESERVOIR  | 16. ENGINEERING & OFFICE BLDG.   | 24. PNEUMATIC TEST FACILITY     |

RPM 3-32

## RESEARCH AND PROGRAM MANAGEMENT

### FISCAL YEAR 1985 ESTIMATES

#### NATIONAL SPACE TECHNOLOGY LABORATORIES

##### DESCRIPTION

The National Space Technology Laboratories (NSTL) is located in southwest Mississippi, approximately 50 miles northeast of New Orleans, Louisiana. Total land area is 138,807 acres of which 13,480 make up the actual installation owned by NASA. The remaining 125,327 acres are held as a buffer zone. In the buffer zone, 7,162 acres are owned by NASA and 118,165 acres are under restrictive easements. The installation has deep water access via the Pearl River and the Intracostal Waterway. Capital investment for the National Space Technology Laboratories, as of September 30, 1983, was \$312,545,000.

##### CENTER ROLES AND MISSIONS

The National Space Technology Laboratories, formerly the Mississippi Test Facility (MTF), is NASA's prime static test facility for large liquid propellant rocket engines and propulsion systems. The redesignation by NASA of MTF to the NSTL in June 1974 recognized the emerging role of the installation in space and environmental technology laboratories.

NSIL is presently engaged in development and acceptance testing of the Space Shuttle Main Engines and Main Propulsion System development testing. NSTL also conducts applied research and development in the fields of remote sensing, environmental sciences, and other selected applications programs. NSIL manages the installation and, through interagency agreements, provides support and maintains full utilization of all facilities by NASA and co-located 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, and the Department of Transportation. Additionally, has working agreements with the State of Mississippi, and the State of Louisiana. The principal roles are:

Space Shuttle: - NSIL provides, maintains and manages the facilities and the related capabilities required for the continued development and acceptance testing of the Space Shuttle Main Engines (SSME), and the development testing of the Shuttle's Main Propulsion Test Article (MPTA) which consists of a cluster of three main engines, an external tank and an orbiter aft-fuselage structure. In 1985, the MPTA stand is planned to be converted to a single engine test stand for SSME component green run testing. NASA will maintain the capability to convert back to the MPTA configuration if required.

Space Applications: - 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 nonrenewable resources.

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

SUMMARY OF RESOURCES REQUIREMENTS

Funding Plan by Function

	<u>1983 Actual</u>	<u>1984</u>		<u>1985</u>
		<u>Budget Estimate</u> (Thousands of	<u>Current Estimate</u> Dollars)	<u>Budget Estimate</u>
I. Personnel and Related Costs.....	4,431	4,489	4,623	4,735
II. Travel.....	158	151	170	170
III. Operation of Installation.....	1,756	4,662	5,000	6,000
A. Facilities Services.....	(505)	(2,659)	(2,921)	(3,853)
B. Technical Services.....	(193)	(217)	(217)	(181)
C. Management and Operations .....	<u>(1,058)</u>	<u>(1,786)</u>	<u>(1,862)</u>	<u>(1,966)</u>
Total, fund requirements. ....	<u>6,345</u>	<u>9,302</u>	<u>9,793</u>	<u>10,905</u>

Distribution of Permanent Workyears by Program

	<u>1983</u> <u>Actual</u>	<u>1984</u> <u>Budget</u> <u>Estimate</u>	<u>1984</u> <u>Current</u> <u>Estimate</u>	<u>1985</u> <u>Budget</u> <u>Estimate</u>
<u>RESEARCH AND DEVELOPMENT</u> .....	<u>46</u>	<u>44</u>	<u>46</u>	<u>46</u>
Space Transportation Capability Development .....	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>
Space Science and Applications .....	<u>40</u>	<u>38</u>	<u>40</u>	<u>40</u>
Space Applications. ....	<u>40</u>	<u>30</u>	<u>40</u>	<u>40</u>
Technology Utilization.....	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
Subtotal, direct workyears .....	<u>46</u>	<u>44</u>	<u>46</u>	<u>46</u>
<u>CENTER MANAGEMENT AND OPERATIONS</u> <del>SECRET</del> .....	<u>59</u>	<u>59</u>	<u>61</u>	<u>61</u>
Total, full-time workyears.....	<u>105</u>	<u>103</u>	<u>107</u>	<u>107</u>
Other than full-time.....	<u>17</u>	<u>17</u>	<u>13</u>	<u>13</u>
Total, workyears. ....	<u>122</u>	<u>120</u>	<u>120</u>	<u>120</u>

PROGRAM DESCRIPTION

<b>RESEARCH AND DEVELOPMENT</b>	Permanent Civil <u>Service Workyears</u>
<u>SPACE TRANSPORTATION CAPABILITY DEVELOPMENT.....</u>	5

In 1985, the National Space Technology Laboratories will continue to provide, maintain, and manage the facilities and the related capabilities required for development and acceptance testing of the Space Shuttle Main Engines.

<b><u>SPACE APPLICATIONS.....</u></b>	<b>40</b>
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In 1985, the NSTL's Earth Resources Laboratory's program will continue to:

- Conduct research investigations in the application of remotely sensed data. This research activity uses existing aircraft and satellite programs as a basic source of obtaining remotely sensed data in conjunction with surface data to develop techniques and procedures for practical applications.
- Conduct applied research investigations for the application of new sensor data to priority information requirements of national concern in the areas of agricultural productivity, geological explorations, and land resources management including studies for aligning appropriate sensor technology with application disciplinary requirements.
- Promote the effective transfer of applications technology as well as reduce system costs, and improve compatibility with other information sources and products.
- Conduct research and development applications in non-remote sensing applications primarily in areas such as environmental system development and closed ecosystems development.

<b><u>TECHNOLOGY UTILIZATION.....</u></b>	<b>1</b>
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In 1985, NSTL will continue to provide the capability to disseminate new technology development to the private sector.

<b><u>CENTER MANAGEMENT AND OPERATIONS SUPPORT.....</u></b>	<b>61</b>
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Center Management and Operations Support is defined as that support or services being provided to all NSTL organizations which cannot be identified exclusively to a single program or project. The civil service personnel involved are:

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

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

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

RESOURCE REQUIREMENTS BY FUNCTION

	1983	1984		1985
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
<b>I. <u>PERSONNEL AND RELATED COSTS</u>.....</b>	<b><u>4,431</u></b>	<b><u>4,489</u></b>	<b><u>4,623</u></b>	<b><u>4,735</u></b>
<u>Summary of Fund Requirements</u>				
<b>A. <u>Compensation and Benefits</u></b>				
1. <u>Compensation</u>				
a. Full-time permanent .....	3,664	3,643	3,860	3,945
b. Other than full-time permanent .....	269	297	259	263
c. Overtime and other compensation. ....	<u>16</u>	<u>15</u>	<u>15</u>	<u>18</u>
Subtotal, Compensation .....	3,949	3,955	4,134	4,226
2. <u>Benefits</u> .....	<u>421</u>	<u>494</u>	<u>456</u>	<u>469</u>
Subtotal, Compensation and Benefits.....	<u>4,370</u>	<u>4,449</u>	<u>4,590</u>	4,695
<b>B. <u>Supporting Costs</u></b>				
1. Transfer of personnel .....	49	25	15	20
2. Personnel training .....	<u>12</u>	<u>15</u>	<u>18</u>	<u>20</u>
Subtotal, Supporting Costs.....	<u>61</u>	<u>40</u>	<u>33</u>	<u>40</u>
<b>Total, Personnel and Related Costs.....</b>	<b><u>4,431</u></b>	<b><u>4,489</u></b>	<b><u>4,623</u></b>	<b><u>4,735</u></b>

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
A. <u>Compensation and Benefits</u> .....	<u>4,370</u>	<u>4,449</u>	<u>4,590</u>	<u>4,695</u>
1. <u>Compensation</u> .....	<u>3,949</u>	<u>3,955</u>	<u>4,134</u>	<u>4,226</u>
a. Full-time permanent.....	3,664	3,643	3,860	3,945

The increase from the 1984 current estimate to the 1984 budget estimate reflects the effect of 1984 pay increase. The 1985 estimate reflects full year effect of the 1984 pay increase.

Basis of Cost for Full-time Workyears

In 1985, the cost of full-time workyears will be \$3,945,000, an increase of \$85,000 from 1984. The increase results from the following:

Cost of full-time workyears in 1984.....	3,860
Cost increases in 1985.....	+151
Within grade and career advances:	
Full year effect of 1984 actions.....	+39
Partial year effect of 1985 actions.....	+53
Full year effect of 1984 pay increases.....	+46
One more day in 1985.....	+13
Cost decreases in 1985.....	-66
Turnover savings and abolished positions:	
Full year effect of 1984 actions.....	-16
Partial year effect of 1985 actions.....	-32
Alteration in the method of calculating salaries paid.....	-3
Reduction related to the Government-wide initiative to reduce the number of GS/GM 11-15 positions.....	-15
cost of full-time workyears in 1985.....	<u>3,945</u>

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current. Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
b. Other than full-time permanent				
1. Cost.....	269	297	259	263
2. Workyears.. ..	18	18	14	14

The distribution of 1985 workyears is as follows:

Distribution of Other than Full-Time Workyears

	<u>Workyears</u>
Ceiling <del>programs</del> .....	13
Developmental programs .....	(3)
Summer <del>programs</del> .....	(1)
Other <b>programs</b> .....	(9)
Youth opportunity <del>programs</del> .....	<u>1</u>
Total.....	<u>14</u>

The decrease from the 1984 budget estimate to the 1984 current estimate is a decrease in other than full time employees. The 1985 increase is the full year effect of the 1984 pay increase.

c. Overtime and other compensation .....	16	15	15	18
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The increase from the 1984 current estimate to the 1985 budget estimate is necessary to meet management and administrative requirements in the procurement and financial management areas.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
2. <u>Benefits</u> .....	421	<u>494</u>	<u>456</u>	<u>469</u>

The following are the amounts of contribution by category:

Civil Service Retirement Fund.....	254	271	280	283
Employee life insurance.....	13	11	11	11
Employee health insurance.....	108	158	115	121
FICA.....	7	a	10	11
Medicare.....	38	46	40	43
Other.....	<u>1</u>	<u>---</u>	<u>---</u>	<u>---</u>
Total.....	<u>421</u>	<u>494</u>	<u>456</u>	<u>469</u>

The decrease from the 1984 budget estimate to the 1984 current estimate reflects 1983 experience offset by the partial year effect of 1984 pay increase. The increase in 1985 is the full year effect of these changes.

B. <u>Supporting Costs</u> .....	<u>61</u>	<u>40</u>	<u>33</u>	<u>40</u>
1. Transfer of personnel.....	49	25	15	20

The estimates for 1984 and 1985 are based on projected hiring plans.

2. Personnel training.....	1%	15	18	20
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The personnel training program continues to develop the skills and knowledge of NSTL employees in order to more efficiently support NSTL roles and missions, primarily through "Upward Mobility" training for women and minorities, and Equal Employment Opportunity seminars.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	<u>Budget Estimate</u>
II. <u>TRAVEL</u> .....	<u>158</u>	<u>151</u>	<u>170</u>	<u>170</u>

Summary of Fund Requirements

A. Program Travel.....	72	87	102	102
B. Scientific and Technical Development Travel.. ...	4	3	4	4
C. Management and Operations Travel.. .....	<u>82</u>	<u>61</u>	<u>64</u>	<u>64</u>
Total, Travel.....	<u>158</u>	<u>151</u>	<u>170</u>	<u>170</u>

Explanation of Fund Requirements

A. <u>Program Travel</u> .....	<u>72</u>	<u>87</u>	<u>102</u>	<u>102</u>
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Program travel requirements are directly related to the accomplishment of the Laboratories' mission, and will mainly be in support of Space Science and Applications Programs. Program travel will account for about 60 percent of total travel in 1985. The increase from the 1984 budget estimate to the 1984 current estimate reflects expected transportation cost increases.

B. <u>Scientific and Technical Development Travel</u> .. ...	<u>4</u>	<u>3</u>	<u>4</u>	<u>4</u>
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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 retain their technical competency and gain awareness of technological advances outside NSTL as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems for the benefit of the Government.

C. <u>Management and Operations Travel</u> .....	<u>82</u>	<u>61</u>	<u>64</u>	<u>64</u>
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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 Laboratories' top management to NASA Headquarters and other NASA Centers. The increase from the 1984 budget estimate to the 1994 current estimate reflects expected transportation cost rates.

	1983 <u>Actual</u>	1984		1985 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
III. <u>OPERATION OF INSTALLATION</u> .....	<u>1,756</u>	<u>4,662</u>	<u>5,000</u>	<u>6,000</u>

Summary of Fund Requirements

A. Facilities Services.....	505	2,659	2,921	3,853
B. Technical Services.....	193	217	217	181
C. Management and Operations. ....	<u>1,058</u>	<u>1,786</u>	<u>1,862</u>	<u>1,966</u>
Total, Operation of Installation.. ....	<u>1,756</u>	<u>4,662</u>	<u>5,000</u>	<u>6,000</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. Activities 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, printing, transportation, and related services.

The increase from the 1984 budget estimate to the 1984 current estimate reflects the assumption of utilities control system maintenance and a revised estimate of the impact of divestiture and deregulation of communication services. The 1985 increase provides for projected rate increases for utilities, support contractor wages, and communications.

A. <u>FACILITIES SERVICES</u> .....	<u>505</u>	<u>2,659</u>	<u>2,921</u>	<u>3,853</u>
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The NSIL covers 138,807 acres of grounds, and a complex of facilities which are comprised of laboratories, offices, and rocket engine test facilities. The complex encompasses some 1,172,098 gross square feet of building space. This physical plant supports an average daily on-site population of 3,023. Many of the test facilities are utilized on schedules involving more than one shift operation and operations during off-peak hours.

	1983 <u>Actual</u>	1984		1985
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
<u>Summary of Fund Requirements</u>				
1. <u>Maintenance and Related Services</u> .....	82	170	170	579
2. <u>Custodial Services</u> .....	75	267	267	429
3. <u>Utility Services</u> .....	<u>348</u>	<u>2,222</u>	<u>2,484</u>	<u>2,845</u>
Total, Facilities Services.....	<u>505</u>	<u>2,659</u>	<u>2,921</u>	<u>3,853</u>

Explanation of Fund Requirements-

1. <u>Maintenance and Related Services</u> .....	82	170	170	579
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This activity provides for the modifications and alterations of facilities and on-site relocations of personnel and equipment of the Earth Resources Laboratory (ERL) and equipment purchases for the ERL. The increase from FY 1984 to FY 1985 reflects not only anticipated support service contractor wage rate increases and expected FY 1985 price levels for supplies, materials, equipment and other contractual effort, but an increase of \$400,000 as part of the NASA-wide augmentation in Operational Maintenance effort. This augmentation will provide a level of activity more consistent with the National investment in the NSTL physical plant.

2. <u>Custodial Services</u> .....	75	267	267	429
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Provides for NASA's share of security guard services, janitorial services and fire protection services by the NSTL institutional support services contractor. The increase in the 1985 Budget Estimate reflects expected cost escalation and the purchase of a fire truck.

3. <u>Utility Services</u> .....	348	2,222	2,484	2,845
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Provides for the purchase of utility commodities; primarily, 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 NSTL. Also provided is NASA's share of the operation of the utility distribution and control systems, water wells, and sewage systems. The increase from the 1984 budget estimate to the 1984 current estimate is higher consumption based on additional engine testing offset by lower than expected rates. The increase in 1985 reflects expected rate escalation.

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
B. <u>TECHNICAL SERVICES</u> .....	<u>193</u>	<u>217</u>	<u>217</u>	<u>181</u>

Summary of Fund Requirements

1. <u>Automatic Data Processing</u> .....	<u>21</u>	<u>5</u>		
2. <u>Scientific and Technical Information</u> .....	<u>128</u>	<u>117</u>	<u>117</u>	<u>76</u>
a. Library.....	3	4	4	4
b. Education and information.....	125	113	113	72
3. <u>Shop and Support Services</u> .....	<u>44</u>	<u>95</u>	<u>95</u>	<u>100</u>
Total, Technical Services.....	<u>193</u>	<u>217</u>	<u>217</u>	<u>181</u>

Explanation of Fund Reauirements

1. <u>Automatic Data processing</u> .....	<u>21</u>	<u>5</u>	<u>5</u>	<u>5</u>
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Provides equipment supplies and materials in support of the Earth Resources Laboratory's ADP requirements.

2. <u>Scientific and Technical Information</u> .....	<u>128</u>	<u>117</u>	<u>117</u>	<u>76</u>
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Provides books, periodicals, and other technical reports by the Earth Resources Laboratory, and NASA's share of upgrading and operating the NSTL Visitor Information Center (VIC). The VIC upgrading program, which began in 1983 in response to public interest, will continue into 1984 to prepare for the expected influx of visitors as a result of the 1984 New Orleans World's Fair. The 1985 estimate reflects a return to base requirements following completion of the VIC update.

3. <u>Shop and Support Services</u> .....	<u>44</u>	<u>95</u>	<u>95</u>	<u>100</u>
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Provides for safety, photography and graphics services. The increase in 1985 reflects expected cost escalation.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
C. <u>MANAGEMENT AND OPERATIONS, . . . . .</u>	<u>1,058</u>	<u>1,786</u>	<u>1,862</u>	<u>1,966</u>

Summary of Fund Requirements

1. <u>Administrative Communications</u> .....	521	834	879	919
2. <u>Printing and Reproduction</u> .....	23	51	51	54
3. <u>Transportation</u> .....	397	790	821	878
4. <u>Installation Common Services</u> .....	<u>117</u>	<u>111</u>	<u>111</u>	<u>115</u>
Total, Management and Operations. ....	<u>1,058</u>	<u>1,786</u>	<u>1,862</u>	<u>1,966</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u> .....	<u>521</u>	<u>834</u>	<u>879</u>	<u>919</u>
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Provides for NASA's share of the local telephone service, FTS, long distance and operation and maintenance of the on-site communications switchboard and other equipment. The increase from the 1984 budget estimate to the FY 1984 current estimate is due to greater impact of divestiture and deregulation than expected. The increase in 1985 reflects expected cost escalation.

2. <u>Printing and Reproduction</u> .....	<u>23</u>	<u>51</u>	<u>51</u>	<u>54</u>
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Provides for printing and reproduction services in support of the Earth Resources Laboratory and the local house organ. The increase from the 1984 current estimate to the 1985 budget estimate reflects expected cost escalation.

3. <u>Transportation</u> .....	<u>397</u>	<u>790</u>	<u>821</u>	<u>878</u>
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This estimate includes local transportation for the NSIL staff and the support contractors, as well as freight costs, government bills of landing, air freight, other general shipments, and related transportation costs. The increase from the 1984 Budget Estimate to the 1984 Current Estimate is due to

higher rates than expected. The increase in 1985 reflects expected cost increases in support contractor rates and vehicle rentals.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
4. <u>Installation Common Services</u> .....	<u>117</u>	<u>111</u>	<u>111</u>	115

Provides supplies, materials and equipment for the Earth Resources Laboratory. The increase from the 1984 current estimate to the 1985 budget estimate reflects expected cost escalation.

NSTL SUMMARY STAFFING		
	FY84	FY85
SES	3	3
GM-15	5	5
GM-14	12	12
All other GSIGM	90	90
<b>TOTAL PERMANENT</b>	<b>110</b>	<b>110</b>

OFFICE OF THE DIRECTOR		
	FY84	FY85
SES	2	2
GM-14	1	1
All other GS/GM	3	3
<b>TOTAL PERMANENT</b>	<b>6</b>	<b>6</b>

CHIEF COUNSEL		
	FY84	FY85
GM-15	1	1
All other GSIGM	1	1
<b>TOTAL PERMANENT</b>	<b>2</b>	<b>2</b>

EXECUTIVE STAFF		
	FY84	FY85
All other GSIGM	4	4
<b>TOTAL PERMANENT</b>	<b>4</b>	<b>4</b>

RESOURCES & FINANCIAL MANAGEMENT OFFICE		
	FY84	FY85
GM-14	1	1
All other GSIGM	16	16
<b>TOTAL PERMANENT</b>	<b>17</b>	<b>17</b>

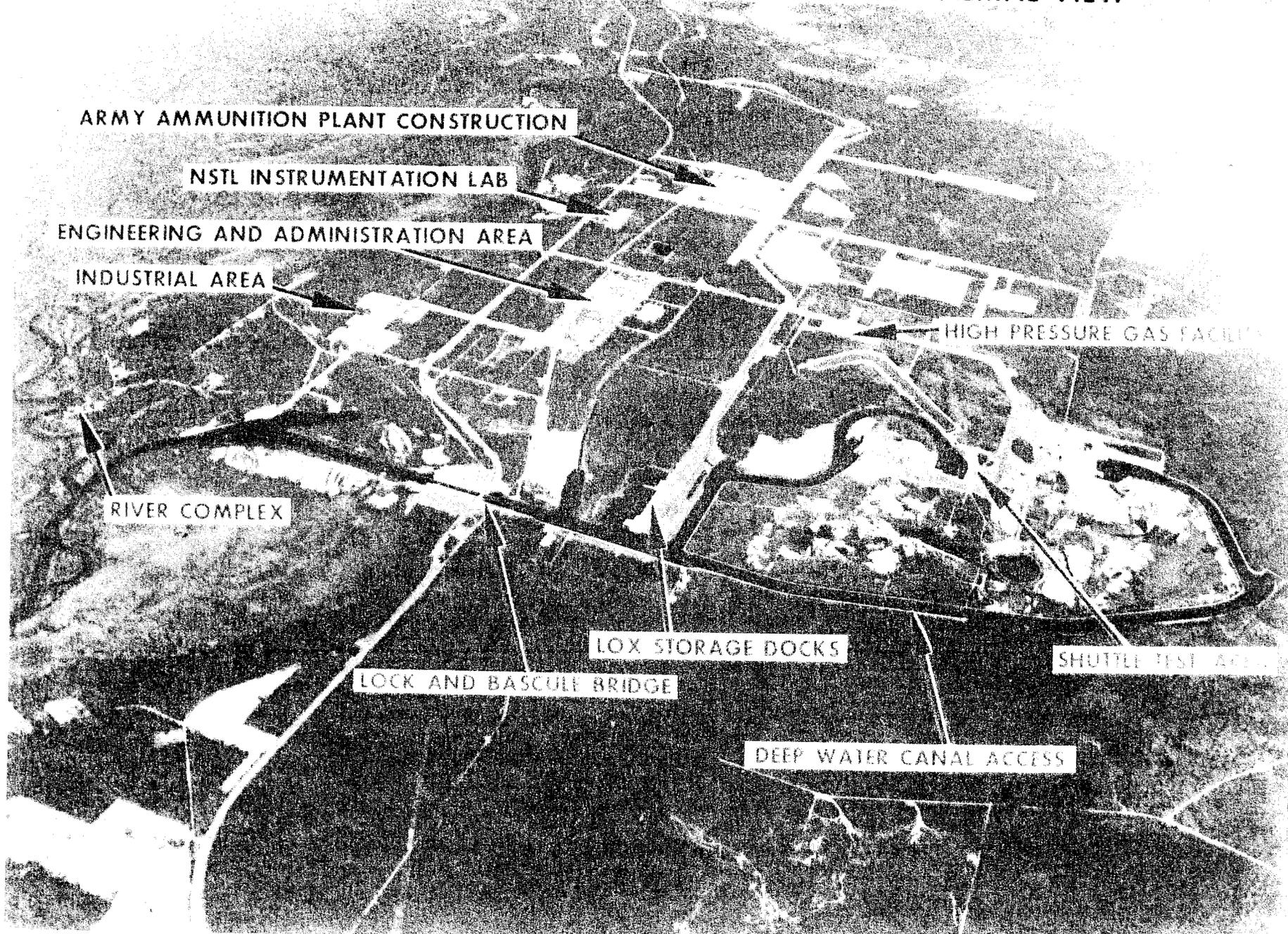
PROCUREMENT & CONTRACTS OFFICE		
	FY84	FY85
GM-14	1	1
All other GSIGM	12	12
<b>TOTAL PERMANENT</b>	<b>13</b>	<b>13</b>

FACILITIES ENGINEERING OFFICE		
	FY84	FY85
GM-14	2	2
All other GSIGM	9	11
<b>TOTAL PERMANENT</b>	<b>11</b>	<b>13</b>

INSTALLATIONS OPERATIONS OFFICE		
	FY84	FY85
GM-15	1	1
GM-14	3	3
All other GSIGM	16	16
<b>TOTAL PERMANENT</b>	<b>20</b>	<b>20</b>

EARTH RESOURCES LABORATORY		
	EY84	EY85
SES	1	1
GS-15	3	3
GS-14	4	4
All other GSIGM	29	27
<b>TOTAL PERMANENT</b>	<b>37</b>	<b>35</b>

# NATIONAL SPACE TECHNOLOGY LABORATORIES - AERIAL VIEW





## RESEARCH AND PROGRAM MANAGEMENT

### FISCAL YEAR 1985 ESTIMATES

#### GODDARD SPACE FLIGHT CENTER

##### DESCRIPTION

The Goddard Space Flight Center (GSFC), located 15 miles northeast of Washington, DC., 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 6,165 acres at the Wallops facility located on the Atlantic Coast of Virginia's eastern shore. The Wallops facility consists of 1,833 acres on the main base, 3,085 acres on Wallops Island launching site, 107 acres on the mainland tracking site, and 1,140 acres of marshland. The total capital investment for the Goddard Space Flight Center, including tracking stations, work in progress, contractor-held facilities at various locations, and the Wallops facility, as of September 30, 1983, was approximately \$881,071,000.

The majority of the Goddard Space Flight 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 tracking and communications network stations throughout the world.

##### CENTER ROLES AND MISSIONS

The Goddard Space Flight Center, established in 1959 as the first major United States installation devoted to the investigation and exploration of space, conducts a wide-ranging program in space science and applications. 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 both the ground network of tracking and data acquisition facilities and the Tracking and Data Relay Satellite System; scientific research to include both theoretical studies and the development of many significant scientific experiments flown on satellites; and the operation of a research airport, located at Wallops, in support of NASA's aeronautics research programs. The principal and supporting roles are:

##### PRINCIPAL

Earth Orbital Spacecraft Development 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, and the planning and conducting of associated flight operations.

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 research and sounding rockets; and network planning and implementation support for Shuttle. (Tracking and data acquisition responsibilities include support of deep space as well as Earth orbital missions and the implementation of the Tracking and Data Relay Satellite System.)

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 the expendable Scout launch vehicles launched from the Wallops facility.

Expendable Launch Vehicles - Goddard is the management center for the Delta launch vehicle, NASA's only medium class standard launch vehicle which is used for NASA missions, reimbursable missions for other government agencies, domestic commercial users, and international users.

Space Science and Applications - develops the science and technology discipline bases, develops and calibrates spaceborne sensors, 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.

Sounding Rocket Development, Procurement and Operations - develops and procures sounding rockets and carries out all phases of operations from mission/flight planning to landing and recovery, including supporting systems (i.e., guidance, telemetry and attitude control, power, payload housing, separation systems, and recovery).

Balloon Program - manages and provides technical oversight and direction to the balloon activities conducted for both NASA and other agencies.

Spacelab Payload Development - develop, analytically integrate and process data for Spacelab payloads in astrophysics, solar terrestrial physics, astronomy, and applications.

Special Payloads Activities - involves the management of such Shuttle payload activities as sounding rocket class payloads which will be flown on the Space Shuttle, Get-Away-Specials, etc., and of balloon and aircraft projects. This involves development and operations of diverse mechanical, electrical, aerodynamic, propulsion, control, thermal, and combined systems.

RPM 5-2

SUPPORTING

Planetary Science - develop and **apply** techniques for the analysis of planetary atmospheres.

Aerospace Flight Test Support - plan and conduct 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.

SUMMARY OF RESOURCES REQUIREMENTS

Funding Plan by Function

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of	<u>Current</u> <u>Estimate</u> Dollars)	
I. Personnel and Related Costs.....	145,615	144,464	149,689	154,955
11. Travel. ....	3,434	3,885	3,676	3,935
III. Operation of Installation.....	31,541	35,377	33,852	40,400
A. Facilities Services.....	(17,306)	(20,285)	(18,376)	(21,939)
B. Technical Services.....	(4,416)	(4,531)	(4,403)	(5,200)
C. Management and Operations .....	(9,819)	(10,561)	(11,073)	(13,261)
Total, fund requirements... ..	<u>180,590</u>	<u>183,726</u>	<u>187,217</u>	<u>199,290</u>

Distribution of Workyears by Program

	1983 Actual	1984		1985 Budget Estimate
		Budget Estimate	Current Estimate	
<b><u>RESEARCH AND DEVELOPMENT</u></b> .....	<b><u>2,056</u></b>	<b><u>2,032</u></b>	<b><u>2,090</u></b>	<b><u>2,159</u></b>
<u>Space Station</u> .....	6	0	17	50
<u>Space Science and Applications</u> .....	1,889	1,878	1,919	1,936
Physics and astronomy.....	962	1,004	1,040	1,047
Life sciences.....	2	3	1	1
Planetary exploration .....	87	78	91	81
Space applications .....	838	793	787	807
<u>Technology Utilization</u> .....	10	5	10	10
<u>Aeronautics and Space Technology</u> .....	125	121	115	134
Aeronautical research and technology.....	15	13	12	19
Space research and technology .....	110	108	103	115
<u>Tracking and Data Advanced Systems</u> .....	26	28	29	29
<b><u>SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS</u></b> .....	<b><u>821</u></b>	<b><u>807</u></b>	<b><u>802</u></b>	<b><u>733</u></b>
Space Transportation Operations .....	142	134	133	100
Space and Ground Network Communications and Data Systems .....	679	673	669	633
Subtotal, Direct Workyears. ....	<u>2,877</u>	<u>2,839</u>	<u>2,892</u>	<u>2,892</u>
<b><u>CENTER MANAGEMENT AND OPERATIONS SUPPORT</u></b> ... ..	<b><u>733</u></b>	<b><u>747</u></b>	<b><u>707</u></b>	<b><u>707</u></b>
Subtotal, Permanent Workyears .....	3,610	3,586	3,599	3,599
Other than full-time permanent .....	99	112	99	99
Total, permanent workyears. ....	<u>3,709</u>	<u>3,698</u>	<u>3,698</u>	<u>3,698</u>

PROGRAM DESCRIPTION

RESEARCH AND DEVELOPMENT

Permanent Civil  
Service Workyears

SPACE STATION

50

Space Station efforts will consist of definitions and integration studies, and focused technology activities.

PHYSICS AND ASTRONOMY.....

1,047

Astrophysics activities have the objective of: accomplishing 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 providing advanced technical development of experiments and spacecraft components for future astrophysics missions. Organized activities accomplish 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.

During 1985, GSFC investigators will be actively involved in studies for the X-Ray Timing Explorer; in development, assembly, and test of instruments for the Space Telescope, Gamma Ray Observatory, Cosmic Background Explorer, Shuttle Payloads and Integrated Rocket Experiments; and in the analysis of data from several major Physics and Astronomy missions including the High Energy Astronomy Observatory, the Dynamics Explorer, the Solar Maximum Repair Mission to be launched in 1984 and the Active Magnetospheric Particle Tracer Explorer also to be launched in 1984.

The International Ultraviolet Explorer (IUE) 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, quickly make observations, and receive data in visual formats.

During FY 1985, GSFC will be responsible for the continued development of a U.S. supplied focal plane high resolution imaging instrument to be flown on the German Roentgen Satellite which is scheduled for launch in 1987 on the Space Shuttle. The Roentgen Satellite, another NASA international cooperative project with the Federal Republic of Germany, will perform the first all sky survey of X-ray sources and will point to and study specific X-ray sources for extended periods of time.

The definition of the Solar Optical Telescope (SOT) will be continued during FY 1985. This facility will carry an instrument package to study solar physics in a detail never before possible by sensing radiation from the deep ultraviolet to the near infrared; thus enabling astronomers to study solar phenomena from the photosphere to the corona.

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. During FY 1985, Goddard will also continue development of sounding rocket class payloads for flight on the Space Shuttle. This is a cost-effective approach which allows these instruments to be flown for much longer periods of time than available with sounding rockets.

Goddard will continue to manage the scientific balloon program providing for launch and tracking support, flight hardware support, and technical support including new systems development. Goddard has assumed responsibility for the National Scientific Balloon Facility at Palestine, Texas, by providing management and technical oversight.

Permanent Civil  
Service Workyears

LIFE SCIENCES..... 1

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

PLANETARY EXPLORATION..... 81

The GSFC activity within the Planetary Exploration program is designed to emphasize the physics of interplanetary space and planetary environments. To this end, GSFC is maintaining a strong and viable research group.

SPACE APPLICATIONS..... 807

The FY 1985 Space Applications 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 in general, 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:

1. The global circulation of the Earth's atmosphere for better weather and climate predictions;
2. The geopotential fields (gravity and magnetic) of the Earth to provide a better understanding of the structure and evolution of the Earth;
3. The processes of the oceans such as surface winds, waves, temperature, currents, and circulation in support of the ongoing weather and climate studies and the ocean research program;
4. The physical characteristics of the Earth's vegetation cover, water resources, and land use which can be remotely sensed; and
5. 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 in FY 1985 include:

1. Operational weather satellite missions for the National Oceanic and Atmospheric Administration (NOAA), including launch of NOAA-G, in March 1985.
2. Continued operation of the Nimbus satellites to provide remotely sensed resources data and environmental observations to a worldwide applications research community.
3. The data from the Landsat-4 and D' will continue to be analyzed to evaluate the benefits of a new generation of land observation instruments.
4. Earth Radiation Budget Experiment data will be collected for the study of geographical and seasonal variations of the Earth's radiation budget.
5. Conducting correlation measurements from balloons, sounding rockets, aircraft, and ground installations.
6. During FY 1985, design and development activities will be continued on the Upper Atmospheric Research Satellite (UARS) instruments, and design and development activities will be initiated on the spacecraft leading to a launch in 1989.

Space Applications activities involve the formulation, analysis, and distribution of applications data received from satellites for which GSFC has management responsibility. 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 Landsat-4; this information will be of use to investigators in the disciplines of agriculture, forestry, geology, land use, cartography, hydrology, ecology, and oceanography. The Landsat-D' thematic mapper sensor will also be evaluated in FY 1985. Solar Terrestrial research efforts will include analysis of data collected from operating satellites, for example, the Dynamics Explorer, the Interplanetary Monitoring Probe and the International Sun-Earth Explorers. Additionally, the International Sun-Earth Explorers (ISEE) will provide unusual opportunities to study the dynamic interactions of the solar wind and the Earth's magnetosphere from various points in space. The ISEE-3 spacecraft (recently renamed the International Comet Explorer) will continue its unique trajectory through the Earth's magnetic tail and embark on a course that will cause it to intercept the comet Giacobini-Zinner in September 1985.

Permanent Civil  
Service Workyears

TECHNOLOGY UTILIZATION..... 10

Technology Utilization activities are directed toward the application of space technology to public and private sector needs. Foremost among the technology applications projects in 1985 are the cerebrospinal fluid control system and the closed loop control system for hypertension. Other activities include: (1) new technology identification, evaluation, and publication; (2) dissemination methods and techniques; and (3) public sector technology applications projects.

AERONAUTICAL RESEARCH AND TECHNOLOGY..... 19

In FY 1985, the Wallops airport will be used to conduct research tests of various aircraft in the 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, terminal area navigation, and tests of other systems leading to automatic landing of aircraft.

One runway has been modified to study means of controlling aircraft and automotive hydroplaning on wet or slush-covered surfaces. The data acquired from the aircraft and automotive tests will ultimately assist in the development of safer, more flexible transportation systems. Wallops will continue to support aircraft noise and safety research for general aviation.

SPACE RESEARCH AND TECHNOLOGY.....

115

The Space Research and Technology Program activities provide results appropriate to space missions. Past efforts have produced many worthwhile advances in space system capability, reliability, and effectiveness. During FY 1985, program areas of primary emphasis will include sensor technology, data base systems and computer system science, and microwave and laser communications. Other discipline areas of continuing focus include materials and structures, thermal energy management, power systems, spacecraft systems automation science, and platform systems.

Goddard's research and technology effort will continue to be directed primarily toward future space applications projects and astronomical, astrophysical, and atmospheric activities.

TRACKING AND DATA ADVANCED SYSTEMS.....

29

Goddard's activity in this area involves the investigation and development of advanced tracking and data acquisition systems and techniques. The primary objectives are to: (1) obtain new and improved tracking and data capabilities that will meet the needs of approved new missions and near term new starts; and (2) improve the cost effectiveness and reliability needed for overall support of the total mix of space flight missions.

**SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS**

SPACE TRANSPORTATION OPERATIONS.....

100

Space Shuttle activities at GSFC include planning and implementing the equipment systems, communications data, voice circuits, and operational procedures required for support of the Shuttle program.

Goddard manages and coordinates the Agency's Get-Away-Special 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 Space Shuttle. Tasks include ensuring that experiments meet flight and safety specifications and securing the experiments into containers for Space Shuttle flight. Individual experimenters 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 is the management center for the Delta launch vehicle which is capable of accurately putting a wide variety of spacecraft into a broad spectrum of orbits, ranging from equatorial to polar inclinations. The Delta is used for a wide range of reimbursable missions for other Government agencies, domestic commercial users, and international users. The Delta vehicle has served the Agency for nearly three decades and will be replaced by the Space Shuttle. A Scout launch capability is maintained by the Wallops facility.

Permanent Civil  
Service Workyears

SPACE AND GROUND NETWORK COMMUNICATIONS AND DATA SYSTEMS.....

**633**

The Space Tracking and Data Systems program at GSFC involves five main areas: Operation of the Space Tracking and Data Network; mission control, data processing, and computation support for flight projects; the Laser Networks; the Tracking and Data Relay Satellite System; and aeronautics and sounding rocket support.

The Space Tracking and Data Network is operated in direct support of NASA's Earth orbiting scientific and applications satellites and Shuttle/Spacelab programs. In addition, the Network provides services to satellites that are operated by other United States Government Agencies, such as the Department of Defense and the National Oceanic and Atmospheric Administration, by foreign governments, and by commercial companies. Appropriate segments of the Network deliver critical coverage for the launch of spacecraft that are on deep space missions by providing support during portions of the early flight path not visible to NASA's Deep Space Network (DSN).

The NASA Communications Network provides all operational communications required by NASA. Facilities of this network, link the stations of the Space Tracking and Data Network, and will make it possible for the Tracking and Data Relay Satellite System to operate as a part of the overall tracking and data acquisition complex.

GSFC provides tracking, data acquisition, communication and control in support of the aeronautics and sounding rockets program. This includes support of balloons, sounding rockets, reentry vehicles, satellites launched from Wallops Island and other offsite range locations.

The Tracking and Data Relay Satellite System (TDRSS) becomes operational during **1985** with two operational satellites in geosynchronous orbit and the White Sands Ground Terminal providing telemetry, tracking, and command support. The system employs both S- and KU-band frequencies and will greatly increase coverage capabilities available to Earth orbiting spacecraft. The network will provide the operational interface

between the project users and the Tracking and Data Relay Satellite System. With the demonstration of a successful Tracking and Data Satellite System, a number of Spaceflight Tracking and Data Network ground stations will be closed. However, some of the current stations will be maintained to provide for Shuttle launch and planetary support. The remaining stations will be consolidated with the Deep Space Network to provide high-Earth orbit support not available from TDRSS.

During FY 1985, the GSFC Tracking Network will provide tracking support for the Space Transportation System launched payloads including Spacelab flights.

Ground Station support will also be continued for a number of operating satellites such as the International Sun Earth Explorers, International Ultraviolet Explorer, Solar Maximum Mission, and Nimbus. Some examples of this support include: mission control, operational computing, and sensor data processing.

During FY 1985, emphasis will continue to be placed on the operation of the Spacelab, Image, and Telemetry Data Processing Facilities. Software development activities will continue relative to the Space Telescope Data Capture Facility to incorporate changes necessitated by Space Telescope integration and test activities.

In the area of mission control, work will continue in FY 1985 on the Multisatellite Operations Control Center to allow for the automation of systems in order to minimize manpower requirements for mission support. Likewise, work will proceed in the Space Telescope Operations Control Center to ready that facility for observer activities beginning in 1986.

Permanent Civil  
Service Workyears

**CENTER MANAGEMENT AND OPERATIONS SUPPORT.....**

**707**

Center Management and Operations Support is support or services being provided to all Goddard Space Flight Center 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, 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, program control, contracting and procurement, property management, personnel 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 automatic data processing, reliability and quality assurance, medical care, and photographic support.

RESOURCES REQUIREMENTS BY FUNCTION  
(Thousands of Dollars)

	1983	1984		1985
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
<b>I. <u>PERSONNEL AND RELATED COSTS</u>.....</b>	<b><u>145,615</u></b>	<b><u>144,464</u></b>	<b><u>149,689</u></b>	<b><u>154,955</u></b>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Full-time permanent.. ..	127,406	126,548	129,798	134,173
b. Other than full-time permanent .....	1,669	1,693	1,694	1,663
c. Overtime and other compensation .....	<u>1,450</u>	<u>1,360</u>	<u>1,488</u>	<u>1,537</u>
Subtotal, Compensation .....	130,525	129,601	132,980	137,373
2. <u>Benefits</u> ..... ..	<u>13,788</u>	<u>13,565</u>	<u>14,965</u>	<u>15,460</u>
Subtotal, Compensation and Benefits....	<u>144,313</u>	<u>143,166</u>	<u>147,945</u>	<u>152,833</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel .....	214	110	378	637
2. Personnel training.....	<u>1,088</u>	<u>1,188</u>	<u>1,366</u>	<u>1,485</u>
Subtotal, Supporting Costs.....	<u>1,302</u>	<u>1,298</u>	<u>1,744</u>	<u>2,122</u>
<b>Total, Personnel and Related Costs.....</b>	<b><u>145,615</u></b>	<b><u>144,464</u></b>	<b><u>149,689</u></b>	<b><u>154,955</u></b>

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
A. <u>Compensation and Benefits</u> .....	<u>144,313</u>	443,466	<u>147,945</u>	<u>152,833</u>
1. <u>Compensation</u> .....	<u>130,525</u>	<u>129,601</u>	<u>132,980</u>	<u>137,373</u>
a. Permanent workyears.....	127,406	126,548	129,798	134,173

The current 1984 estimate reflects an increase from the 1984 budget estimate and is primarily due to the recent pay increase.

Basis of Cost for Permanent Workyears

In 1985, the cost of permanent workyears will be \$134,173,000. The increase from 1984 is calculated as follows:

Cost of permanent workyears in 1984.....		129,798
Cost increases in 1985.....		+8,009
Within grade and career advances:		
Full year effect of 1984 actions.....	+1,656	
Partial year effect of 1985 actions.....	+2,570	
Full year effect of 1984 pay increases.....	+1,534	
Additional paid day in 1985.....	+514	
Effect of 1984 decrease in reimbursements.....	+1,735	
Cost decreases in 1985.....		- 3,634
Turnover savings and abolished positions:		
Full year effect of 1984 actions.....	-1,727	
Partial year effect of 1985 actions.....	-1,282	
Alteration in the method of calculation of salaries paid.	-127	
Reduction related to the Government-wide initiative to reduce the number of GS/GM 11-15 positions.....	-498	
Cost of permanent workyears in 1985.....		<u>134,173</u>

	1983 Actual	1984		1985
		Budget Estimate	Current Estimate	Budget Estimate
(Thousands of Dollars)				
b. Other than full-time permanent workyears				
1. cost.....	1,669	1,693	1,694	1,663
2. Workyears.....	122	135	131	130

The distribution of 1985 workyears is as follows:

Distribution of Other than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Developmental programs.....	59
Other temporary.....	39
Subtotal, ceiling programs.....	<u>98</u>
Youth opportunity programs.....	<u>32</u>
<u>Total</u> .....	130

The level of support remains constant for these programs.

c. Overtime and other compensation.....	1,450	1,360	1,488	1,537
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Overtime at GSFC is required to meet peak operational requirements where additional workhours are essential, generally culminating in the launch of a manned or automated spacecraft. Some of the areas involved are fabrication, experimentation, testing, launching and tracking of the spacecraft. The increase from the 1984 budget to the 1984 current estimate reflects additional requirements during Shuttle launch activities, increasing demands for project support, and the recent pay increase. The 1985 budget estimate is based on the Center's current estimate of requirements.

	1983	1984		1985
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
(Thousands of Dollars)				
2. <u>Benefits</u> .....	<u>13,788</u>	<u>13,565</u>	<u>14,965</u>	<u>15,460</u>

The following are the amounts of contribution by the category:

Civil Service Retirement Fnd.....	8,645	8,394	9,065	9,357
Employee life insurance.....	336	335	366	378
Employee health insurance.....	3,116	3,115	3,483	3,652
Workmen's compensation.....	305	300	300	300
FICA.....	31	41	72	74
Medicare.....	1,313	1,347	1,636	1,656
Other benefits.....	<u>42</u>	<u>33</u>	<u>43</u>	<u>43</u>
<u>Total</u> .....	13,788	13,565	14,965	15,460

The increase from the 1984 budget estimate to the 1984 current estimate is a result of the recent pay and health benefits increases. The workmen's compensation for 1984 and 1985 reflects estimates based on Department of Labor billings.

B. <u>Supporting Costs</u> .....	<u>1,302</u>	<u>1,298</u>	<u>1,744</u>	<u>2,122</u>
1. Transfer of personnel.....	214	110	378	637

The category includes the reimbursement to employees for movement of household goods to the employee's new duty station, transfer between tracking stations, and other relocation expenses. The increase from the 1984 budget estimate to the 1984 current estimate reflects a revised number of transfers, and additional costs due to recent legislation which increased moving allowances. The 1985 estimate reflects the planned level of transfers at the anticipated cost levels.

2. Personnel Training.....	1,088	1,188	1,366	1,485
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The personnel training costs are based on current training programs and the need to reorient skills of employees into areas compatible with the direction of the current space program and GSFC's role in the program. The increase from the 1984 budget estimate to the 1984 current estimates reflects an increase in tuition costs, and development of and provisions for state-of-the-art training programs to keep pace with current technology. The 1985 estimate provides for increased training at anticipated tuition cost levels.

	1983 Actual	1984		1985
		Budget Estimate (Thousands of Dollars)	Current Estimate	Budget Estimate
II. <u>Travel</u> .....	<u>3,434</u>	<u>3,885</u>	<u>3,676</u>	<u>3,935</u>

Summary of Fund Requirements

A. Program Travel.....	2,961	3,581	3,333	3,426
B. Scientific and Technical Development Travel...	178	90	97	253
C. Management and Operations Travel.....	<u>295</u>	<u>- 214</u>	<u>246</u>	<u>256</u>
Total, Travel.....	<u>3,434</u>	<u>3,885</u>	<u>3,676</u>	<u>3,935</u>

Explanation of Fund Requirements

A. Program Travel.....	<u>2,961</u>	<u>3,581</u>	<u>3,333</u>	<u>3,426</u>
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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, Aeronautics and Space Technology, Tracking and Data Acquisition, and Space Transportation system programs. 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. The decrease from the 1984 budget estimate to the 1984 current estimate reflects 1983. The increase in the 1985 estimate reflects approximately the same level of travel at higher anticipated travel cost.

B. <u>Scientific and Technical Development Travel...</u>	<u>178</u>	<u>90</u>	<u>97</u>	<u>253</u>
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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. 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. Many of the meetings are working panels convened to solve certain problems for the benefit of the Government. In addition to anticipated increases in per diem and travel rates, \$150,000 is included as part of the NASA-wide increase in funds for greater participation by GSFC scientists and engineers in technical meetings and symposia.

	1983 Actual	1984		1985
		Budget Estimate	Current Estimate -	Budget Estimate
C. <u>Management and Operations Travel</u> .....	<u>295</u>	<u>214</u>	<u>246</u>	<u>256</u>

(Thousands of Dollars)

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 top management to other NASA Centers and local travel in and around the Washington metropolitan area and to and from Wallops. The 1985 estimate reflects approximately the same level of activity as in 1984 at anticipated price levels.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
III. <u>OPERATION OF INSTALLATION</u> .....	<u>31,541</u>	<u>35,377</u>	<u>33,852</u>	<u>40,400</u>

Summary of Fund-Requirements

1. Facilities Services.....	17,306	20,285	18,376	21,939
2. Technical Services.....	4,416	4,531	4,403	5,200
3. Management and Operations.....	<del>9,819</del>	<u>10,561</u>	<u>11,073</u>	<u>13,261</u>
Total, Operation of Installation.....	<u>31,535</u>	<u>35,377</u>	<u>33,852</u>	<u>40,400</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: (1) Facilities Services, the cost of renting real property, 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, printing, transportation, medical, supply, and related services.

The decrease from the 1984 budget estimate to the 1984 current estimate is primarily due to the delay and deferral of activities to accommodate the appropriation reduction and partial absorption of increased pay costs. The 1985 budget estimate provides for projected increases in support contractor rates, supplies, materials, equipment, and along with anticipated utility rates.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousand & of Dollars)				
A. <u>FACILITIES SERVICES</u> .....	<u>17,306</u>	<u>20,285</u>	<u>18,376</u>	<u>21,939</u>

The Greenbelt facility is located on a 552 acre main site, and on a 554 acre remote site area with a complex of laboratory and office-type buildings as well as test facilities. This complex encompasses 2,517,000 **gross** square feet of building space including 34 buildings. This physical plant supports an average daily on-Center population of about 6,000. Many of the test facilities are used on schedules involving more than one shift often during off-peak hours.

The Wallops facility includes 6,165 acres and a complex of facilities which mainly consists of research, airport, and launch operations facilities. This complex encompasses 1,057,344 **gross** square feet of building space including three major buildings. Also included are three major technical facilities. This physical plant supports an average daily on-site population of approximately 1,000.

Summary of Fund Requirements

1. <u>Rental of Real Property</u> .....	640	895	591	574
2. <u>Maintenance and Related Services</u> .....	3,427	3,823	3,823	5,379
a. Facilities.....	3,427	3,823	3,823	5,379
b. Equipment.....	---	---	---	---
3. <u>Custodial Services</u> .....	3,395	3,976	3,657	4,584
4. <u>Utility Services</u> .....	<u>9,844</u>	<u>11,591</u>	<u>10,305</u>	<u>11,402</u>
Total, Facilities Services.....	<u>17,306</u>	<u>20,285</u>	<u>18,376</u>	<u>21,939</u>

Explanation of Fund Requirements

1. <u>Rental of Real Property</u> .....	<u>640</u>	<u>895</u>	<u>591</u>	<u>574</u>
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Provides space for personnel at three tracking stations and the Goddard Institute for Space Studies (GISS) in New York, as well as storage and warehouse space for equipment, supplies and materials. The decrease from the 1984 budget estimate to the 1984 current budget estimate reflects the partial year

vacating of rented warehouse space and more accurately reflects 1983 experience in rental payments to the General Service Administration. The decrease in the 1985 budget estimate reflects a full year decrease in rented warehouse space and projected increased GSA rates.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
2. <u>Maintenance and Related Services</u> .....	<u>3,427</u>	<u>3,823</u>	<u>3,823</u>	<u>5,379</u>

This activity includes general buildings maintenance such as painting, inspection and mechanical and electrical maintenance. Provides for ground maintenance and also includes supplies and facilities equipment such as building materials, electrical and electronics materials, general maintenance and operating materials. The increase from FY 1984 to FY 1985 reflects not only anticipated support service contractor wage rate increases and expected FY 1985 price levels for supplies, materials, equipment and other contractual effort, but an increase of \$1,200 as part of the NASA-wide augmentation in Operational Maintenance effort. This augmentation will provide a level of activity more consistent with the National investment in the Goddard Space Flight Center physical plant.

3. <u>Custodial Services</u> .....	<u>3,395</u>	<u>3,976</u>	<u>3,657</u>	<u>4,584</u>
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The estimate provides for janitorial, plant security, firefighting 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 firefighting and ambulance service at Wallops. The decrease from the 1984 budget estimate to the 1984 current estimate reflects a reduction in cost of support contractor effort to reflect 1983 experience. The increase in the 1985 budget estimate is due to anticipated rate changes in support service contracts and the purchase of security and fire protection equipment.

4. <u>Utility Services</u> .....	<u>9,844</u>	<u>11,591</u>	<u>10,305</u>	<u>11,402</u>
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The estimate provides for operation and maintenance of the utility plant and distribution systems as well as the purchase of utility services, and 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. The only purchased utilities at Wallops are electricity and fuel oil to operate the heating plant. This funding also provides for the operation and maintenance of the heating plant and water and sewage facilities. The decrease from the 1984 budget estimate to the 1984 current estimate is based on current rate estimates and consumption

estimates based on 1983 experience. The increase in 1985 provides for anticipated utility and support service contractor rate increases.

	1983 <u>Actual</u>	1984		1985
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
B. <u>TECHNICAL SERVICES</u> .....	<u>4,416</u>	<u>4,531</u>	<u>4,403</u>	<u>5,200</u>
<u>Summary of Fund Requirements</u>				
1. <u>Automatic Data Processing</u> .....	<u>2,833</u>	<u>2,628</u>	<u>2,785</u>	<u>3,319</u>
a. <u>Equipment</u> .....	1,391	543	827	1,227
b. <u>Operations</u> .....	1,442	2,085	1,958	2,092
2. <u>Scientific and Technical Information</u> .....	<u>1,146</u>	<u>1,403</u>	<u>1,354</u>	<u>1,459</u>
a. <u>Library</u> .....	855	940	1,020	1,077
b. <u>Education and Information</u> .....	291	463	334	382
3. <u>shop Support Services</u> .....	<u>-437</u>	<u>500</u>	<u>264</u>	<u>422</u>
Total, Technical Services.....	<u>4,416</u>	<u>4,531</u>	<u>4,403</u>	<u>5,200</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u> .....	<u>2,833</u>	<u>2,628</u>	<u>2,785</u>	<u>3,319</u>
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This funding provides accounting and management information to satisfy requirements of NASA and GSFC management. The lease and purchase costs of all administrative ADP hardware are included in this estimate. Leased equipment includes disk drives, various terminals, and other peripheral equipment. The systems supported include institutional management, finance and accounting, procurement and personnel management. The increase in the 1984 current estimate is due to increased cost for contractor support for programming services. The 1985 estimate provides for recurring costs of administrative computer operations and equipment lease and purchases to upgrade existing capability.

2. <u>Scientific and Technical Information</u> .....	<u>1,146</u>	<u>1,403</u>	<u>1,354</u>	<u>1,459</u>
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These funds provide for the operation of a technical library at GSFC, a public affairs educational and informational program, and support to the Center in the provision of various scientific and technical information services. Catalog, reference translating services, and distribution of books and publications in the operation of the GSFC library are also funded in this estimate. This includes over 65,000 books, 45,000 journals, plus almost one million microfiche copies of aerospace documents. This estimate also provides for exhibit management and refurbishment, demonstration models, workshops and symposia, and educational and information materials. The decrease from the 1984 budget estimate to the 1984 current estimate reflects 1983 experience. The 1985 effort reflects the purchase of equipment for the library and anticipated increases in costs.

	1983	<u>1984</u>		1985
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
3. <u>Shop Support Services</u> .....	<u>437</u>	<u>500</u>	<u>264</u>	<u>422</u>

Support is provided in the areas of safety, photo services, graphics, and publications. Fire protection system maintenance and related supplies and equipment; film and print processing, photographic supplies and repair of photographic equipment, art work services and related supply and equipment costs; and materials and equipment maintenance for compilation of documents comprise this category. Also included is engineering and fabrication support for facility planning and alteration; and safety, reliability, and quality assurance requirements and other technical services. The decrease from the 1984 budget estimate to the 1984 current estimate reflects a reduction in the purchase of supplies and materials and equipment maintenance. The 1985 effort reflects funding of essentially the same level of services as in 1983.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
C. <u>MANAGEMENT AND OPERATIONS</u> .....	<u>9,819</u>	<u>10,561</u>	<u>11,073</u>	<u>13,261</u>

Summary of Fund Requirements

1. Administrative Communications.....	3,465	4,081	4,262	4,965
2. Printing and Reproduction... ..	257	299	287	374
3. Transportation.....	2,187	2,366	2,661	3,297
4. Installation Common Services.....	<u>3,910</u>	<u>3,815</u>	<u>3,863</u>	<u>4,625</u>
Total, Management and Operations.....	<u>9,819</u>	<u>10,561</u>	<u>11,073</u>	<u>13,261</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u> .....	<u>3,465</u>	<u>4,081</u>	<u>4,262</u>	<u>4,965</u>
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The estimate provides for local telephone service, long distance telephone service, and other nontelephone communications. Local telephone services cover 3,900 PBX internal lines and 6,000 telephone instruments. There are ten tielines for Baltimore-area communications. Four hundred Centrex lines are used for computer data operations. Other communication services include teletype costs including the GSA Automatic Records System (ARS), United Press International Wire Service for the public affairs office and telephone operators. The 1984 budget estimate reflects 1983 experience and the impact of divestiture. The 1985 estimate provides for approximately the same level of service with anticipated rate increases due to divestiture.

2. <u>Printing and Reproduction</u> .....	<u>257</u>	<u>299</u>	<u>287</u>	<u>374</u>
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This estimate provides the funding for an on-site printing plant operated by GSFC personnel. This printing plant produces approximately 17,000,000 units of printing each year. In addition to this on-site printing plant, GSFC must also purchase from private firms under Government Printing Office contract about 30,000,000 units of printing each year. This purchased printing is a combination of an overflow requirement that cannot be handled because of the on-site workload and items that cannot be handled with the

on-site equipment. Types of printing accomplished by **off-site private firms are multiple-copy forms, multicolor work, and forms for computer use.** Also included in **this function is the support service contractor effort to operate the printing and reproduction facility at Wallops.** The **1985** estimate reflects anticipated increases in off-site contractor printing costs and support contractor costs.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
3. <u>Transportation</u> .....	<u>2,187</u>	<u>2,366</u>	<u>2,661</u>	<u>3,297</u>

This estimate provides the following services: operation of a transportation center; packing and crating; rigging equipment for shipment; storage and warehousing; and moving and hauling. Maintenance and repair of the Wallops administrative aircraft, supplies and equipment for vehicle maintenance, and special vehicle rental are also included. The increase from the 1984 budget estimate to the 1984 current estimate is due to an increase in support contractor effort and rates. The 1985 budget estimate reflects anticipated support contractor rates and the purchase of motor vehicles deferred from 1983 and 1984.

4. <u>Installation Common Services</u> .....	<u>3,910</u>	<u>3,815</u>	<u>3,863</u>	<u>4,625</u>
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This activity supports Center management and staff activities, provides medical services, and covers various installation support services. Funding includes patent searches and applications; stenographic services, handbook revisions, equal opportunity programs; and general administrative supplies, materials, equipment maintenance, (microfilm, copiers, special typewriters) for staff offices; operation of the GSFC on-site health unit and medical services for the Goddard Institute for Space Studies (GISS) employees in New York. Provides for emergency care on-site, annual physical exams for Goddard employees, fitness programs, immunizations and counseling. Annual physical exams are provided for approximately 3,600 employees at the Center. The necessary supplies, materials, and equipment for operation of the health unit are included. The 1985 estimate represents the purchase of supplies and equipment in order to upgrade to a satisfactory level, and anticipated contractor rate increases.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
 GODDARD SPACE FLIGHT CENTER  
 FISCAL YEAR 1985 ESTIMATE

DIRECTOR  
 DEPUTY DIRECTOR

	84	85
SES	4	4
EXCEPTED	0	0
GS 16	0	0
GS 15	1	1
GS 14	0	0
OTHER GS	7	7
WAGE GRADE	0	0
TOTAL	12	12

NASA OFFICE OF  
 INSPECTOR GENERAL  
 GSFC FIELD OFFICE

	84	85
SES	53	53
EXCEPTED	3	3
GS 16	1	1
GS 15	317	316
GS 14	543	541
OTHER GS	2592	2595
WAGE GRADE	146	146
TOTAL	3655	3655

COMPTROLLER

	84	85
SES	2	2
EXCEPTED	0	0
GS 16	0	0
GS 15	4	4
GS 14	6	6
OTHER GS	93	93
WAGE GRADE	0	0
TOTAL	105	105

DIRECTOR OF  
 FLIGHT ASSURANCE

	84	85
SFS	1	1
EXCEPTED	0	0
GS 16	0	0
GS 15	17	17
GS 14	25	25
OTHER GS	73	73
WAGE GRADE	0	0
TOTAL	116	116

CHIEF COUNSEL  
 CHIEF COUNSEL

	84	85
SES	1	1
EXCEPTED	0	0
GS 16	0	0
GS 15	1	1
GS 14	2	2
OTHER GS	6	6
WAGE GRADE	0	0
TOTAL	10	10

EQUAL OPPORTUNITY  
 PROGRAMS OFFICE

	84	85
SES	0	0
EXCEPTED	0	0
GS 16	0	0
GS 15	0	0
GS 14	1	1
OTHER GS	5	5
WAGE GRADE	0	0
TOTAL	6	6

OFFICE OF  
 PUBLIC AFFAIRS

	84	85
SES	0	0
EXCEPTED	0	0
GS 16	0	0
GS 15	1	1
GS 14	3	3
OTHER GS	10	10
WAGE GRADE	0	0
TOTAL	14	14

DIRECTOR OF  
 MANAGEMENT  
 OPERATIONS

	84	85
SES	3	3
EXCEPTED	1	1
GS 16	0	0
GS 15	14	14
GS 14	37	37
OTHER GS	500	500
WAGE GRADE	144	144
TOTAL	699	699

DIRECTOR OF  
 FLIGHT PROJECTS

	84	85
SES	11	11
EXCEPTED	0	0
GS 16	0	0
GS 15	70	70
GS 14	97	97
OTHER GS	140	140
WAGE GRADE	0	0
TOTAL	318	318

DIRECTOR OF  
 MISSIONS AND  
 DATA OPERATIONS

	84	85
SES	3	3
EXCEPTED	0	0
GS 16	0	0
GS 15	14	14
GS 14	37	37
OTHER GS	170	170
WAGE GRADE	0	0
TOTAL	224	224

DIRECTOR OF  
 SCIENCES

	84	85
SES	7	7
EXCEPTED	0	0
GS 16	1	1
GS 15	44	43
GS 14	47	47
OTHER GS	212	213
WAGE GRADE	0	0
TOTAL	311	311

DIRECTOR OF  
 ENGINEERING

	84	85
SES	6	6
EXCEPTED	0	0
GS 16	0	0
GS 15	50	50
GS 14	121	121
OTHER GS	556	556
WAGE GRADE	0	0
TOTAL	733	733

DIRECTOR OF  
 NETWORKS

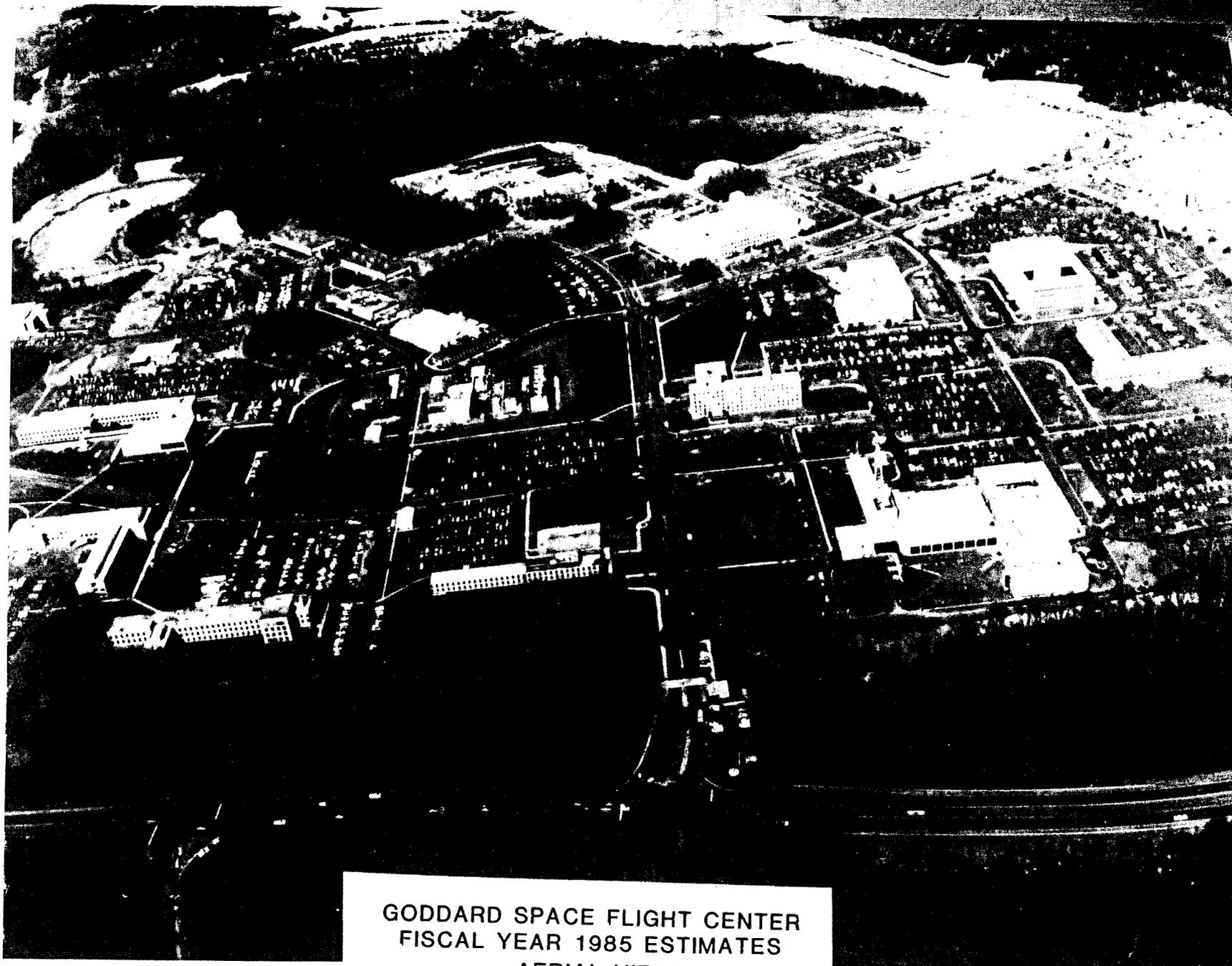
	84	85
EXCEPTED	0	0
GS 16	0	0
GS 15	39	39
GS 14	66	66
OTHER GS	287	287
WAGE GRADE	0	0
TOTAL	395	395

DIRECTOR OF  
 APPLICATIONS

	84	85
SES	9	9
EXCEPTED	2	2
GS 16	0	0
GS 15	53	53
GS 14	73	71
OTHER GS	325	327
WAGE GRADE	0	0
TOTAL	462	462

DIRECTOR OF  
 SUBORBITAL PROJECTS  
 AND OPERATIONS

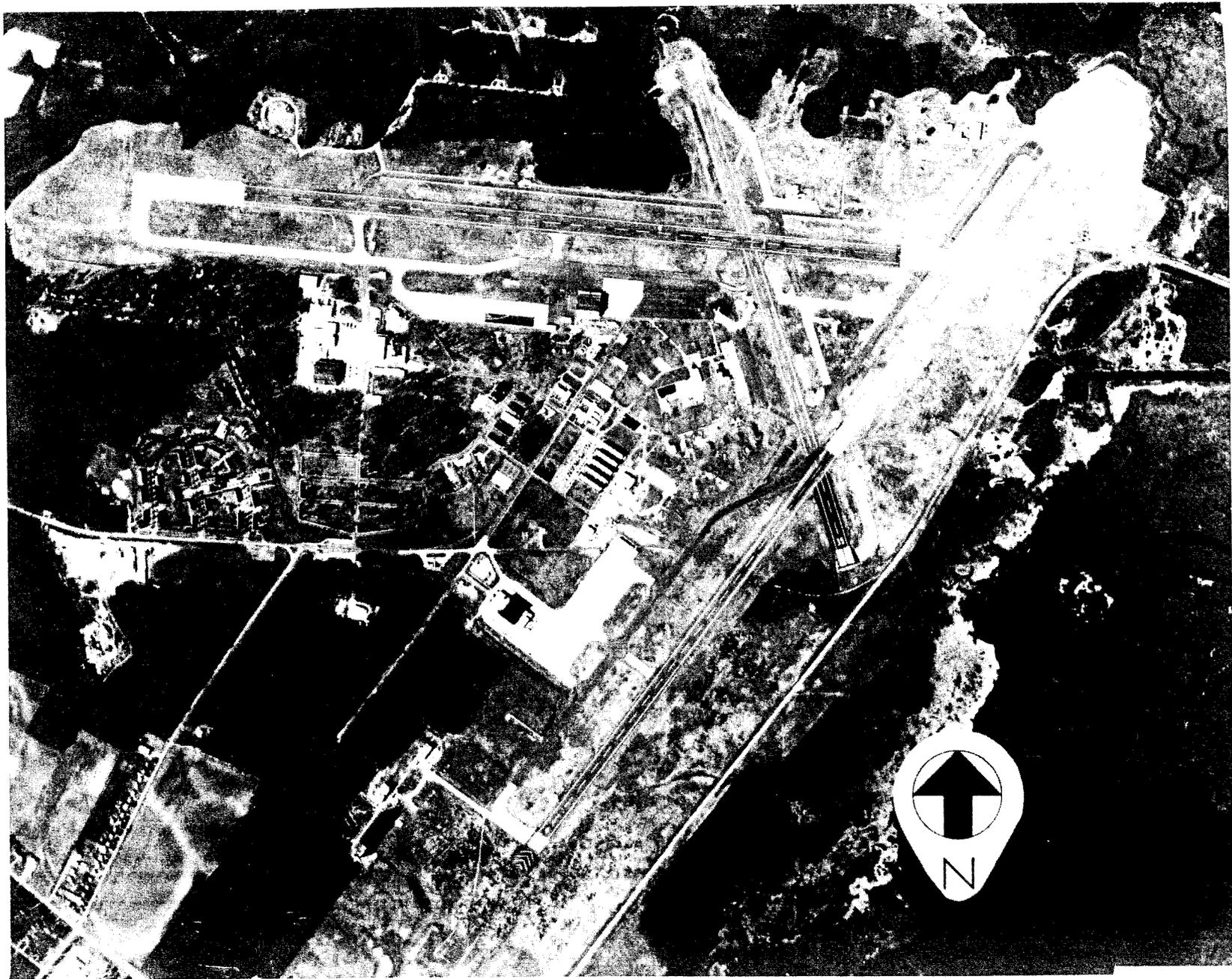
	84	85
SES	3	3
EXCEPTED	0	0
GS 16	0	0
GS 15	9	9
GS 14	28	28
OTHER GS	208	208
WAGE GRADE	2	2
TOTAL	250	250



GODDARD SPACE FLIGHT CENTER  
FISCAL YEAR 1985 ESTIMATES  
AERIAL VIEW



GODDARD SPACE FLIGHT CENTER / WALLOPS  
FISCAL YEAR 1985 ESTIMATES  
AERIAL VIEW





## RESEARCH AND PROGRAM MANAGEMENT

### FISCAL YEAR 1985 ESTIUATES

#### AMES RESEARCH CENTER

##### DESCRIPTION

Established in 1940, Ames Research Center (ARC) operates in two locations. The Ames North location is on 423.5 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 Research and Technology Laboratory. The capital investment at Ames North, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1983, was \$682,371,000

The Ames Dryden Flight Research Facility (DFRF) is 65 air miles northeast of Los Angeles. Dryden is located at the north end of Edwards Air Force Base on 521 acres of land under a permit from the Air Force. The total capital investment at Ames Dryden, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1983, was \$114,488,000.

##### CENTER ROLES AND MISSIONS

The programs at ARC involve research and development in the fields of aeronautics, life sciences, space sciences and applications, and space technology, as well as utilization for national needs of the new science and technology growing from the aerospace program. Specifically, the Center's major program responsibilities are concentrated in: theoretical and experimental fluid mechanics and aerodynamics, rotorcraft technology, high performance aircraft technology, flight simulation, flight testing, computational fluid dynamics, fluid and thermal physics, space sciences, airborne sciences and applications, human factors, and space biology, and ground and flight projects in support of aeronautics and space technology. In addition to these major program responsibilities, the Center provides major support for military programs. The principal and supporting roles are:

##### PRINCIPAL

##### Aeronautics and Space:

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

Rotorcraft Technology - advance the tools of helicopter 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 area with emphasis on rotorcraft' technology and systems.

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 test facilities and conduct flight research programs of advanced aerospace vehicle concepts.

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 test evaluation of new and innovative concepts in rotorcraft 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 man-machine and other human factor interactions and considerations involved in aircraft operations.

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

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

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

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

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

Airborne Research and Applications - conduct airborne research and applications experiment by operating instrumented jet aircraft.

Fluid and Thermal Physics - develop thermal analysis methods and thermal protection systems required for re-entry and orbital transfer vehicles, including probe development for the Galileo mission.

Planetary Mission Operations and Data Analysis - conduct mission operations and data analysis support for the Pioneer series of missions.

Physics and Astronomy - conduct research in infrared astronomy, atmospheric physics, and astrophysics to contribute to basic understanding of the planet Earth.

Life Sciences:

Biomedical Support Systems - develop advanced technology for long-duration life support systems and protective systems.

Biological Experiments - develop, manage and operate experiments for determining effects of space flight on living organisms (nonhuman) and for providing information applicable to solving space medicine problems.

Life in the Universe - provide a better understanding of the origin, evolution, nature and distribution of complex life in the universe and understand its interaction with the terrestrial environment.

SUPPORTING

Space Transportation System Passenger Selection Criteria - Develop and evaluate the medical criteria for noncrew passenger selection.

Astronomical Observation Techniques - Develop infrared techniques and supporting systems for use in Spacelab payloads focusing on airborne research.

Space Shuttle Orbiter - provide contingency recovery capability for operational flights.

SUMMARY OF RESOURCES REQUIREMENTS

Funding Plan by Function

	1983	1984		1985
	<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 .....	83,626	81,957	87,170	90,592
II. Travel.....	2,160	2,212	2,391	2,493
III. Operation of Installation.....	21,434	24,666	25,075	30,031
A. Facilities Services.....	(10,759)	(13,640)	(13,648)	(17,767)
B. Technical Services.. ..	(3,403)	(3,136)	(3,469)	(3,836)
C. Management and Operations.....	<u>(7,272)</u>	<u>(7,890)</u>	<u>(7,958)</u>	<u>(8,428)</u>
Total, fund requirements .....	<u>107,220</u>	<u>108,835</u>	<u>114,636</u>	<u>123,116</u>

Distribution of Civil Service Workyears

	1983	1984		1985
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
<b><u>RESEARCH AND DEVELOPMENT</u>.....</b>	<b><u>1,455</u></b>	<b><u>1,479</u></b>	<b><u>1,448</u></b>	<b><u>1,461</u></b>
<u>Space Station</u> ... ..	---	---	---	25
<u>Space Science and Applications</u> ....	<u>360</u>	<u>353</u>	<u>360</u>	<u>358</u>
Physics and astronomy... ..	78	117	127	133
Life sciences.....	130	125	133	133
Planetary exploration.....	58	57	46	38
Space applications.....	94	54	54	54
<u>Technology Utilization</u> .....	<u>3</u>	3	<u>2</u>	1
<u>Aeronautics and Space Technology</u> .....	<u>1,092</u>	<u>1,123</u>	<u>1,086</u>	<u>1,077</u>
Aeronautics.....	955	980	958	963
Space .....	137	143	128	114
<b><u>SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS</u>..</b>	<b><u>88</u></b>	<b><u>60</u></b>	<b><u>86</u></b>	<b><u>73</u></b>
<u>Space Transportation Operations</u> .....	<u>88</u>	<u>60</u>	<u>86</u>	<u>73</u>
Subtotal, direct workyears .....	<u>1,543</u>	<u>1,539</u>	<u>1,534</u>	<u>1,534</u>
<b><u>CENTER MANAGEMENT AND OPERATIONS</u>.....</b>	<b><u>484</u></b>	<b><u>461</u></b>	<b><u>487</u></b>	<b><u>487</u></b>
Total, permanent workyears .....	<u>2,027</u>	<u>2,000</u>	<u>2,021</u>	<u>2,021</u>
Other than full-time.....	114	125	115	115
Total, workyears .....	<u>2,141</u>	<u>2,125</u>	<u>2,136</u>	<u>2,136</u>

PROGRAM DESCRIPTION

**RESEARCH AND DEVELOPMENT**

Permanent Civil  
Service Workyears

SPACE STATION..... 25

Space station effort will consist of definition and integration studies and focused technology activities.

PHYSICS AND ASTRONOMY..... 133

In 1985, the civil service personnel will provide support for the airborne astronomy program, which includes a C-141 aircraft, the Kuiper Airborne Observatory and a Lear Jet aircraft, which are operated by ARC as flying astronomical observatories with the bulk of the observing accomplished by various university research teams. These facilities are supported through in-house science competence and with in-house capability to operate research aircraft. The Center controls a variety of operational aircraft, including two U-2C's, an ER-2, a CV-990 and a C-130, 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.

Infrared astronomy observation from space avoids obscuration caused by the Earth's atmosphere. ARC has the responsibility for instruments to accomplish these observations, which has included such developments as the telescope portion of the Infrared Astronomical Satellite, launched in early 1983; definition of the Space Shuttle Infrared Telescope Facility (SIRTF); and definition studies of instruments to be used on potential free flyers in space.

LIFE SCIENCES..... 133

In FY 1985, the civil service personnel will continue to be involved in research, hardware development, and program management related to meeting program milestones in the areas of understanding the effects of space flight on humans and other life forms, managing nonhuman biological experiments in space, developing advanced life support concepts, and understanding the origin, evolution, and distribution of life and life-related chemicals on Earth and elsewhere in the universe.

Biomedical research will be conducted to investigate the effects of space flight on humans. Specifically, causes and potential countermeasures for the observed changes in the musculoskeletal and cardiovascular systems during space flight will continue to be studied. Ground-based space flight simulations and actual flight experiments with humans and animals will be performed to provide a basis for understanding why and how biological systems are affected by space flight.

Early in 1985, Spacelab 3 will be launched and will carry a space motion sickness Autogenic Feedback Experiment and the Research Animal Holding Facility designed to house and support squirrel monkeys and rats in space. The develop of this hardware was the responsibility of ARC.

The experiment verification testing and mission integrated training for Spacelab 4 will take place in early FY 1985, with delivery of the ARC flight hardware to the Kennedy Space Center in mid-FY 1985.

Research into the origin and distribution of life and life-related molecules will also be continued through analyses of biochemical pathways in living systems and analyses of chemical abundances in Precambrian deposits by the use of an ultrasensitive stable isotope measuring system and studies of the interactions of known polypeptides and DNA segments.

Permanent Civil  
Service Workyears

PLANETARY EXPLORATION..... 38

A continuing series of project management activities, backed by the scientific expertise of principal investigators from ARC, other NASA Centers and the university community, will be continued in FY 1985 to accomplish the ongoing programs in planetary exploration. An in-house supporting research and technology program serves both to maintain the Center's scientific and technological expertise and to provide the stimulus and definition for new planetary research.

In FY 1985, the 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 and providing ongoing data on the plasma in which the Earth is immersed; Pioneers 10 and 11, which made close approaches to the planet Jupiter to study both the planet itself and the interaction of the solar wind with the planet's strong magnetic field; and for the Galileo Probe integration with the Orbiter leading to the launch of the Galileo orbiter/probe in 1986.

ARC researchers are playing a key role in these missions. ARC scientists are responsible, as principal investigators, for measuring the characteristics of the solar wind in the interplanetary space and near Jupiter and Saturn; measuring the atmospheric structure on Mars, Venus and Jupiter; measuring atmospheric radiation balance and cloud characteristics on Venus and Jupiter; and studying Mars for possible life-bearing soils and compounds. ARC reseachers are also responsible for synthesizing atmospheric models of these planets that can be used to explain their current state and evolution and be applied in comparative studies to understand features of the Earth's weather and climate.

ARC maintains an active program of laboratory and theoretical studies to develop basic atmospheric modeling concepts, obtain the necessary physical data on a molecular scale to interpret the spacecraft

observations, and develop improved scientific measurements and instrument concepts for use on spacecraft. This program concentrates on planetary atmospheres and has been particularly active in combining radiative transfer concepts with aerosol physics to obtain comprehensive planetary cloud and dust models.

Permanent Civil  
Service Workyears

SPACE APPLICATIONS..... 54

A highly diversified group of scientific people are required in FY 1985 to support programs in Earth and environmental observations including space, atmospheric, and stratospheric programs; to provide skilled personnel in support of the Agency's applications satellite programs; to interpret and process both spaceborne and airborne remotely sensed data; and to interact with and disseminate data and associated processing techniques to the user community.

The ARC stratospheric research program is an integrated activity that blends the expertise of the Center personnel and university scientists, both in the development of computer models for the upper atmosphere and in the measurement of stratospheric constituents and properties from aircraft platforms. Computer modeling of the stratosphere is being performed to understand the stratosphere 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. A similar program which focuses on the climatic effects of aerosols in the Earth's atmosphere through models of aerosols and their radiative effects and through measurements of aerosol properties from aircraft is also underway at ARC.

ARC's space applications responsibility is also fulfilled by conducting a continuing program of applied research and development to enhance the use of remote and in-situ sensing technology for Earth resources applications and defining, developing, and evaluating potential future satellite sensors, data acquisition and processing techniques, and associated communications technology.

TECHNOLOGY UTILIZATION..... 1

The technology utilization program at ARC is a community undertaking of scientists and engineers in many disciplines and Center organizations that work under the leadership and coordination of a technology utilization program director. It serves to transfer knowledge developed through the NASA programs into industry for effective use in the marketplace.

AERONAUTICS TECHNOLOGY..... 963

In 1985, the content of the ARC program in aeronautics is characterized in terms of three elements: generic research and technology, vehicle specific technology (e.g., rotorcraft) and aeronautical support to

other government agencies and to industry. These three elements form a coherent and interdependent program to meet the objectives of rotorcraft, powered-lift and high-performance aircraft improvements in aerodynamic propulsion and operational performance to improve terminal-area safety and efficiency and reduce aircraft noise and vibrations.

#### Generic Research and Technology:

The generic research and technology program at ARC is principally focused in the disciplines of fluid and thermal physics, propulsion, structures, 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 ARC'S 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. Numerical Aerodynamic Simulation will focus on augmenting the Nation's program in computational fluid dynamics and other areas of computational physics by developing an advanced capability that will provide modern and efficient access for users nationwide for application to computational aerodynamics, computational chemistry, and other complex analytical problems. Also, fundamental aerodynamic research will be continued using large- and small-scale research facilities and flight research vehicles to develop design methodologies for designing advanced aircraft. Flight research will continue for the development of aircraft systems integration technology including flight, propulsion, and aerodynamic controls. In controls and guidance, advanced control technology will focus on: developing reliable flight-critical control systems for advanced aircraft; evaluating and improving digital flight control system prediction tools, techniques, methodology and criteria; applying optimal control theory in conjunction with dynamic modeling of aircraft and ground-based guidance aids to provide new insights into the definition of air traffic control system interfaces; and conducting flight research on digital fly-by-wire concepts to continue to support the development of advanced flight systems technology. In 1985, the human factors program will include continuation of basic research in workload and performance measurements, fundamentals of visual perception, development of helicopter and high-performance aircraft display and control integration to reduce pilot workload, study of advanced flight display formats for improving information presentation to aircrew, and more complete understanding of human fatigue and circadian desynchronization effects on aircraft pilots. In addition, the applications of the results of these generic activities to space flight crews and hardware will be examined.

#### Vehicle Specific Technology:

The vehicle specific technology at ARC is focused on rotorcraft, powered-lift and high-performance aircraft. The vehicle technology emphasis at ARC relates to, and depends on, the basic capabilities and the aeronautical research disciplines described previously. The 1985 research program will include small-scale and large-scale wind tunnel testing and ground-based simulation, and flight research. 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 ARC. 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 aerodynamics, research will be conducted to improve the understanding of rotor aerodynamics, and rotor/fuselage interaction. 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 1985, technology for next-generation rotorcraft will pursue further understanding relative to high speed rotorcraft concepts and will continue preparation for flight research on the X-wing.

#### Other Aeronautical Support:

ARC 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, ARC provides 8,000 to 9,000 hours per year of wind tunnel occupancy time in support of both commercial and military aircraft development, as well as support for large NASA projects such as the Space Shuttle. The U.S. Army Research and Technology Laboratory of the Army Aviation Research and Development Command is located at ARC. The Aeromechanics Laboratory, the primary investigator of Army rotorcraft flight dynamics and controls, is also located at Ames North, 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 ARC 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 Federal Aviation Administration (FAA). Examples of these joint efforts include: (1) V/STOL and STOVL fighter studies, JVX support and an AV-8B flight test program with the Navy; (2) participation in the joint NASA/DARPA X-29A forward swept wing demonstration program; (3) continued participation in the joint NASA/USAF Advanced Fighter Technology Integration (AFTI) F-111 program for research and development of a Mission Adaptive Wing that will obtain smooth in-flight contour changes to the wing aerodynamic shape to achieve improved aerodynamic efficiency; (4) continued participation in the joint NASA/USAF AFTI/F-16 program using a digital flight control system for conventional and nonconventional control without degrading overall performance; and (5) work on digital flight control system verification and validation with the FAA. Advanced structural, aerodynamic, propulsion, and control concepts will be investigated. In conjunction with the DARPA, a large scale flight investigation of the X-wing rotor system will be conducted, utilizing the Rotor Systems Research Aircraft. The focus will be in exploring the start-stop phase of flight for the high-speed X-wing concept.

SPACE TECHNOLOGY..... 114

In 1985, these civil service personnel will provide a space research and technology program which encompasses both basic research and project support. The basic research focuses on entry technology and materials research. The project work supports Space Shuttle, the Orbiter Experiments (OEX) Program, the Infrared Astronomy Program, the Galileo Probe, and advanced work related to technology definition of a space station with a future potential to be permanently manned.

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 that 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); 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.

In 1985, the Space Shuttle project will be supported with ground-based facilities to study a variety of aerodynamic and thermodynamic problems. The Galileo project will be supported with heat shield design and performance data, heat shield shape change effects on aerodynamics, and subsonic probe stability. 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. ARC 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; 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. Also, 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.

Permanent Civil  
Service Workyears

**SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS**

SPACE TRANSPORTATION OPERATIONS..... 73

Ames Dryden was the primary recovery site for the first seven Space Shuttle missions, and is the primary recovery site for Flights 9 and 14. After landing, the Space Shuttle Orbiter is returned to Kennedy Space Center by shuttle carrier aircraft. Ames Dryden will provide Orbiter convoy operations support and maintain the Space Shuttle/carrier aircraft and the Space Shuttle servicing facilities.

CENTER MANAGEMENT AND OPERATIONS..... 487

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

Director and Staff - The Center Director, Deputy Director, Associate Director, and the immediate staff, e.g., Chief Counsel, Patent Counsel, Equal Opportunity, Public Affairs, Resources Management, and under the auspices of the Chief Engineer, Health, Safety, Security, and Energy Management.

Management Support - The part of the ARC civil service workforce which provides information and control services supporting all levels of Center management, both program and functional. Specific functions include financial management, contracting and procurement, property management, and personnel management.

Operations Support - The part of the ARC civil service workforce which provides for the operation and maintenance of institutional facilities, buildings, systems, and equipment, and which provides technical services such as administrative automatic data processing, library, and information services.

RESOURCE REQUIREMENTS BY FUNCTION

	1983 <u>Actual</u>	1984		1985 <u>Rudget Estimate</u>
		<u>Rudget Estimate</u>	<u>Current Fstimate</u>	
	(Thousands of Dollars)			
<b>I. <u>PERSONNEL AND RELATED COSTS</u>.....</b>	<b><u>83,626</u></b>	<b><u>81,957</u></b>	<b><u>87,170</u></b>	<b><u>90,592</u></b>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Full-time permanent workyears	70,279	68,663	72,731	75,457
b. Other than full-time permanent	2,477	2,251	2,457	2,478
c. Reimbursable detailees.....,	354	291	365	368
d. Overtime & other compensation	<u>1,171</u>	<u>1,124</u>	<u>1,238</u>	<u>1,248</u>
Subtotal, Compensation	74,382	72,329	76,791	79,551
2. <u>Benefits</u> .....	<u>8,297</u>	<u>5,571</u>	<u>9,395</u>	<u>10,007</u>
Subtotal, Compensation and Benefits.....	<u>52,679</u>	<u>80,900</u>	<u>86,186</u>	<u>89,558</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel.....	146	223	160	168
2. Personnel training.....	<u>801</u>	<u>834</u>	<u>824</u>	<u>866</u>
Subtotal, Supporting Costs.....	947	1,057	984	1,034
Total, Personnel and Related Costs.	<u>93,626</u>	<u>81,957</u>	<u>87,170</u>	<u>90,592</u>

Explanation of Fund Requirements

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
A. <u>Compensation and Benefits</u> .....	82,679	80,900	86,186	89,558
1. <u>Compensation</u> .....	74,382	72,329	76,791	79,551
a. Full-time Permanent workyears..	70,279	68,663	72,731	75,457

The increase from the 1984 budget estimate to the 1984 current estimate is due to the 1984 pay raise.

Basis of cost for Civil Service Workyears

In 1985, the cost of permanent workyears will be \$75,457,000. The increase from 1984 is calculated as follows:

Cost of permanent workyears in 1984.....	72,731
Cost increases in 1985.....	+3,362
Within grade and career development advances:	
Full-year effect of 1984 actions.....	+913
Partial year effect of 1985 actions.....	+883
Full-year effect of 1984 pay increase.....	+1,281
One more paid day in 1985.....	+285
Cost decreases in 1985.....	-636
Turnover savings:	
Full-year effect of 1984 actions.....	-257
Partial year effect of 1985 actions.....	-67
Alleration in the method of calculating salaries paid. ....	-65
Reduction related to the government-wide initiative to reduced the number of GS/GM 11-15 positions.....	-247
Cost of permanent full-time workyears in 1985.....	<u>75,457</u>

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
b. Other than full-time permanent workyears				
1. Cost.....	2,477	2,251	2,457	2,478
2. Workyears.....	162	166	163	163

The distribution of 1985 workyears is as follows:

Distribution of Other Than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Development programs.. .. .	59
Summer employment program.....	11
Youth opportunity programs.....	48
Other temporary.....	<u>45</u>
Total. ....	<u>163</u>

The increase in cost and the decrease in workyears from the 1984 budget estimate to the 1984 current estimate reflects the 1984 pay raise.

c. Reimbursable detailees.....	354	291	365	368
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The military personnel detailed to the Ames Research Center on a reimbursable basis are individuals experienced in aeronautics, rotorcraft technology, veterinary medicine, and related fields. The increase from the 1984 budget estimate to the 1984 current estimate is due to additional requirements in the life sciences and rotorcraft programs and the cost of 1984 pay raises. The 1985 estimate is the same level of effort as 1984, except for the full-year cost of the 1984 pay raise.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
d. Overtime and other compensation..	1,272	1,124	1,238	1,248

Overtime and other compensation includes overtime, holiday pay, incentive awards, Sunday premium pay, and night work differential. The use of overtime and other Compensation is primarily for off-peak operation of major facilities such as the Unitary Plan Wind Tunnel System, and the 6-by-5 Foot supersonic Wind Tunnel, and preparation for test flights and Space Shuttle operations. The increase from the 1984 budget estimate to the 1984 current estimate is for the 1984 pay raise and additional overtime requirements for the 40-by-80-by-120 Foot Wind Tunnel Project and the Shuttle landings. The 1985 estimate is level with 1984, except for the full year cost of the 1984 pay raise.

2. <u>Benefits</u> .....	<u>8,297</u>	<u>8,571</u>	<u>9,395</u>	<u>10,007</u>
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The following are the amounts of contributions by category:

Civil Service Retirement Fund..	5,005	4,997	5,277	5,549
Employee Life Insurance.....	185	188	194	204
Employee Health Insurance.....	1,828	2,009	2,226	2,400
Workmen's Compensation.....	501	429	650	621
FICA.....	51	50	221	367
Medicare.....	727	798	827	857
Other benefits.....		100		
Total.....	<u>8,297</u>	<u>8,571</u>	<u>9,395</u>	<u>10,007</u>

The increase from the 1984 budget estimate to the 1984 current estimate is due to the 1984 pay raise, P.L. 98-21 "Social Security Amendments of 1983" (FICA), and higher workmen's compensation billings. (The workmen's compensation estimates for 1984 and 1985 reflect estimates based on Department of Labor billings.) The increase in the 1985 estimate is due to the full-year effect of these changes.

B. <u>Supporting Costs</u> .....	<u>947</u>	<u>1,057</u>	<u>984</u>	<u>1,034</u>
1. Transfer of personnel.....	146	223	160	168

The decrease from the 1984 budget estimate to the 1984 current estimate is due to a decrease in the number of expected relocations based on our 1983 experience. Transfers in 1985 are expected to be the same.

	1983	1984		1985
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
2. Personnel training.....	801	934	824	866

The decrease from the 1984 budget estimate to the 1984 current estimate is due to an increase in tuition costs offset by a decrease in the number of people taking courses at Stanford University. The 1985 budget is based on the **same level of effort** as 1984.

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	1983 <u>Actual</u>	1984		1985 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
<b>II. <u>TRAVEL</u>.....</b>	<b><u>2,160</u></b>	<b><u>2,212</u></b>	<b><u>2,391</u></b>	<b><u>2,493</u></b>

Summary of Fund Requirements

A. Program Travel.....	1,385	1,433	1,558	1,568
B. Scientific and Technical Development Travel.....	320	339	354	430
C. Management and Operations Travel.....	<u>455</u>	<u>440</u>	<u>479</u>	<u>495</u>
Total, Travel.....	<u>2,160</u>	<u>2,212</u>	<u>2,391</u>	<u>2,493</u>

Explanation of Fund Requirements

A. <u>Program Travel</u> .....	<u>1,385</u>	<u>1,433</u>	<u>1,558</u>	<u>1,568</u>
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Program travel is required for the accomplishment of the Center's missions and is the largest part of the ARC travel budget, accounting for approximately 63 percent of travel costs in 1985. At APC, travel for program purposes is required for the continuing efforts in space research, aeronautical research and technology, flight simulation, fluid mechanics, airborne research and applications, space life sciences, flight test techniques, flight measurements, guidance and flight control, and flight measurement development activities. The increase in 1984 from the Budget to the Current estimate is due to increased requirements in the Space Life Sciences area. The 1985 estimate provides for the same level as 1984.

B. <u>Scientific and Technical Development Travel</u> .....	<u>320</u>	<u>339</u>	<u>354</u>	<u>430</u>
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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 them to benefit from exposure to technological advances outside Ames Research Center, as well as to present both accomplishments and problems to their associates. Many such meetings are working panels convened to

solve certain problems for the benefit of the Government. The increase from the Budget to the current estimate in 1984 is based on the FY 1983 experience plus inflation. The 1985 estimate provides for an increase in the number of presentations of technical papers to the scientific community than experienced in 1983 and 1984. In addition to anticipated increases in per diem and travel rates, \$55,000 is included as part of the NASA-wide increase in funds for greater participation by ARC scientists and engineers in technical meetings and symposia.

C. Management and Operations Travel...                      455                      440                      479                      495

Management and operations travel provides for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management and procurement; travel of the Center's top management to NASA Headquarters, other NASA Centers, and contractor plants; and local transportation. The increase from the Budget to the current estimate in 1984 is based on the FY 1983 experience plus inflation. The 1984 and 1985 estimates provide the same level as 1983.

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	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
III. <u>OPERATION OF INSTALLATION</u> .....	<u>21,434</u>	<u>24,666</u>	<u>25,075</u>	<u>30,031</u>

(Thousands of Dollars)

Summary of Fund Requirements

A. Facilities Services.....	10,759	13,640	13,648	17,767
B. Technical Services.....	3,403	3,136	3,469	3,836
C. Management and Operations.. ..	<u>7,272</u>	<u>7,890</u>	<u>7,958</u>	<u>8,428</u>
Total, Operation of Installation.. ...	<u>21,434</u>	<u>24,666</u>	<u>25,075</u>	<u>30,031</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 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, and related services.

The increase from the 1984 budget estimate to the 1984 current estimate is primarily due to higher ADP maintenance and operating costs, and a rate increase in communications. The 1985 estimate reflects the Agency's operational maintenance initiative and expected rate increases for support contractors and utilities.

A. <u>FACILITIES SERVICES</u> .....	<u>10,759</u>	<u>13,640</u>	<u>13,648</u>	<u>17,767</u>
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ARC is located on 423.5 acres in a complex of facilities made up of laboratory and office-type buildings as well as research wind tunnels. This complex encompasses 2,254,754 gross square feet of building space including 10 major buildings. Also included are 11 major technical facilities. This physical plant supports an average daily population of 2,500 to 2,900 personnel. Many of the facilities are utilized on schedules involving more than one shift and frequently during off-peak hours.

DFRF is located on 521 acres and occupies a complex of facilities consisting of laboratory and office-type buildings as well as flight test facilities. This complex encompasses 523,758 gross square feet of office building space including eight major facilities. This physical plant houses an average daily on-site population of 900 to 1,200 personnel. Many of the test facilities are utilized on schedules involving more than one shift, which frequently operate during off-peak hours.

Summary of Fund Requirements

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
1. <u>Rental of Real Property</u> .....	67	142	44	45
2. <u>Maintenance and Related Services</u> ...	<u>2,555</u>	<u>2,542</u>	<u>2,747</u>	<u>4,566</u>
a. Facilities.....	2,512	2,496	2,702	4,520
b. Equipment .....	43	46	45	46
3. <u>Custodial Services</u> .....	3,369	3,656	3,530	3,847
4. <u>Utility Services</u> .....	<u>4,768</u>	<u>7,300</u>	<u>7,327</u>	<u>9,309</u>
Total, Facilities Services.....	<u>10,759</u>	<u>13,640</u>	<u>13,648</u>	<u>17,767</u>

Explanation of Fund Requirements

1. <u>Rental of Real Property</u> .....	<u>67</u>	<u>142</u>	<u>44</u>	<u>45</u>
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At DFRF, this item provides for the rental of trailers to provide office, shop, laboratory, and storage space in support of the Space Shuttle program. The decrease from the 1984 budget estimate to the 1984 current estimate can be attributed to the purchase, rather than anticipated rental, of some of the trailers which support the Space Shuttle program. The 1985 estimate provides for the same level as 1984.

2. <u>Maintenance and Related Services</u> ...	<u>2,555</u>	<u>2,542</u>	<u>2,747</u>	<u>4,566</u>
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At ARC, maintenance and repair includes the maintenance of grounds and emergency repairs of heating, ventilating, and lighting equipment in the institutional buildings and offices. Maintenance of grounds includes maintenance of approximately 30 acres of improved planted areas and associated pest control?

maintenance of approximately 45 acres of unimproved areas such as substations, aircraft taxiways, drainage ditches, large fields and roadway shoulders within these areas; and vacuum sweeping approximately 42 acres of streets, parking lots, and aircraft ramp, taxiway and V/STOL areas. At DFRF, this activity involves all DFRF facilities, including those used for Shuttle.

The 1984 current estimate provides a continuation of the 1983 level of maintenance and repair effort. The increase from FY 1984 to FY 1985 reflects not only anticipated support service contractor wage rate increases and expected FY 1985 price levels for supplies, materials, equipment and other contractual effort, but an increase of \$1,700 thousand as part of the NASA-wide augmentation in Operational Maintenance effort. This augmentation will provide a level of activity more consistent with the National investment in the ARC physical plant.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
3. <u>Custodial Services</u> .....	<u>3,369</u>	<u>3,656</u>	<u>3,530</u>	<u>3,847</u>

Janitorial and building cleaning services are associated with approximately two and three quarters million square feet of various types of space located in 226 buildings and structures, and over 90 trailers which provide temporary office and shop space. Security services are for buildings and property, including aircraft and computer facilities, and "round-the-clock" staffing of an emergency duty office which monitors fire, security, and safety alarms, and coordinates fire, security, and safety areas in emergency situations. Other services included are pest control services, refuse collection, laundry and custodial supplies.

This activity involves support contractor efforts which provide janitorial and security services, fire protection and other miscellaneous custodial services and supplies. The decrease from the 1984 budget estimate to the 1984 current estimate reflects minor adjustments in support service contract rates. The increase in 1985 provides for increased effort in the janitorial contracts at both Ames and Dryden. This increased effort provides support for newly completed buildings, i.e., Data Analysis Facility and the Manned Vehicle Systems Research Facility.

4. <u>Utility Services</u> .....	<u>4,768</u>	<u>7,300</u>	<u>7,327</u>	<u>9,309</u>
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The major utility service is electricity with lesser requirements for natural gas, fuel oil, water and sewage services. At ARC, 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 at Moffett Field; and sewage service by the City of Mountain View.

Approximately 80 percent of the electric power at ARC is consumed in the operation of high power demand research facilities, such as the Unitary Plan Wind Tunnel System, 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. ARC, Moffett Field, accounts for 95 percent of the overall utility energy usage and 91 percent of total utility costs.

At DFRF, utility services are purchased through Air Force contracts with regional utility companies. Costs are based on Air Force projected rates. The major amount is for electricity with lesser amounts for natural gas, fuel oil, water and sewage services.

The increase between the 1984 current estimate and the 1985 budget estimate is due to an increase in electricity consumption and rates. The 1985 estimate reflects rate increases are those published by WAPA and scheduled to become effective in 1985.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
B. <u>TECHNICAL SERVICES</u> .....	<u>3,403</u>	<u>3,136</u>	<u>3,469</u>	<u>3,836</u>
<u>Summary of Fund Requirements</u>				
1. <u>Automatic Data Processing</u> .....	<u>2,378</u>	<u>2,251</u>	<u>2,452</u>	<u>2,780</u>
a. Equipment.. ..	354	229	---	100
b. Operations .. ..	2,024	2,022	2,452	2,680
2. <u>Scientific &amp; Technical Information</u> ..	<u>650</u>	<u>615</u>	<u>639</u>	<u>663</u>
a. Library.....	75	21	84	87
b. Education and Information.....	575	594	555	576
3. <u>Shop and Support Services</u> .....	<u>375</u>	<u>270</u>	<u>378</u>	<u>393</u>
<u>Total, Technical Services</u> .....	<u>3,403</u>	<u>3,136</u>	<u>3,469</u>	<u>3,036</u>

Explanation of Fund Requirements

	<u>1983</u>	<u>1984</u>		<u>1985</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)		
1. <u>Automatic Data Processing</u> .....	<u>2,378</u>	<u>2,251</u>	<u>2,452</u>	<u>2,780</u>

This category includes the central administrative ADP facility equipment and operating costs.

The increase from the 1984 budget estimate to the 1984 current estimate provides for increased software systems support, higher maintenance costs and the acquisition of user terminals and other hardware and software to provide interactive capability to the system that was purchased in 1981 to assure the smooth functioning of the administrative ADP data systems between ARC and DFRF. The 1985 estimate provides for continuation of ARC's phased office automation management information system, as well as anticipated support contractor wage rate increases.

2. <u>Scientific and Technical Information</u> .	<u>650</u>	<u>615</u>	<u>639</u>	<u>663</u>
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This category provides for the purchase of books, supplies, and materials for the operation of the DFRF library. Also included in this category is a support contract to perform public information services, media development, and education programs. The 1984 current estimate reflects a reduction in Space Shuttle public affairs requirements more than offset by increased library costs. The 1985 estimate reflects the same 1984 at anticipated 1985 cost rates.

3. <u>Shop and Support Services</u> .....	<u>375</u>	<u>270</u>	<u>378</u>	<u>393</u>
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This category includes administrative shop, photo and graphics, and audiovisual services primarily supporting the public affairs activity. The increase from the 1984 budget estimate to the 1984 current estimate is the result of an accounting realignment. The 1984 current estimate and 1985 budget estimate provide for the same level of services as in 1983.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	<u>Rudget Estimate</u>
C. <u>MANAGEMENT AND OPERATIONS</u> .....	<u>7,272</u>	<u>7,890</u>	<u>7,958</u>	<u>8,429</u>

Summary of Fund Requirements

1. <u>Administrative Communications</u> .....	2,321	2,596	2,669	2,929
2. <u>Printing and Reproduction</u> .....	308	303	311	319
3. <u>Transportation</u> ... ..	954	984	906	943
4. <u>Installation Common Services</u> .. ..	<u>3,789</u>	<u>4,007</u>	<u>4,072</u>	<u>4,237</u>
Total, Management and Operations. .	<u>7,272</u>	<u>7,890</u>	<u>7,958</u>	<u>8,479</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u> .. ....	<del>2,321</del>	<u>2,596</u>	<u>2,669</u>	<u>2,929</u>
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Communications services are provided by the General Services Administration (GSA) for the Federal Telecommunications Service (FTS), and the Pacific Telephone and Telegraph Company and the General Telephone and Telegraph Company for local services at **Ames** and **DFRF**, respectively. Other communications consist of teletype equipment and services provided by Western Union. **Also** included are the lease of switchboard equipment and the support contract for telephone operators. The increase from the 1984 hudget estimate to the 1984 current estimate is due to an increase in local communication costs at **DFRF** and higher FTS rates at ARC and the **AT&T** divestiture impact. The 1985 estimate will maintain the same level of services as 1984 at anticipated cost levels.

2. <u>Printing and Reproduction</u> .... ..	<u>308</u>	<u>303</u>	<u>311</u>	<u>319</u>
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The estimate for administrative printing includes the operating costs of the printing and reproduction facility as well as supplies, materials, equipment acquisitions and outside procurements. All common processes of duplication, including photostating, blueprinting and microfilming are included. The 1984 current estimate and the 1985 budget estimate reflect approximately the same level of activity as in 1983.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
3. <u>Transportation.. .. .</u>	<u>854</u>	<u>984</u>	<u>906</u>	<u>943</u>

The estimates include motor pool operation costs including GSA vehicle rentals, freight costs, Government bills of lading, air freight and other general shipments. The decrease in the 1984 current estimate is due to reduced Space Shuttle support requirements. The 1985 estimate provides approximately the same level of support as in 1984.

4. <u>Installation Common Services.....</u>	<u>3,789</u>	<u>4,007</u>	<u>4,072</u>	<u>4,237</u>
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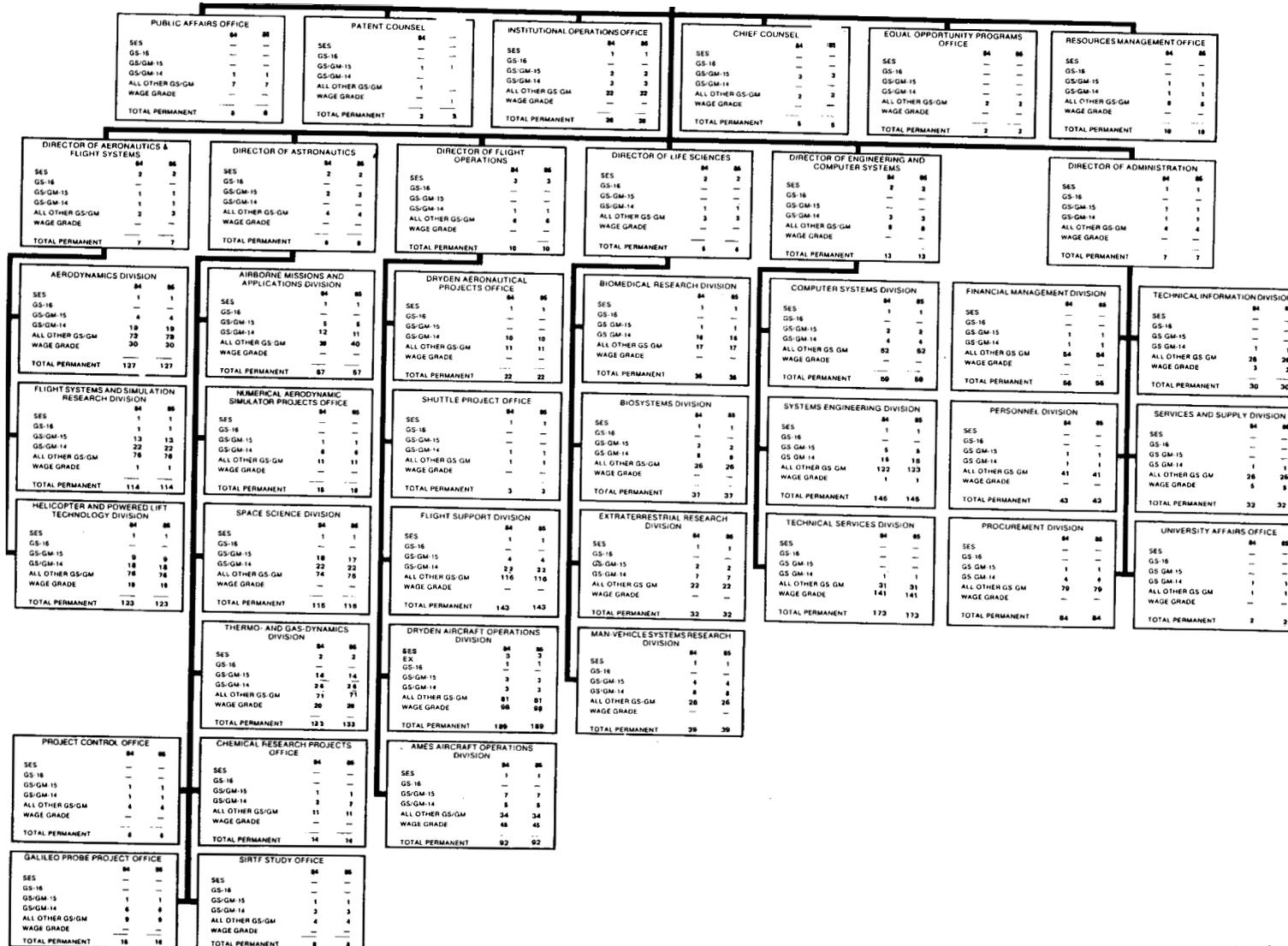
These services include center management and staff activities, medical services, and installation support services activities. For example, this category includes those supplies, materials and services in support of center management, general and patent legal services, personnel, procurement, and financial management services. 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 1984 current estimate and the 1985 budget estimate maintain the same level of effort as in 1983 adjusted for support service contract wage rate changes.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
ORGANIZATION AND STAFFING CHART

AMES RESEARCH CENTER

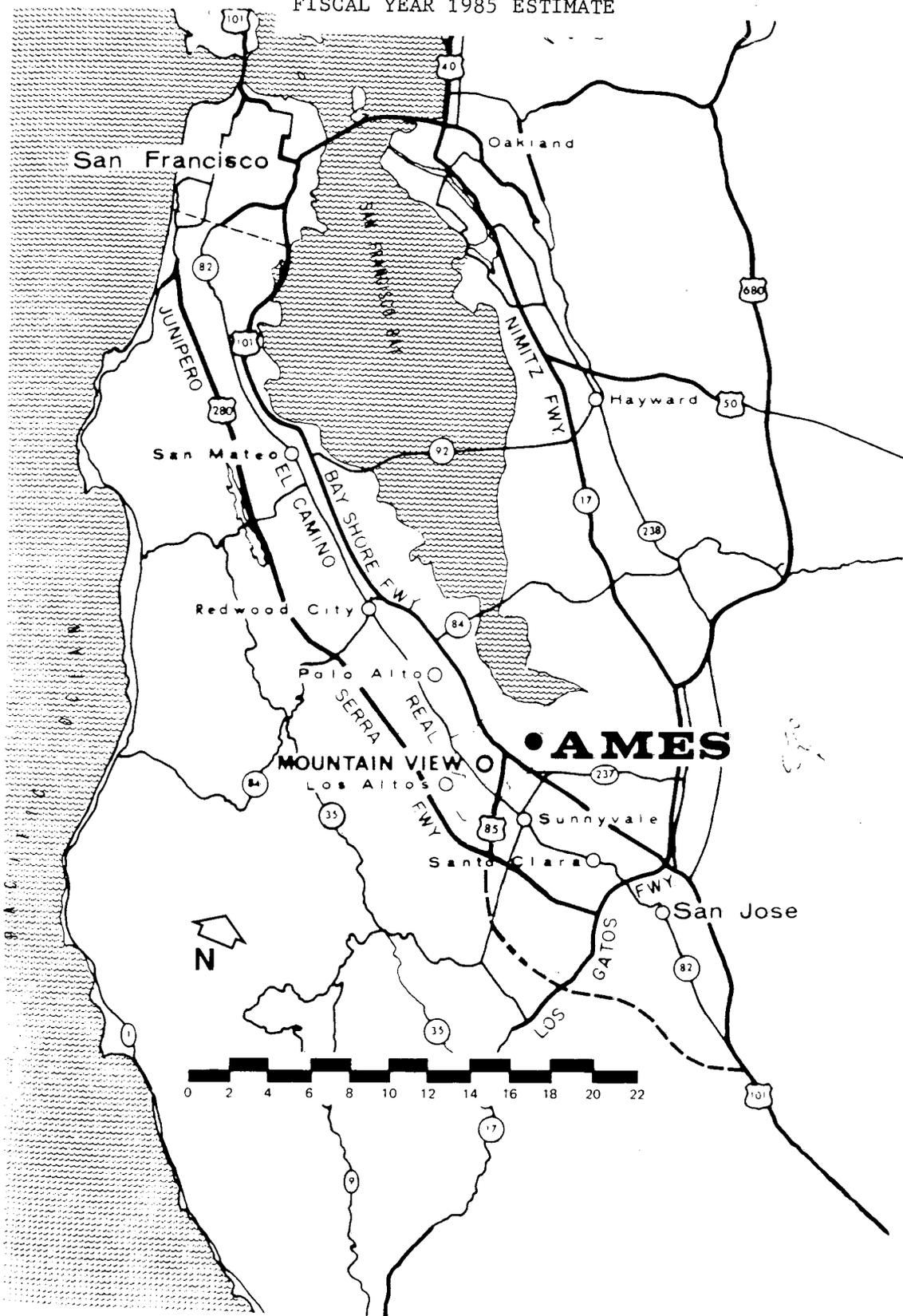
CENTER TOTAL		
	84	86
SES	28	35
EX	1	1
GS-16	1	1
GS-GM-15	114	113
GS-GM-14	246	244
ALL OTHER GS/GM	1210	1213
WAGE GRADE	363	363
TOTAL PERMANENT	2070	2070

DIRECTOR		
	84	86
SES	2	1
GS-16	—	—
GS-GM-15	2	2
GS-GM-14	1	1
ALL OTHER GS/GM	12	12
WAGE GRADE	—	—
TOTAL PERMANENT	17	17



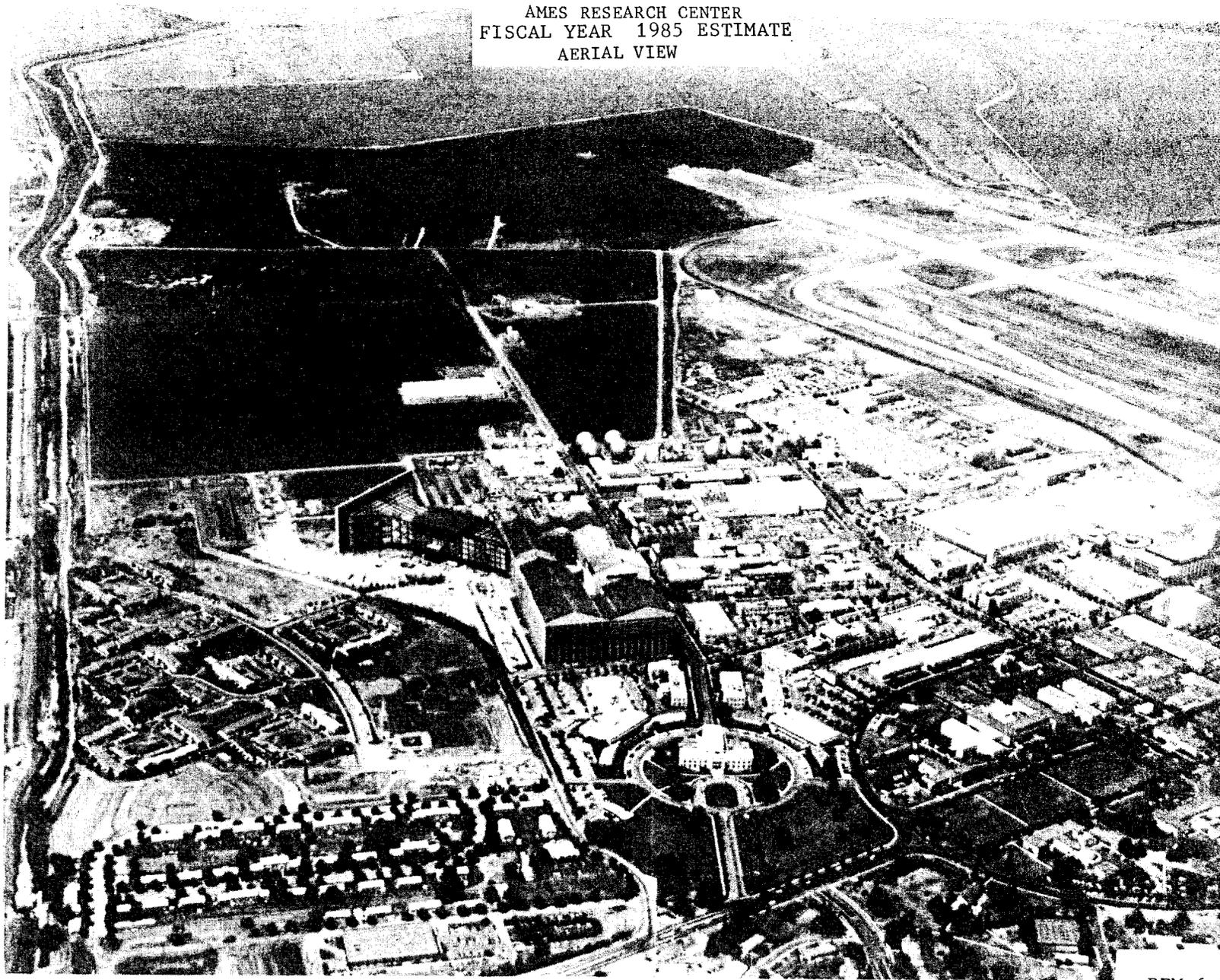
# LOCATION MAP

FISCAL YEAR 1985 ESTIMATE



RPM 6-28

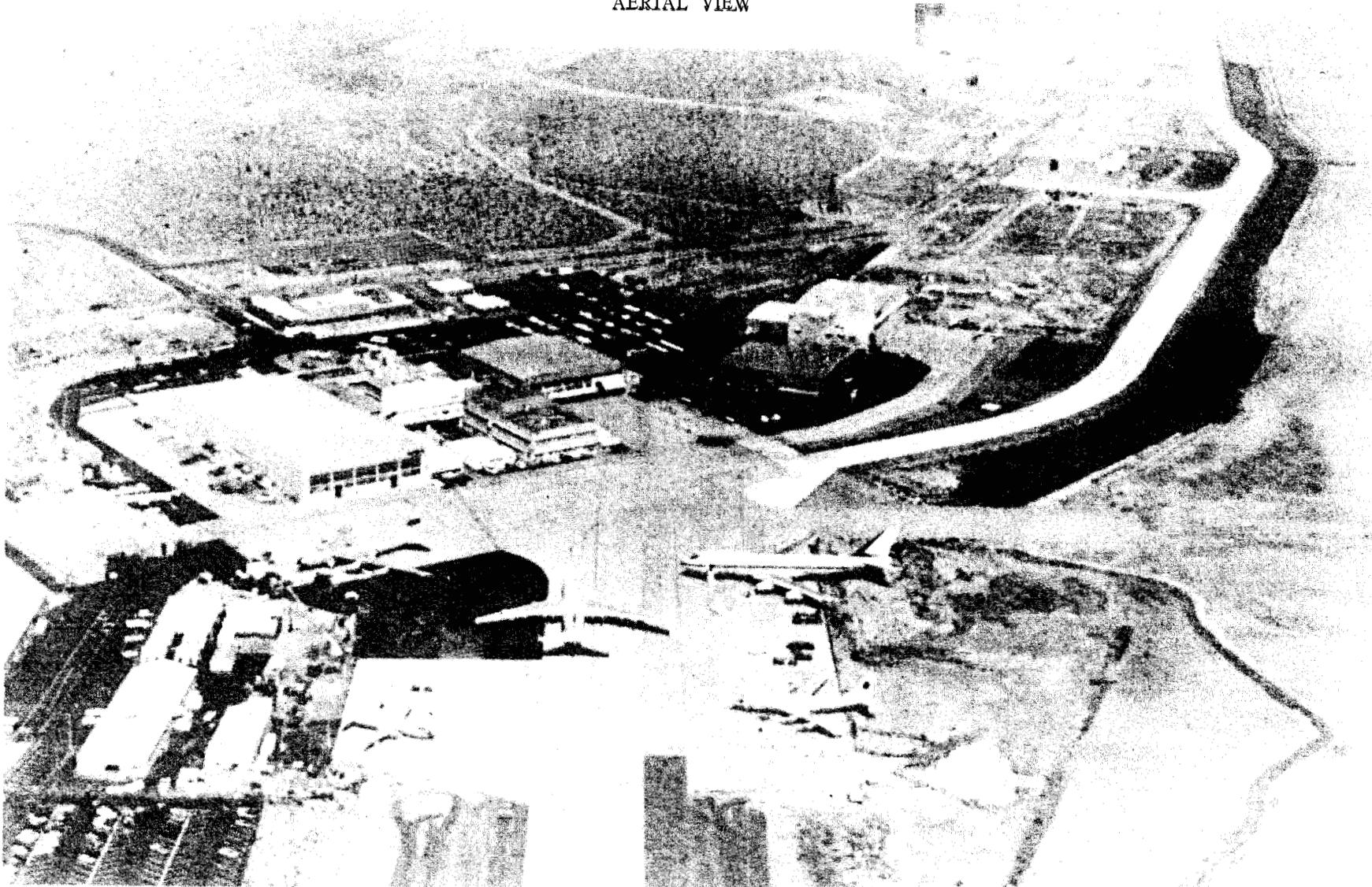
AMES RESEARCH CENTER  
FISCAL YEAR 1985 ESTIMATE  
AERIAL VIEW



RPM 6-29



DRYDEN FLIGHT RESEARCH FACILITY  
FISCAL YEAR 1985 ESTIMATES  
AERIAL VIEW



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1985 ESTIMATES

LANGLEY RESEARCH CENTER

DESCRIPTION

The Langley Research Center, (LaRC) located at Hampton, Virginia, was established in 1917. It is situated between Norfolk and Williamsburg, 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. In addition, there are 110 acres of NASA-owned land located in the city of Newport News, Virginia, and 3,276 acres under permit from the Department of Interior. 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, 1983, was \$708,491,000.

CENTER ROLES AND MISSIONS

LaRC continues to play a leading role in the development of aeronautics and space technology.

LaRC's 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 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.

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

Acoustics and Noise Reduction - conduct research and develop a technology base related to reducing interior and exterior aircraft noise.

Aerospace Vehicle Structures and Materials - develop a technology base for potential advances.

Guidance and Control Technology - develop a technology base related to improving aircraft control and guidance systems.

Military and FAA Support - provide technical support and advance the technologies for military and civil aviation in areas consistent with aeronautics roles and unique capabilities.

Advanced Space Vehicle Configuration Technology - develop technology for advanced vehicle transportation systems, including orbit-on-demand vehicles, aeroassisted orbit transfer, transatmospheric vehicles, and maneuvering reentry vehicles.

Advanced Space Systems Technology - develop a technology base and systems analysis capability for large space antenna applications and space station system trade studies.

Sensor and Data Acquisition Technology - develop a technology base for sensors and data acquisition devices.

Technology Experiments in Space - define and develop space technology experiments in support of LaRC roles including materials, structures, control and dynamics of large space structures, large space antenna systems, remote sensing atmospheric sciences, and advanced transportation systems.

Atmospheric Sciences Technology - develop improved techniques for atmospheric sensing. Includes research, experiment development/management, data analysis, and investigator management and specialized ground/aircraft investigations. This also includes development of Shuttle payloads related to atmospheric sensing.

#### SUPPORTING

Rotorcraft Technology - contribute to the development of the technology base with emphasis on structures, aeroelasticity, acoustics, noise, and avionics components.

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

Planetary Entry Technology - provide planetary and entry aerothermodynamics experimental and analytical data.

Computational Fluid Dynamics - contribute to the software technology base.

Upper Atmospheric Research - provide mission analysis, sensor development, data interpretation, and utilization for remote sensing; contributing to model development.

Launch Vehicle Procurement - develop and procure for science/applications missions, including Scout launch vehicle.

SUMMARY OF RESOURCES REQUIREMENTS

Funding Plan by Function

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
I. Personnel and Related Costs.....	106,887	108,351	111,478	115,058
II. Travel.....	2,127	2,325	2,294	2,525
III. Operation of Installation.....	23,688	28,405	26,100	30,454
A. Facilities Services.....	(12,994)	(16,256)	(14,316)	(17,277)
B. Technical Services.....	(3,740)	(4,124)	(4,021)	(4,720)
C. Management and Operations.....	(6,954)	(8,025)	(7,763)	(8,457)
Total, fund requirements.....	<u>132,702</u>	<u>139,081</u>	<u>139,872</u>	<u>148,037</u>

Distribution of Civil Service Workyears

	1983	1984		1985
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
<b><u>RESEARCH AND DEVELOPMENT</u></b> .....	<b><u>2,097</u></b>	<b><u>2,116</u></b>	<b><u>2,145</u></b>	<b><u>2,147</u></b>
<u>Space Station</u> .....	---	---	---	25
<u>Space Transportation Capability Development</u> .....	8	6	6	6
<u>Space Science and Applications</u> .....	212	188	186	186
Life sciences.....	5	6	6	6
Space applications.....	207	182	180	180
<u>Technology Utilization</u> .....	9	9	10	10
<u>Aeronautics and Space Technology</u> .....	1,868	1,913	1,943	1,920
Aeronautics.....	1,354	1,385	1,390	1,391
Space.....	514	528	553	529
<b><u>SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS</u></b> .....	<b><u>31</u></b>	<b><u>26</u></b>	<b><u>24</u></b>	<b><u>22</u></b>
Space Transportation Operations.....	31	26	24	22
Subtotal, direct workyears.....	2,128	2,142	2,169	2,169
<b><u>CENTER MANAGEMENT AND OPERATIONS SUPPORT</u></b> .....	<b><u>693</u></b>	<b><u>673</u></b>	<b><u>666</u></b>	<b><u>666</u></b>
Total, full time workyears....	2,821	2,815	2,835	2,835
Other than full time.....	116	103	93	93
Total, workyears....	<u>2,937</u>	<u>2,918</u>	<u>2,928</u>	<u>2,928</u>

PROGRAM DESCRIPTION

Permanent Civil  
Service Workyears

**RESEARCH AND DEVELOPMENT**

SPACE STATION..... 25

Space Station effort will consist of definition and integration studies and focused technology activities.

SPACE TRANSPORTATION CAPABILITY DEVELOPMENT..... 6

The objective of this activity is to evaluate alternate crew safety strategies for near- and far-term space mission scenarios; to establish safety criteria and identify technology requirements to meet those criteria; and to perform design synthesization, analytical modeling, and systems analysis and evaluation tasks on competing space station technology concepts.

LIFE SCIENCES..... 6

This research brings together an interdisciplinary program to investigate hypotheses concerning the role of wetland ecosystems in the global methane cycle and the concentration and flux of organic carbon.

SPACE APPLICATIONS..... 180

The space applications program at LaRC 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 atmospheric trace species and of theoretical and empirical atmospheric modeling. In the area of Upper Atmospheric Research, LaRC civil service personnel will continue to study the Earth's atmosphere in FY 1985 to assess any changes caused by man and determine whether or not there is any associated change in the transmission of solar radiation. Efforts will continue in defining and developing Shuttle and satellite experiments which will provide measurements of atmospheric constituents and other characteristics, as well as characteristics of Earth features.

A significant improvement in the understanding of man's impact on the stratosphere and climate will be obtained from the combination of Langley developed statistical/theoretical models and the comprehensive global data set provided by spaceborne sensors such as Nimbus-7, LIMS, SAM 11, and SAGE.

The Center's sensor development program encompasses the broadest possible range of advanced remote sensing techniques, including correlation gas filter radiometry and interferometry, laser heterodyne radiometry, lidar, and active and passive microwave techniques.

The Center 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. LaRC has the responsibility for the sensor development and data management of the Earth Radiation Budget Experiment, a prime element in NASA's support of the National Climate Program. Preliminary radiation budget studies, based on Nimbus data, are examining the relationship of radiation budget to such climatological parameters as cloudiness, snow and ice cover, and sea surface temperature. The Earth Radiation Budget Experiment Satellite, equipped with instruments which were the responsibility of Langley Research Center, is scheduled for launch in 1984; thus analysis of the data will be continued in FY 1985.

Permanent Civil  
Service Workyears

TECHNOLOGY UTILIZATION..... 10

The general objective of the NASA technology utilization program is to enhance economic growth and contribute to the technological solution of public problems through the transfer of new technology, resulting from aeronautical and space research and development efforts, to the nonaerospace segments of the economy.

In FY 1985, civil service personnel will provide support to define methods to expedite the application of new technology through the compression of the time required from generation of technology to its use in the economy; and encourage the use of aerospace technology in nonaerospace segments of the economy having problems amenable to aerospace technological solutions.

AERONAUTICS TECHNOLOGY..... 1,391

The aeronautical and research technology program at LaRC is characterized by the dynamic interaction between a broad spectrum of technical disciplines, the application of discipline research to specific technology requirements, demonstrations of particular technology applications and the in-depth examination of future technology requirements. The unique wind tunnel, computing facilities, and flight operations capabilities at LaRC complement the expertise of the technical staff to produce a broad cohesive program in aeronautical research.

The aerodynamics activity at LaRC 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 unique LaRC capabilities made possible by the Cyber 203 computer and recently developed cryogenic wind tunnel testing capability provided in the National Transonic Facility which allows the full simulation of flight conditions.

Research areas which are studied include airfoil and wing design, flow field analysis, configuration design processes, aircraft noise prediction, control analysis, aircraft drag reduction, propulsion system integration, flight dynamics, and fighter and missile aerodynamics. Wind tunnel testing techniques will be further enhanced by the development of methods to minimize interference from tunnel walls, mounting systems, and by introduction of nonintrusive instrumentation. The Cyber 203 computer will be used 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. Generation and documentation of the aerodynamic characteristics of turbulent and both passive and active laminar flow airfoils will be furthered by the introduction of new designs and the wind tunnel and flight evaluation of these concepts. Application of advanced transonic theories to the design of improved 3-D wings will be continued and evaluated by wind tunnel tests. Wind tunnel and flight tests will be continued on general aviation aircraft configurations having the potential for practical stall immunity and means for spin avoidance. Basic research will continue on the conception and development of methods for reducing turbulent skin friction drag for aeronautical vehicles.

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, manufacturing processes, and design technology to improve the structural efficiency, reliability, and durability and to reduce design costs of airframes and components. This activity is directed toward research on advanced composite materials, advanced metallic materials, computer-aided analysis and design technology, and development of analytical or semiempirical fatigue and life prediction methodology. Use of active and passive controls for minimization of aeroelastic response, reduced static stability, and minimization of gust and maneuver loads is being pursued in both theoretical and wind tunnel studies.

Emerging technological advances in computer systems are being exploited to significantly increase the utility and reduce the cost of engineering computations. The LaRC research program in computer science is directed at software systems for distributed computer networks, methods for concurrent systems design, software engineering, assessment of software reliability, three-dimensional graphics, and engineering data base management. Investigations of advanced computer hardware applications will be continued with a finite element structural computational device using microprocessor components to evaluate the potential of reducing computational costs and/or times over present analysis methods.

Controls and guidance work at LaRC includes research programs to advance technology development in aircraft guidance and navigation, aircraft control systems, cockpit systems, and integration and interfacing techniques. Also, major efforts in aircraft flight-path management and operations technology and active controls technology for conventional-takeoff- and-landing aircraft are being conducted in this program area. The work includes requirement analyses, design studies, ground simulation, and experimental flight research. The LaRC expertise in the controls and guidance area is being applied to various aircraft classes, 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. Emphasis in 1985 will be on: investigations of the integration of aircraft with enhanced capabilities and the evolving air traffic control system to achieve benefits in capacity and efficiency while maintaining safety. Other efforts will include the definition of technology for enhanced functional integration to increase aircraft systems reliability and reduce operating costs, definition of requirements and technology to facilitate general aviation single-pilot flight management in Instrument Flight Rules environments, and the investigation of concepts and technology which will result in greatly improved pilot displays and input/output capabilities. Other technology applications are found in research on advanced digital flight control systems, design procedures, and validation techniques for fault tolerant systems, including the development of mathematical tools to investigate and enhance reliability prediction and assessment, pilot modeling and assessment of pilot performance and workload. Increased utilization will be made of the Avionics Integration Research Laboratory, a major new facility for fault tolerant systems research opened in 1983. The impact of lightning on inducing errors in digital aircraft systems will continue to receive research attention.

LaRC has traditionally received requests from other agencies and industry for test support of their aircraft, missiles, and system development programs. The Structures Laboratory of the Army Research and Technology Laboratories of the U.S. Army Aviation Research and Development Command is located at LaRC. This laboratory, the primary investigator of Army rotorcraft structures, works on independent research and development projects and on projects of mutual interest with a staff integrated into the NASA organization. Extensive use is made of LaRC facilities in these research activities. There are also a large number of joint programs with the Air Force Systems Command, the Naval Air System Command, other DOD components, and the Federal Aviation Administration.

Permanent Civil  
Service Workyears

SPACE TECHNOLOGY..... 529

The space research and technology program at LaRC is characterized 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 space station with a future potential of being permanently manned.

The objective in the materials area is to establish and demonstrate the required technology for application of advanced materials for 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; and high-stiffness, low weight, low thermal expansion composites for large, long-life space structures. Environmental effects on the mechanical and physical properties of materials are being studied utilizing specialized facilities and laboratories. These studies include dimensional stability and radiation stability of composites and thermal control coatings. An integral part of the research activity is the

definition of new experimental testing 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 (STS) are being derived 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 integral controls software that will require application of advanced numerical techniques and computer hardware.

An extensive program in electronic component technology, automation/intelligent systems technology, and information systems technology is conducted at LaRC. 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). In 1985, LaRC will evaluate data from a Laser Heterodyne Spectrometer observation program to measure stratospheric constituents in the 9-12 micron region, and will begin extension of microwave radiometer technology to large space systems. Evaluation of a candidate onboard data management system concept will be carried out in 1985. This work supports a broad objective of developing candidate architectures and associated systems technology for manned spacecraft onboard data management, with potential application to a future space station. The demonstration of a 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 unique micro-G environment of space provides an opportunity to develop advanced materials processing concepts. Langley is investigating the potential of diffusion limited crystal growth as a technique to provide large uniform lead tin telluride crystals with potential application in infrared sensors. The evaluation of solid state data storage technology for space station applications has been initiated. The overall objective is to identify candidate technologies, evaluate their potential, and perform research necessary to demonstrate viability in 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 matrix arithmetic at high speed for potential application to complex aerospace systems. Automation technology efforts will focus on remote satellite servicing concepts and requirements. Other space electronics technology efforts are focused on spacecraft attitude control (using momentum storage or vernier pointing devices), software development, verification, and validation techniques, and special problems in large space structures pointing and figure control.

The objective of the LaRC entry technology program is to develop experimental and theoretical data bases to support: development of Space Transportation System (STS) vehicles for the 1990's and beyond, employing

technologies advanced beyond those utilized for the Space Shuttle; support of the evolving STS program and solving operational problems as they surface; and reduction and interpretation of STS flight data. The objectives are being met through the development and application of experimental and theoretical techniques employing LaRC computers and wind tunnel facilities and through comparative analyses of the resulting data with flight data as available. Disciplines include aerodynamic/thermodynamic performance, configuration optimization, flight control system assessment, mission design, planetary entry trajectory analyses, and computational flow-field techniques.

The Space Shuttle orbiter will be utilized as a research vehicle to extend the knowledge of aerodynamics, aerothermodynamics, and basic fluid mechanics into previously inaccessible flow regimes by acquiring flight measurements during routine Space Shuttle operations. Experiments are being developed for Space Shuttle flights which will provide unique measurements for direct assessment of ground-based facility measurements and theoretical techniques. The Space Shuttle will also be utilized as a space platform to perform LaRC-developed payload experiments extending basic research and technology development into the space environment when economically feasible or when the development can be achieved in space.

The LaRC 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, or work for potential power generation, transmission, and storage for future space missions.

Permanent Civil  
Service Workyears

SPACE TRANSPORTATION OPERATIONS..... 22

The expendable launch vehicle program at LaRC provides centralized procurement of the Scout launch vehicle. In 1985, civil service personnel will support a program which includes the procurement of launch vehicle hardware, launch services, engineering, and maintenance. Launches under this program will be conducted from sites located at the Western Space and Missile Center in California, Wallops Flight Facility in Virginia, and San Marco Equatorial Range, Kenya, Africa.

CENTER MANAGEMENT AND OPERATIONS..... 666

Center management and operations support provides services or support to all LaRC 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 immediate staff, e.g., Chief Scientist, Equal Opportunity, and Public 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.

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**RESOURCES REQUIREMENTS BY FUNCTION**

	1983	1984		1985
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
<b>I. <u>PERSONNEL AND RELATED COSTS</u>.....</b>	<b><u>106,887</u></b>	<b><u>108,351</u></b>	<b><u>111,478</u></b>	<b><u>115,058</u></b>
<u>Summary of Fund Requirements</u>				
<b>A. <u>Compensation and Benefits</u></b>				
<b>1. <u>Compensation</u></b>				
a. Full-time permanent .....	92,670	92,737	96,298	99,045
b. Other than full-time permanent.....	1,735	1,686	1,689	1,704
c. Overtime and other compensation .....	<u>844</u>	<u>1,027</u>	<u>951</u>	<u>1,120</u>
Subtotal, Compensation.. .....	95,249	95,450	98,938	101,869
<b>2. <u>Benefits</u>.....</b>	<u>10,888</u>	<u>12,091</u>	<u>11,780</u>	<u>12,304</u>
Subtotal, Compensation and Benefits.....	<u>106,137</u>	<u>107,541</u>	<u>110,718</u>	<u>114,173</u>
<b>B. <u>Supporting Costs</u></b>				
1. Transfer of personnel .....	134	175	160	190
2. Personnel training.... ..	<u>616</u>	<u>635</u>	<u>600</u>	<u>695</u>
Subtotal, Supporting Costs.....	<u>750</u>	<u>810</u>	<u>760</u>	<u>885</u>
<b>Total, Personnel and Related Costs.....</b>	<b><u>106,887</u></b>	<b><u>108,351</u></b>	<b><u>111,478</u></b>	<b><u>115,058</u></b>

Explanation of Fund Requirements

	1983 <u>Actual</u>	1984		1985
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
A. <u>Compensation and Benefits</u> .....	<u>106,137</u>	<u>107,541</u>	<u>110,718</u>	<u>114,173</u>
1. Compensation .....	<u>95,249</u>	<u>95,450</u>	<u>98,938</u>	<u>101,869</u>
a. Full-time permanent....	<u>92,670</u>	<u>92,737</u>	<u>96,298</u>	<u>99,045</u>

The current estimate for 1984 reflects a change from the 1984 budget estimate due to the recent pay increases.

Basis of Cost for Civil Service Workyears

In 1985, the cost of permanent workyears will be \$99,045,000. The increase results from the following:

Cost of permanent workyears in 1984.....		<u>96,298</u>
Cost increases in 1985.....		<u>+4,491</u>
Within grade and career development advances:		
Full year effect of 1984 actions.....	<u>+1,161</u>	
Partial year effect of 1985 actions.....	<u>+1,303</u>	
Full year effect of 1984 pay increase.....	<u>+1,654</u>	
One more paid day in 1985.....	<u>+373</u>	
Cost decreases in 1985.....		<u>-1,744</u>
Turnover savings:		
Full-year effect of 1984 actions.....	<u>-818</u>	
Partial year effect of 1985 actions.....	<u>-499</u>	
Alteration in the method of calculating salaries paid.....	<u>-87</u>	
Reduction related to the government-wide initiation to reduce the number of GS/6 or 11-15 workyears.....	<u>-340</u>	
 Cost of full-time permanent workyears in 1985.....		 <u><u>99,045</u></u>

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
b. Other than full-time permanent				
1. Cost.....	1,735	1,686	1,689	1,704
2. Workyears .....	148	144	127	127

The distribution of 1985 workyears is as follows:

Distribution of Other Than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Developmental program.....	79
Youth opportunity programs.....	34
Other temporary... ..	<u>14</u>
Total.. ..	127

The decrease from the 1984 budget estimate to the 1984 current estimate is due to a reduction in ceiling controlled workyears.

c. Overtime and other compensation .....	844	1,027	951	1,120
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A major cost in this activity is overtime. Included in other compensation are, holiday pay, and incentive awards. The use of overtime and other compensation is limited to emergency repairs and work that cannot be accomplished during normal duty hours. This includes the monitoring of on-site contracts being performed during off-duty and wind tunnel work required at night to take advantage of off-peak electrical rates. The decrease from the 1984 budget estimate to the 1984 current estimate reflects 1983 experience level of effort. The 1985 estimate represents a higher level of effort to support the full operational mode of the National Transonic Facility.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
2. <u>Benefits</u> .....	<u>10,888</u>	<u>12,091</u>	<u>11,780</u>	<u>12,304</u>
The following are the amounts of contribution by category:				
Civil Service Retirement Fund.....	6,539	6,797	6,872	7,024
Employee Life Insurance.....	261	279	265	272
Employee Health Insurance.....	2,393	2,805	2,736	2,925
Workmen's Compensation .....	629	1,075	800	919
FICA.....	34	27	75	105
Medicare.....	958	1,091	1,011	1,028
Other Benefits.....	<u>74</u>	<u>17</u>	<u>21</u>	<u>31</u>
Total.....	<u>10,888</u>	<u>12,091</u>	<u>11,780</u>	<u>12,304</u>

The decrease from the 1984 budget estimate to the 1984 current estimate is primarily due to revised Medicare, Employee Health Insurance, and Workmen's Compensation estimates based on 1983 experience and a change in the civil service retirement system being only partially offset by the 1984 pay raise. The 1985 estimate reflects the 1984 pay raise.

B. <u>Supporting Costs</u> .....	<u>750</u>	<u>810</u>	<u>760</u>	<u>885</u>
1. Transfer of personnel.....	134	175	160	190
Transfer of personnel includes actual expenses involved in the movement and temporary storage of an employee's household goods, subsistence and temporary expenses, real estate costs, and miscellaneous moving expenses. The decrease from the 1984 budget estimate to the 1984 current estimate reflects the planned level of hires to be made in 1984. The 1985 estimate reflects the same level of activity as 1984.				
2. Personnel training.....	616	635	600	695

The purpose of the training program is to continue the development and education of civil service employees to support LARC's roles and missions more efficiently. The decrease from the 1984 budget estimate to the 1984 current estimate was necessary due to budget constraints. The 1985 estimate is essentially level with 1983 at anticipated 1985 tuition rates.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
<b>II. <u>TRAVEL</u>.....</b>	<b><u>2,127</u></b>	<b><u>2,325</u></b>	<b><u>2,294</u></b>	<b><u>2,525</u></b>

Summary of Fund Requirements

A. Program Travel.....	1,435	1,615	1,616	1,739
B. Scientific and Technical Development Travel.....	450	479	479	563
C. Management and Operations Travel.....	<u>242</u>	<u>231</u>	<u>199</u>	<u>223</u>
Total, Travel.....	2,127	2,325	2,294	2,525

Explanation of Fund Requirements

A. <u>Program Travel</u> .....	<u>1,435</u>	<u>1,615</u>	<u>1,616</u>	<u>1,739</u>
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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, and Shuttle support. The increase from the 1984 budget estimate to the 1984 current estimate reflects a reprogramming of Scientific and Technical and Management and Operations travel due to an increased number of launches. The 1985 estimate reflects essentially the same level of travel as 1984, but reflects anticipated air fare and per diem rate increases.

B. <u>Scientific and Technical Development Travel</u> .....	<u>450</u>	<u>479</u>	<u>479</u>	<u>563</u>
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Scientific and technical development travel permits employees to participate in meeting and technical seminars with other representatives of the aerospace community. Participation allows staff to benefit from exposure to technological advances outside LaRC, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems for the benefit of the Government. The decrease from the 1984 budget estimate to the 1984 current estimate is a result of a reduction in available funds due to the program travel necessary to support Shuttle launches. In addition to FY 1985 anticipated increases in per diem and travel rates, \$56,000 is included as part of the NASA-wide increase in funds for greater participation by LaRC scientists and engineers in technical meetings and symposia.

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
C. <u>Management and Operations Travel</u> .....	<u>242</u>	<u>231</u>	<u>199</u>	<u>223</u>

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters and other NASA Centers; peer group reviews, and local transportation. The decrease between the **1984** budget estimate and the **1984** current estimate reflects reprogramming into program travel resulting in a reduction in the number of management and operations trips. The **1985** estimate reflects a small increase in the level of travel over **1984** at anticipated price levels.

	1983 Actual	1984		1985
		Budget Estimate (Thousands of Dollars)	Current Estimate (Thousands of Dollars)	Budget Estimate
<b>III. OPERATION OF INSTALLATION.....</b>	<b><u>23,688</u></b>	<b><u>28,405</u></b>	<b><u>26,100</u></b>	<b><u>30,454</u></b>

Summary of Fund Requirements

A. Facilities Services.....	12,994	16,256	14,316	17,277
B. Technical Services.....	3,740	4,124	4,021	4,720
C. Management and Operations .....	<u>6,954</u>	<u>8,025</u>	<u>7,763</u>	<u>8,457</u>
Total, Operation of Installation.....	23,688	28,405	26,100	30,454

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 data processing for management activities, and the cost of educational and informational programs and exhibits; and Management and Operations, the cost of administrative communications, reproduction, transportation, medical, and logistic services.

The decrease in the 1984 current estimate from the 1984 budget estimate is the result of more accurately defined electrical requirements, more in line with the 1983 experience, coupled with a slight decrease in support service contractor rates. The 1985 budget estimate provides for utility rate increases, plus adjustments in support service contractor rates, and supplies, materials, and equipment costs. The 1985 budget estimate also reflects the Agency's operational maintenance initiative.

<b>A. FACILITIES SERVICES.....</b>	<b>12,994</b>	<b>16,256</b>	<b>14,316</b>	<b>17,277</b>
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The LaRC complex encompasses 2,068,679 gross square feet of building and space. Included are 19 major technical facilities. This physical plant houses an average daily on-Center population of 4,100 to 4,400 personnel. Many of the test facilities are utilized on more than one shift or during off-peak hours.

Summary of Fund Requirements

	<u>1983</u>	<u>1984</u>		<u>1985</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)		
1. <u>Rental of Real Property</u> .....	38	--	17	8
2. <u>Maintenance and Related Services</u> .....	534	557	527	2,255
3. <u>Custodial Services</u> .....	2,603	2,877	2,775	2,937
4. <u>Utility Services</u> .....	<u>9,819</u>	<u>12,822</u>	<u>10,997</u>	<u>12,077</u>
<u>Total, Facilities Services</u> .....	12,994	16,256	14,316	17,277

Explanation of Fund Requirements

1. <u>Rental of Real Property</u> .....	<u>38</u>	<u>--</u>	<u>17</u>	<u>8</u>
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The estimates shown here are the costs of leasing rights of way for access to model drop zone areas at Plum Tree Island.

2. <u>Maintenance and Related Services</u> .....	<u>534</u>	<u>557</u>	<u>527</u>	<u>2,255</u>
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This estimate provides funds for maintenance and repair of administrative facilities, roads and utility lines, and grounds maintenance. The increase from FY 1984 to FY 1985 reflects not only anticipated support service contractor wage rate increases and expected FY 1985 price levels for supplies, materials, equipment and other contractual effort, but an increase of \$1,700 thousand as part of the NASA-wide augmentation in Operational Maintenance effort. This augmentation will provide a level of activity more consistent with the National investment in the Langley physical plant.

3. <u>Custodial Services</u> .....	<u>2,603</u>	<u>2,877</u>	<u>2,775</u>	<u>2,937</u>
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This activity provides for janitorial and security services. Also included are funds for fire protection services provided by the City of Hampton. The decreases from the 1984 budget estimate to the 1984 current estimate reflects a cost reduction in janitorial and security services. The 1985 estimate provides for the continuation of janitorial, security and fire protection services at the 1984 level of effort.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
4. <u>Utility Services</u> .....	<u>9,819</u>	<u>12,822</u>	<u>10,997</u>	<u>12,077</u>

Included in this item is the purchase of electric service from Virginia Electric and 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 Eor East Area facilities and the purchase of steam from Hampton for facilities located in the West Area of LaRC from operation of the City of Hampton, Air Force and NASA Cooperative Refuse Burner. The decrease from the 1984 budget estimate to the 1984 current estimate reflects the 1983 experience of the successful operation of the Refuse Burner being on-line all year, reducing fuel oil needs and also reflects a reduction in the electrical rates. The 1985 budget estimate reflects rate increases in all utility costs.

B. <u>TECHNICAL SERVICES</u> .....	<u>3,740</u>	<u>4,124</u>	<u>4,021</u>	<u>4,720</u>
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Summary of Fund Requirements

1. <u>Automatic Data Processing</u> .....	<u>2,995</u>	<u>3,323</u>	<u>3,256</u>	<u>3,628</u>
a. Equipment.....	785	624	620	834
b. Operations.....	2,210	2,699	2,636	2,794
2. <u>Scientific and Technical Information</u> .....	<u>745</u>	<u>801</u>	<u>765</u>	<u>1,092</u>
a. Library.....	189	228	204	222
b. Education and Information.....	<u>556</u>	<u>573</u>	<u>561</u>	<u>870</u>
Total, Technical Services.....	3,740	4,124	4,021	4,720

Explanation of Fund Reauirements

1. <u>Automatic Data Processing</u> .....	<u>2,995</u>	<u>3,323</u>	<u>3,256</u>	<u>3,628</u>
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Funds for the Center's business computer complex which provides the accounting and management information data are provided in this function. Included are equipment lease, purchase and maintenance; paper and other expendable supplies; a contract for programming and operations; and several small contracts. The decrease from the 1984 budget estimate to the 1984 current estimate is due to a deferral of equipment replacement. The 1985 estimate provides for expected support service contractor rate escalation and for equipment replacement.

	1983 <u>Actual</u>	1984		1985 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
2. <u>Scientific and Technical Information</u> .....	<u>745</u>	<u>801</u>	<u>765</u>	<u>1,092</u>

(Thousands of Dollars)

This estimate provides support service contract assistance in the operation of the technical library and the Visitor Information Center. Funding for all the Center's public affairs activities is included in these estimates. Also included is support for operation of the Visitor Information Center; coordination of tours and special events; construction and transportation of exhibits; and other miscellaneous educational and informational programs. The decrease from the 1984 budget estimate to the 1984 current estimate reflects deferment of exhibit construction for the Visitor Information Center. The 1985 estimate reflects an expected support contractor rate escalation along with a return to the 1983 level of exhibit construction.

C. <u>MANAGEMENT AND OPERATIONS</u> .....	6,954	8,025	7,763	8,457
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Summary of Fund Requirements

1. <u>Administrative Communications</u> .....	1,908	2,017	2,310	2,735
2. <u>Printing and Reproduction</u> .....	136	173	164	175
3. <u>Transportation</u> .....	2,156	2,364	2,175	2,321
4. <u>Installation Common Services</u> .....	<u>2,754</u>	<u>3,471</u>	<u>3,114</u>	<u>3,226</u>
Total, Management and Operations.....	<u>6,954</u>	<u>8,025</u>	<u>7,763</u>	<u>8,457</u>

Explanation of Fund Reauirements

	<u>1983</u>	<u>1984</u>		<u>1985</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)		
1. <u>Administrative Communications</u> .....	<u>4,908</u>	<u>2,017</u>	<u>2,310</u>	<u>2,735</u>

Includes funds for local telephone and exchange costs; Federal Telecommunications Systems (FTS) services; and datafax and telegraphic service. The budgets for 1984 and 1985 reflect the same level of service as 1983 adjusted for rate increases in FTS and local telephone service and AT&T divestiture impact.

2. <u>Printing and Reproduction</u> .....	<u>136</u>	<u>173</u>	<u>164</u>	<u>175</u>
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Provides for special supplies for reproduction service. The 1984 current estimate is consistent with prior year experience. The 1985 estimate reflects the same level of service as 1984.

3. <u>Transportation</u> .....	<u>2,156</u>	<u>2,364</u>	<u>2,175</u>	<u>2,321</u>
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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, furniture, and other bulk objects; and operation and maintenance of the administrative aircraft. This effort also includes all of the aircraft fuel, equipment, and expendable supplies. The decrease in the 1984 current estimate from the 1984 budget estimate is due to deferment of replacing equipment. The 1985 estimate provides for continuation of the 1984 level of effort plus some necessary motor vehicle replacement.

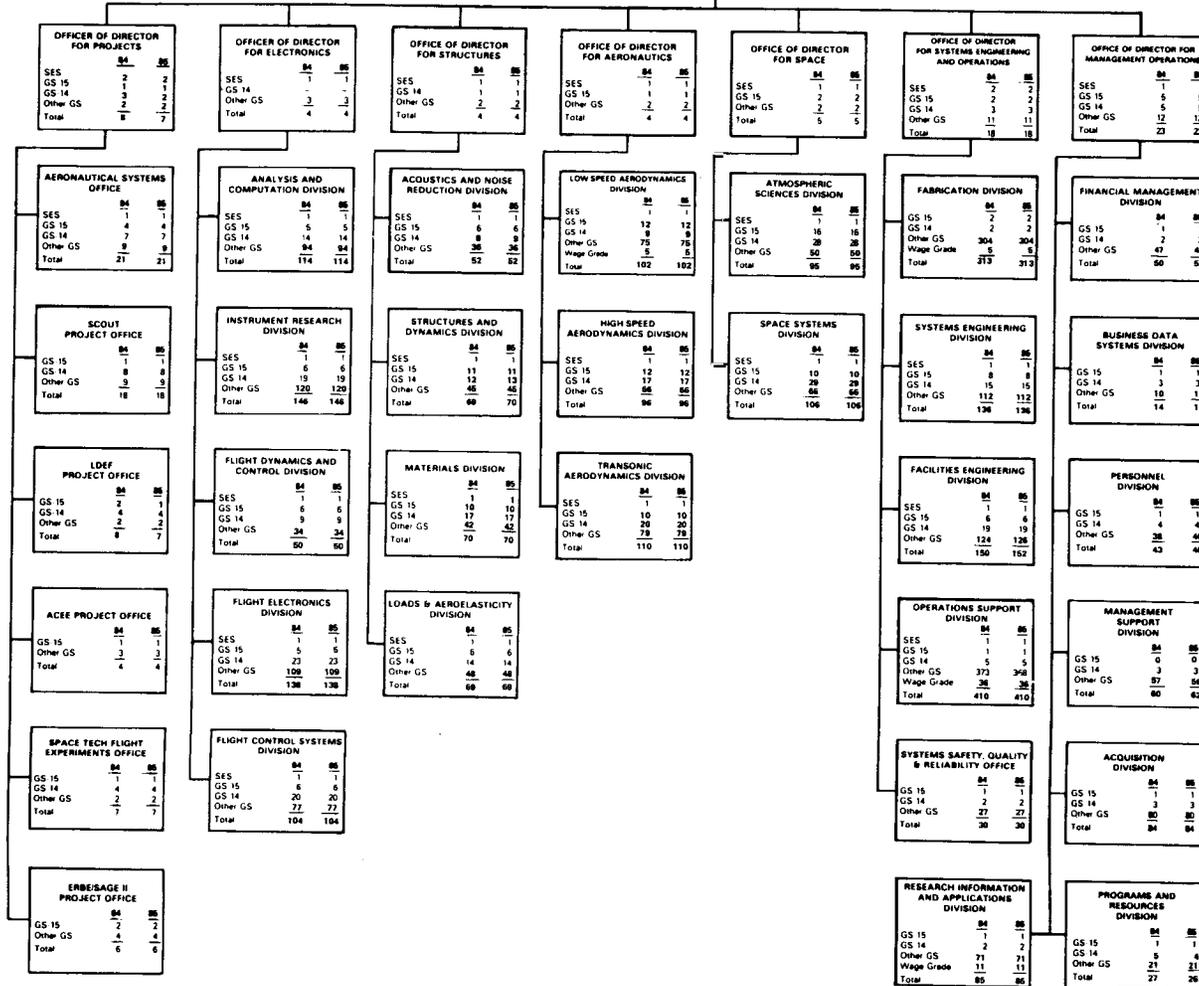
4. <u>Installation Common Services</u> .....	<u>2,754</u>	<u>3,471</u>	<u>3,114</u>	<u>3,226</u>
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Provide for medical service, mail delivery, stock issue and warehousing, and other general administrative support. Also included are the rental and maintenance of office copy machines and equipment, minority programs, and other administrative services and supplies. The decrease from the 1984 budget estimate to the 1984 current estimate reflects a postage reassessment. The 1985 estimate reflects the same level as 1984, adjusted for anticipated increases in support service contractor costs.

# LANGLEY RESEARCH CENTER

STAFFING SUMMARY		
	84	86
SES	30	30
GS 15	2	2
GS 14	148	147
Other GS	2292	2296
Wage Grade	57	57
Total	2890	2890

OFFICE OF DIRECTOR		
	84	86
SES	2	2
GS 15	1	1
GS 14	1	1
Other GS	24	26
Total	31	31





Langley Research Center  
West Area  
Fiscal Year 1985 Estimates



## RESEARCH AND PROGRAM MANAGEMENT

### FISCAL YEAR 1985 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 8,005 acres owned by NASA and approximately 47 acres in easements. There are 69 buildings and 99 concrete storage bunkers. A 100 kw wind turbine generator research facility is in operation for a program jointly sponsored by NASA and the U.S. Department of Energy. During 1975, consistent with future NASA research and technology needs, the principal facilities were placed in a standby mode. Since then a number of Federal, state and local government agencies have utilized office space and other facilities. The Garrett Corporation presently leases the Space Power Facility (SPF). The lease began on November 1, 1979, and covers a five-year period with three one-year extensions possible. The Garrett Corporation utilizes the SPF to manufacture gas centrifuges for the Department of Energy.

The total capital investment of LeRC and Plum Brook Station, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1983, was \$505,411,000.

##### CENTER ROLES AND MISSIONS

LeRC was established as an aircraft engine research laboratory to develop superior aircraft propulsion systems. Since then, LeRC 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, and space communication systems. The principal and supporting roles are:

##### PRINCIPAL

Aeronautics - develop and maintain a preeminent national capability in: fundamental aer propulsion disciplines including internal computational fluid dynamics, internal unsteady aerodynamics and

aeroelasticity, fuels and combustion chemistry and kinetics, hot section heat transfer, fluid mechanics and acoustics, aircraft icing phenomena, and computer science and applications; aeronautical propulsion and power transfer technologies including engine materials and structures, tribology, bearings, seals, inlets, nozzles, propulsion system integration, compressors, turbines, transmissions, propellers, instrumentation and controls; and the associated research facilities and techniques.

Expendable Launch Vehicles - management and operation of the Atlas and Centaur launch vehicle systems for Government and commercial users.

Space Transportation System/Cryogenic Upper Stage - design, develop and manage the Shuttle Centaur Cryogenic Upper Stage for the Space Transportation System to support the launch of the Galileo, International Solar Polar missions, Tracking and Data Relay Satellite System, Venus Radar Mapper, and Air Force missions.

Space Propulsion Systems Technology - development and maintenance of the technology base for advanced chemical and electric space propulsion systems, including associated structures and materials.

Space Energy Processes and Systems Technology - development and maintenance of the technology base for space power and energy conversion systems, including associated structures and materials.

#### SUPPORTING

Expendable Launch Vehicles - procurement of Atlas boosters for the Air Force.

Energy Processes and Systems Technology - management of research and technology projects for terrestrial applications of energy production, conservation and storage systems.

**SUMMARY OF RESOURCES REQUIREMENTS**

Funding Plan by Function

	1983 <u>Actual</u>	1984		1985 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
I. Personnel and Related Costs.....	95,295	98,009	104,157	108,264
II. Travel.....	1,837	2,086	1,979	2,178
III. Operation of Installation.....	21,637	21,762	24,277	30,061
A. Facilities Services.....	(16,761)	(18,378)	(18,394)	(22,877)
B. Technical Services.....	(1,116)	(777)	(1,974)	(2,182)
C. Management and Operations .....	<u>(3,760)</u>	<u>(2,607)</u>	<u>(3,909)</u>	<u>(5,002)</u>
Total, fund requirements .....	<u>118,769</u>	<u>121,857</u>	<u>130,413</u>	<u>140,503</u>

Distribution of Civil Service Workyears

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
<b><u>RESEARCH AND DEVELOPMENT</u></b> .....	<b><u>1,876</u></b>	<b><u>1,810</u></b>	<b><u>1,944</u></b>	<b><u>1,950</u></b>
Space Station.....	<u>---</u>	<u>---</u>	<u>---</u>	<u>25</u>
Space Transportation Capability Development .....	<u>91</u>	<u>115</u>	<u>117</u>	124
Space Science and Applications .....	<u>84</u>	<u>103</u>	<u>112</u>	<u>112</u>
Space applications .....	84	103	112	112
Technology utilization.....	<u>2</u>	<u>1</u>	<u>2</u>	<u>2</u>
Aeronautics and Space Technology .....	<u>1,699</u>	<u>1,591</u>	<u>1,713</u>	<u>1,687</u>
<b>Aeronautics</b> .....	1,283	1,219	1,336	1,310
Space .....	334	372	377	377
Energy .....	82	--	--	--
<b><u>SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS</u></b> .....	<b><u>62</u></b>	<b><u>45</u></b>	<b><u>69</u></b>	<b><u>65</u></b>
Space Transportation Operations .....	62	45	69	65
Subtotal, direct workyears .....	<u>1,938</u>	<u>1,855</u>	<u>2,013</u>	<u>2,015</u>
<b><u>CENTER MANAGEMENT AND OPERATIONS</u></b> .....	<b><u>582</u></b>	<b><u>598</u></b>	<b><u>578</u></b>	<b><u>576</u></b>
Total, full-time workyears .....	2,520	2,453	2,591	2,591
Other than full-time workyears .....	<u>180</u>	<u>144</u>	<u>125</u>	<u>125</u>
Total, workyears .....	<u><u>2,700</u></u>	<u><u>2,597</u></u>	<u><u>2,716</u></u>	<u><u>2,716</u></u>

PROGRAM DESCRIPTION

<b>RESEARCH AND DEVELOPMENT</b>	<u>Permanent Civil Service Workyears</u>
<b><u>SPACE STATION</u>.....</b>	25
<p>Space Station effort will consist of definition and integration studies and focused technology activities.</p>	
<b><u>SPACE TRANSPORTATION CAPABILITY DEVELOPMENT</u>.....</b>	124
<p>Design and development of the Cryogenic Upper Stages, Centaur G and Centaur G-Prime, are managed by the Shuttle/Centaur Project Office at LeRC. In 1985, civil service personnel will support the activities associated with qualification of the Centaur G-Prime and Centaur G vehicles and the fabrication and acceptance testing of the Centaur G-Prime vehicles to be utilized for the Galileo and International Solar Polar Missions. Major milestones in 1985 are associated with the delivery of the Galileo and ISPM upper stages to Kennedy Space Center for launch in 1986. In addition, in 1985 civil service personnel will support those activities required to integrate the Centaur Upper Stage into the Space Shuttle, and initiation of production of Centaur G vehicles for the Venus Radar Mapper and Tracking and Data Relay Satellite missions in 1988.</p>	
<b><u>SPACE APPLICATIONS</u>.....</b>	112
<p>The space applications activity at LeRC consists principally of space communications research. In FY 1985, civil service personnel will continue to support studies of various advanced satellite communications systems concepts directed at providing additional frequency bands and improved communications service. These studies are being focused on the needs of the public and private sectors, both nationally and internationally. LeRC will continue to develop technology with possible application to both ground and space segments of future advanced civil and military communications systems. In addition, LeRC has management responsibility for design and development activities on the Advanced Communication Technology Satellite (ACTS) leading to the launch in 1988.</p> <p>LeRC will be responsible, in FY 1985, for accomplishing advanced design and development of scientific flight experiments in basic science and technology associated with materials combustion and fluid dynamics phenomenon in reduced gravity.</p>	
<b><u>TECHNOLOGY UTILIZATION</u>.....</b>	2
<p>The FY 1985 technology utilization program at LeRC will continue to concentrate on the identification and evaluation of technology which can be transferred to the non-aerospace industry, and to publish this technology.</p>	

AERONAUTICS TECHNOLOGY..... 1,310

LeRC's major research and technology responsibility in aeronautics is propulsion. The primary goal is to provide the technology base for developing advanced civil and military aeronautical propulsion systems which will lead to improvements in fuel efficiency, operating cost, reliability and durability, and which will operate with acceptable environmental impact. In 1985, civil service personnel will be involved in conducting the program described below.

In aeronautical propulsion-related research, the goal is to develop an understanding of the physical phenomena related to propulsion systems and components including: structural dynamics and aeroelasticity, computational fluid mechanics, fatigue and fracture of materials, fuel chemistry and physical characterization, combustion processes and heat transfer, low- and high-temperature materials, noise generation mechanisms, and advanced control theories and concepts.

The major goal in component research is to advance the state of the art in engine component technology including the following areas: highly loaded compressor stages, advanced turbine cooling, blade tip clearance control, advanced transmissions, fuel-flexible combustors, two-dimensional nozzles, supersonic inlets, high and low-speed propellers, bearings, seals, and instrumentation.

In engine systems research, LeRC is studying the problems encountered in complete engines and propulsion systems, including engine performance at altitude, inlet flow distortion effects, dynamic component interactions including stall recovery, thrust augmentation, advanced control systems, icing research associated with propulsion systems, advanced turboprop technology, and small engine technology.

An extensive effort in materials and structures research supports the aeronautics program. The scope of this effort includes research and technology development in advanced materials, structural analysis and life prediction for advanced aircraft engines. The areas of emphasis for advanced materials are superalloys, metal matrix composites, polymeric composites, monolithic ceramics, ceramic matrix composites, protective coatings and intermetallics. The areas of emphasis for structural analysis and life prediction are structural mechanics, structural dynamics, high temperature fatigue and fracture mechanics. Research efforts are also being conducted in high temperature oxidation/corrosion and nondestructive evaluation of metal and ceramic systems.

SPACE TECHNOLOGY . . . . .

The major roles of LeRC in space research and technology are to advance the state of the art and maintain a technology base for advanced propulsion and power systems, including associated materials and structures work and space power processing, as well as technology development for a space station with a future potential of being permanently manned. In 1985, civil service personnel will be used in the activities described below:

The LeRC chemical propulsion programs emphasize the extension and advancement of the technologies of existing and conceptual hydrogen- or hydrocarbon-fueled engines such as the Space Shuttle Main Engine toward long-life, reusable, serviceable high-performance engine systems for Earth-to-orbit applications. This effort concentrates on thrust chamber cooling and life enhancement, critical turbomachinery components such as bearings, seals, improved materials, advanced structural analysis and life prediction and maintenance diagnostics. Another thrust is to provide the technology for improving orbital transfer propulsion systems in the areas of versatility, performance, life and reusability. Both high- and low-thrust systems will be investigated with emphasis on combustion and heat transfer, long-life lightweight reusable components, and high expansion area nozzles. To support this orbital propulsion work, there will be an effort in cryogenic propellant management under reduced gravity. Effort on space auxiliary propulsion systems will concentrate on the technology for gaseous hydrogen-oxygen propulsion systems and their special requirements.

The LeRC electric propulsion programs are directed toward both primary and auxiliary applications. Electrostatic propulsion is concerned with advanced thruster performance, controls and power processing. Electrothermal concepts are investigated to understand basic physical processes and to establish the feasibility of specific approaches. The performance and potential use in auxiliary propulsion systems for large low-Earth-orbit missions will be analyzed and exploited.

LeRC does basic science and technology work in materials, combustion and fluid dynamics in reduced gravity. This defines and accomplishes the conceptual design for science experiments among the scientific community in universities, industry, and government.

Space power generation programs include solar photovoltaic, electrochemical energy conversion, nuclear energy conversion, and power circuit development. The photovoltaic program is directed toward an improvement in solar cell efficiency, reduced cost and improved operating life. Electrochemical research and development supports extended operating life and improved energy density for space batteries and fuel cell components and systems. The nuclear energy conversion program, a NASA/DARPA/DOE program, is directed toward determining the feasibility of a 100 kilowatt nuclear reactor space power system.

Power circuit technology development for management of multihundred kw power systems on space vehicles of the future and new modes of power generation and conversion are being investigated. The interactions of the space plasma environment with high-voltage power systems and components are also being studied, and technology is being developed to control these interactions and prevent power system failures.

The space communications program includes applied research and advanced development in microwave electron beam amplifiers, microwave solid-state devices, and antenna systems. 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 100GHz.

The LeRC 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. The research and technology program includes environmental effects on superalloys and protective coatings, lubrication for mechanical components and protective coatings and life prediction for reusable space propulsion system.

**SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS**

Permanent Civil  
Service Workyears

SPACE TRANSPORTATION OPERATIONS.....

65

This program provides launch vehicles and launch operations for automated space missions. The program includes the procurement of vehicle systems hardware, launch services, and engineering and management support, as well as development, maintenance and operation of ground support equipment. In 1985, civil service personnel working the Atlas/Centaur launch vehicle program will continue to support the Intelsat V-A and FLTSATCOM programs. In addition, Atlas vehicles are being procured by LeRC to support Department of Defense missions.

CENTER MANAGEMENT AND OPERATIONS.....

576

Center Management and Operations Support is defined as support or services being provided to all LeRC 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., Technology Utilization, Equal Opportunity, and Public Affairs.

Management Support - Those who provide information and control services supporting all levels of Center program and functional management. Specific functions include resources planning and management, legal and patent counsel, 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, reliability and quality assurance, medical care, and graphics support.

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RESOURCES REQUIREMENTS BY FUNCTION

	1983	1984		1985
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		(Thousands of Dollars)		<u>Estimate</u>
		<u>Estimate</u>	<u>Estimate</u>	
I. <u>PERSONNEL AND RELATED COSTS</u> .....	<u>95,295</u>	<u>98,009</u>	<u>104,157</u>	<u>108,264</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Full-time permanent.....	81,057	82,325	88,503	91,505
b. Other than full-time permanent... ..	2,571	2,232	2,023	2,040
c. Overtime and other compensation.....	<u>1,152</u>	<u>1,430</u>	<u>1,452</u>	<u>1,496</u>
Subtotal, Compensation .....	84,780	85,987	91,978	95,041
2. <u>Benefits</u> .....	<u>9,685</u>	<u>11,297</u>	<u>11,299</u>	<u>12,343</u>
Subtotal, Compensation and Benefits.....	<del>94,465</del>	<u>97,284</u>	<u>103,277</u>	<u>107,384</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel.....	157	50	60	60
2. Personnel training.. ..	<u>673</u>	<u>675</u>	<u>820</u>	<u>a20</u>
Subtotal, Supporting Costs.....	<u>830</u>	<u>725</u>	<u>880</u>	<u>880</u>
Total, Personnel and Related Costs.....	<u>95,295</u>	<u>98,009</u>	<u>104,157</u>	<u>108,264</u>

Explanation of Fund Requirements

	1983 <u>Actual</u>	1984		1985 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
A. <u>Compensation and Benefits</u> .....	94,465	97,284	103,277	107,384
1. <u>Compensation</u> .. .. .	84,780	85,987	91,978	95,041
a. Full-time permanent. ....	81,057	82,325	88,503	91,505

The increase from the 1984 budget estimate to the 1984 current estimate is due primarily to the recent pay increase coupled with the full year effect of new hires in 1983. The increase in the 1985 budget estimate reflects the full year effect of the 1984 pay increases.

Basis of Cost for Civil Service Workyears

In 1985, the cost of permanent workyears will be \$91,505,000. The increase from the 1984 level results from the following:

Cost of permanent workyears in 1984.....	88,503
Cost of increases in 1985.....	+4,652
Within grade and career development advances:	
Full year effect of 1984 actions.....	+574
Partial year effect of 1985 actions.....	+983
Full year effect of 1984 pay increases.....	+1,893
Effect of 1985 decrease in offsetting reimbursements.....	+843
One more paid day in 1985.....	+359
<b>Cost</b> decreases in 1985.....	-1,650
Turnover saving:	
Full year effect of 1984 actions.....	-321
Partial year effect of 1985 actions.....	-961
Alteration in the method of calculating salaries paid..	-80
Reduction related to the Government-wide initiative to reduce the number of GS/GM 11-15 positions .....	-288
Cost of permanent full-time workyears in 1985.....	91,505

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
b. Other than full-time permanent. ....				
1. cost.....,.....	2,571	2,232	2,023	2,040
2. Workyears. ....	193	175	140	147

The distribution of 1985 workyears is as follows:

Distribution of Other Than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Development programs.....	46
Summer employment program.....	17
Youth opportunity programs.....	13
Other temporary.....	<u>62</u>
Total.....	<u>138</u>

The reduction from the 1984 budget estimate to the 1984 current estimate is due to a reduction in ceiling controlled workyears to provide for a greater number of permanent workyears. The 1985 budget estimate reflects a realignment of skill mix in the temporary employment programs coupled with workyear increases in the other temporary area.

c. Overtime and other compensation. ....	1,152	1,430	1,452	1,496
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The 1984 current estimate is slightly lower than the 1984 budget estimate due to a lower level of awards than previously planned. The 1985 estimate provides for the same level of overtime and awards as 1984.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
2. <u>Benefits</u> .....	<u>9,685</u>	<u>11,297</u>	<u>11,299</u>	<u>12,343</u>

The following are the amounts of contribution by category:

Civil Service Retirement Fund.....	5,775	6,245	6,343	6,716
Employee life insurance.....	216	253	257	266
Employee health insurance.....	2,294	2,828	2,993	3,211
Workmen's compensation .....	380	878	410	587
FICA.....	108	90	125	334
Medicare .....	890	993	1,135	1,193
Other benefits.....	<u>22</u>	<u>10</u>	<u>36</u>	<u>36</u>
Total.....	<u>9,685</u>	<u>11,297</u>	<u>11,299</u>	<u>12,343</u>

The decrease from the 1984 budget estimate to the 1984 current estimate is primarily due to a revised estimate for workmen's compensation based on Department of Labor billings. The increase in other benefits from the 1984 budget estimate to the 1984 current estimate reflects the 1984 pay raise. The increase in 1985 is due to full year impact of the 1984 pay raise.

B. <u>Supporting Costs</u> .....	<u>830</u>	<u>725</u>	<u>880</u>	<u>880</u>
1. Transfer of personnel.....	157	50	60	60

The increase from the 1984 budget estimate to the 1984 current estimate reflects a higher number of relocations than previously anticipated.

2. Personnel training.....	673	675	820	820
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The purpose of the training program is to provide for the development and education of civil service employees to more efficiently support LeRC roles and missions. The increase from the 1984 budget estimate to the 1984 current estimate reflects training required for the recently graduated scientists and engineers hired in 1983 at anticipated tuition cost levels.

	1983 <u>Actual</u>	1984		1985 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
<b>II. <u>TRAVEL</u>.....</b>	<b><u>1,837</u></b>	<b><u>2,086</u></b>	<b><u>1,979</u></b>	<b><u>2,178</u></b>

Summary of Fund Requirements

A. Program Travel.....	1,267	1,698	1,475	1,595
B. Scientific and Technical Development Travel...	234	234	275	340
C. Management & Operations Travel.....	<u>336</u>	<u>154</u>	<u>229</u>	<u>243</u>
Total, Travel.....	<u>1,837</u>	<u>2,086</u>	<u>1,979</u>	<u>2,178</u>

Explanation of Fund Requirements

A. <u>Program Travel</u> .....	<u>1,267</u>	<u>1,698</u>	<u>1,475</u>	<u>1,595</u>
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Program travel is directly related to the accomplishment of the Center's mission and accounts for approximately 74% of travel costs. These funds are necessary for the management of major contractual programs in aeronautical research and technology, space propulsion, materials research and development and space energy processes and systems technology. Program travel is also essential to the management and procurement of launch vehicles. The decrease from the 1984 budget estimate to the 1984 current estimate reflects a decreased level of travel compared to 1983 experience. The 1985 budget estimate provides for an increase in travel due to the Space Transportation System/Centaur Development program plus expected increases in travel costs.

B. <u>Scientific and Technical Development Travel</u> .....	<u>234</u>	<u>234</u>	<u>275</u>	<u>340</u>
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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 technological advances outside LeRC, as well as to present both accomplishments and problems to their associates is invaluable. Many of the meetings are working panels convened to solve problems for the benefit of the Government. The increase from the 1984 budget estimate to the 1984 current estimate reflects primarily the increased travel costs to domestic and foreign technical seminars as well as an increase in

travel requirements. The 1985 estimate provides for an increase in the number of presentations of technical papers to the scientific community than experienced in 1983 and 1984.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
C. <u>Management &amp; Operations Travel</u> .....	<u>336</u>	<u>154</u>	<u>229</u>	<u>243</u>

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, and local transportation. The increase from the 1984 budget estimate to the 1984 current estimate reflects increased travel requirements associated with new management personnel at the Center and coordination efforts involving new programs. The 1985 estimate reflects a slightly decreased level of travel offset by expected increases in travel costs.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
<b>III. <u>OPERATION OF INSTALLATION</u>.....</b>	<b><u>21,637</u></b>	<b><u>21,762</u></b>	<b><u>24,277</u></b>	<b><u>30,061</u></b>

Summary of Fund Requirements

A. Facilities Services.....	16,761	18,378	18,394	22,877
B. Technical Services.....	1,116	777	1,974	2,182
C. Management & Operations.....	<u>3,760</u>	<u>2,607</u>	<u>3,909</u>	<u>5,002</u>
Total, Operation of Installation.....	<u>21,637</u>	<u>21,762</u>	<u>24,277</u>	<u>30,061</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: (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 supplies.

The increase from 1984 budget estimate to the 1984 current estimate is due to an increase in support service contractor rates and workyears partially offset by utility rate decreases. The 1985 estimate provides for increases in: support contractor workyears and wage rates; utilities; communication rates; and an approved OMB facility maintenance initiative.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
A. <u>FACILITIES SERVICES</u> .....	<u>16,761</u>	<u>18,378</u>	<u>18,394</u>	<u>22,877</u>

Summary of Fund Requirements

1. <u>Maintenance &amp; Related Services</u> .....	2,072	1,686	2,412	4,331
2. <u>Custodial Services</u> .....	2,927	3,526	3,416	4,053
3. <u>Utility Services</u> .....	<u>11,762</u>	<u>13,166</u>	<u>12,566</u>	<u>14,493</u>
Total, Facilities Services.. ..	<u>16,761</u>	<u>18,378</u>	<u>18,394</u>	<u>22,877</u>

Explanation of Fund Requirements

1. <u>Maintenance and Related Services</u> .....	<u>2,072</u>	<u>1,686</u>	<u>2,412</u>	<u>4,331</u>
--	--------------	--------------	--------------	--------------

This activity provides for the operation and maintenance of facilities at the main installation in Cleveland 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 increase from the 1984 budget estimate to the 1984 current estimate reflects necessary maintenance, painting, equipment upgrading and an increase in contractor support for Facility Maintenance projects. The increase in 1985 is due to anticipated support contractor wage increases and a reactor documentation study at Plum Brook Station. In addition, the increase from 1984 to 1985 reflects anticipated effort service contractor wage rate increases and expected 1985 price levels for supplies, materials, equipment and other contractual effort. Also affecting this increase is the NASA-wide augmentation in Operational Maintenance which will provide a level of activity more consistent with the National investment in the Lewis physical plant.

2. <u>Custodial Services</u> .....	<u>2,927</u>	<u>3,526</u>	<u>3,416</u>	<u>4,053</u>
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Security and janitorial services are provided by support contractors. Other services include rubbish disposal, and industrial cleaning of walls and lights on an as needed basis. The increase in the 1985 budget estimate is due to a slight workyear increase and anticipated rate changes in support service contracts.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
3. <u>Utility Services</u> .....	<u>11,762</u>	13,166	<u>12,566</u>	<u>14,493</u>

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 decrease from the 1984 budget estimate to the 1984 current estimate is due to slightly lower utility rates than originally anticipated. The increase from 1984 to 1985 is attributable to rate escalation for utilities (electricity and natural gas) and support contractors.

B. <u>Technical Services</u> .....	<u>1,116</u>	<u>777</u>	<u>1,974</u>	<u>2,182</u>
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Summary of Fund Requirements

1. <u>Automatic Data Processing</u> .....	<u>492</u>	<u>200</u>	<u>1,346</u>	1,440
a. Equipment .....	198	200	227	265
b. Operations .....	294	---	1,119	1,175
2. <u>Scientific and Technical Information</u> .....	<u>624</u>	577	<u>628</u>	<u>742</u>
Total, Technical Services.....	<u>1,116</u>	<u>777</u>	<u>1,974</u>	<u>2,182</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u> .....	<u>492</u>	<u>200</u>	<u>1,346</u>	<u>1,440</u>
---	------------	------------	--------------	--------------

Funding provides for administrative data processing, including maintenance and periodic replacement of equipment, and operations. The increase from the 1984 budget estimate to the 1984 current estimate reflects the full year cost of a new support service contract for computer systems analysis. The new service contractor will provide support in business systems analysis and design, and in the implementation of new data base management system. The increase in the 1985 budget estimate is due to anticipated support contractor wage increases and the full year funding of support contractors.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
2. <u>Scientific and Technical Information</u> .....	<u>624</u>	<u>577</u>	<u>628</u>	<u>742</u>

Included in this activity is the support of the Center's educational programs and public information services. Funding for operation of the Visitor Information Center (VIC), conduct of tours and special events, construction and transport of special exhibits, and related activities are also included. The increase from the 1984 budget estimate to the 1984 current estimate is due to a VIC upgrading program. The VIC upgrading program, which began in 1983 and will continue into 1985.

C. <u>MANAGEMENT AND OPERATIONS</u> .....	<u>3,760</u>	<u>2,607</u>	<u>3,909</u>	<u>5,002</u>
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Summary of Fund Requirements

1. Administrative Communications.....	441	251	500	683
2. Printing and Reproduction .....	35	37	37	39
3. Transportation. ....	1,952	1,759	1,929	2,145
4. Installation Common Services.....	<u>1,332</u>	<u>560</u>	<u>1,443</u>	<u>2,135</u>
Total, Management and Operations.....	<u>3,760</u>	<u>2,607</u>	<u>3,909</u>	<u>5,002</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u> .....	<u>441</u>	<u>251</u>	<u>500</u>	<u>683</u>
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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 and is comprised of approximately 1,900 instruments, 950 stations and 50 incoming and outgoing lines. 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 from the 1984 budget estimate to the 1984 current estimate reflects 1983 experience plus anticipated increases due to AT&T divestiture. The 1985 budget estimate projects rate increases in local services, FTS services, other communications services plus a support contract for Telephone Operators.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	<u>Budget Estimate</u>
2. <u>Printing and Reproduction</u> .....	<u>35</u>	<u>37</u>	<u>37</u>	<u>39</u>

This activity provides for administrative printing and copier service.

3. <u>Transportation</u> .....	<u>1,952</u>	<u>1,759</u>	<u>1,929</u>	<u>2,145</u>
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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 and maintenance. The increase from the 1984 budget to the 1984 and 1985 current estimates are primarily due to increases in aircraft fuel costs and support contractor wage rates.

4. <u>Installation Common Services</u> .....	<u>1,332</u>	<u>560</u>	<u>1,443</u>	<u>2,135</u>
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This funding provides minor administrative services for Center management and staff and administrative recordkeeping at Plum Brook Station. Also included is 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. All of these services are provided by a support contractor. This function also includes funding for maintenance and periodic replacement of administrative equipment and supplies, and postage. The increase from the 1984 budget estimate to the 1984 current estimate reflects anticipated support service contractor rate increases coupled with workyear increases for the physical fitness facility and equipment. The 1985 budget estimate includes the full year effect of the support contracts starting in 1984 plus workyear increases for clerical services coupled with anticipated support service contractor rate increases.

**National Aeronautics and Space Administration  
Organization and Staffing Chart  
LEWIS RESEARCH CENTER  
Cleveland, Ohio**

STAFFING SUMMARY		
	86	85
SES	30	30
EXCEPTED	1	1
CS-16	1	1
CS-15	101	104
CS-14	271	269
OTHER GS	1508	1401
WG	837	839
TOTAL	2643	2545

OFFICE OF THE DIRECTOR		
	86	85
SES	1	1
OTHER GS	3	3
TOTAL	4	4

OFFICE OF EXTERNAL AFFAIRS		
	86	85
CS-15	1	1
CS-14	1	1
OTHER GS	20	20
TOTAL	22	22

OFFICE OF EQUAL OPPORTUNITY PROGRAMS		
	86	85
CS-14	4	4
OTHER GS	3	3
TOTAL	7	7

OFFICE OF THE CHIEF COUNSEL		
	86	85
CS-15	1	1
CS-14	3	3
OTHER GS	3	3
TOTAL	7	7

OFFICE OF THE COMPTROLLER		
	86	85
SES	1	1
OTHER GS	1	1
TOTAL	2	2

DIRECTOR OF AERONAUTICS		
	86	85
SES	2	2
EXCEPTED	1	1
CS-15	2	2
CS-14	1	1
OTHER GS	1	1
TOTAL	7	7

DIRECTOR OF SPACE TECHNOLOGY		
	86	85
SES	1	1
CS-14	8	6
OTHER GS	20	20
TOTAL	29	27

DIRECTOR OF SPACE FLIGHT SYSTEMS		
	86	85
SES	1	1
OTHER GS	1	1
TOTAL	2	2

DIRECTOR OF MATERIALS AND STRUCTURES		
	86	85
SES	1	1
OTHER GS	1	1
TOTAL	2	2

DIRECTOR OF ENGINEERING AND TECHNICAL SERVICES		
	86	85
SES	1	1
OTHER GS	2	2
TOTAL	3	3

DIRECTOR OF ADMINISTRATION AND COMPUTER SERVICES		
	86	85
SES	2	2
CS-15	1	1
CS-14	1	1
OTHER GS	2	2
TOTAL	6	6

PROGRAM COORDINATION OFFICE		
	86	85
CS-15	1	1
OTHER GS	3	3
TOTAL	4	4

ADVANCED PROGRAMS AND PLANNING OFFICE		
	86	85
SES	1	1
CS-15	1	1
CS-14	6	6
OTHER GS	11	11
TOTAL	19	19

SPACE SYSTEMS OFFICE		
	86	85
CS-15	4	5
CS-14	1	1
TOTAL	5	6

MANAGEMENT OPERATIONS OFFICE		
	86	85
CS-14	1	1
OTHER GS	12	12
TOTAL	13	13

PROJECT MANAGEMENT AND COORDINATION OFFICE		
	86	85
CS-15	1	1
CS-14	2	2
OTHER GS	2	2
TOTAL	5	5

ALTIITUDE WIND TUNNEL PROJECT OFFICE		
	86	85
CS-15	1	1
CS-14	1	1
OTHER GS	7	7
TOTAL	9	9

FLIGHT BOOK MANAGEMENT OFFICE		
	86	85
OTHER GS	3	3
TOTAL	3	3

REQUIREMENTS ANALYSIS AND MANAGEMENT OFFICE		
	86	85
CS-15	1	1
OTHER GS	17	17
TOTAL	18	18

AERODYNAMICS AND ENGINE SYSTEMS DIVISION		
	86	85
SES	1	1
CS-15	5	5
CS-14	18	17
OTHER GS	85	83
TOTAL	109	106

ENERGY TECHNOLOGY DIVISION		
	86	85
SES	1	1
CS-15	1	1
CS-14	24	24
OTHER GS	32	30
TOTAL	68	66

SPACE COMMUNICATIONS DIVISION		
	86	85
SES	1	1
CS-15	7	7
CS-14	20	20
OTHER GS	104	102
TOTAL	132	130

MATERIALS DIVISION		
	86	85
SES	1	1
CS-15	7	6
CS-14	17	16
OTHER GS	76	78
TOTAL	101	99

TEST INSTALLATIONS DIVISION		
	86	85
CS-14	8	8
OTHER GS	1	1
WG	295	295
TOTAL	404	404

PATENT COUNSEL OFFICE		
	86	85
CS-15	1	1
CS-14	2	2
OTHER GS	1	1
TOTAL	4	4

FINANCIAL MANAGEMENT OFFICE		
	86	85
CS-15	1	1
OTHER GS	47	47
TOTAL	48	48

PROCESSED SYSTEMS DIVISION		
	86	85
SES	1	1
CS-15	6	6
CS-14	10	10
OTHER GS	64	61
TOTAL	81	78

SPACE POWER TECHNOLOGY DIVISION		
	86	85
SES	1	1
CS-15	1	1
CS-14	14	14
OTHER GS	78	80
TOTAL	94	96

SPACE TRANSPORTATION ENGINEERING DIVISION		
	86	85
SES	1	1
CS-15	5	5
CS-14	15	15
OTHER GS	102	103
TOTAL	123	124

STRUCTURES AND MECHANICAL TECHNOLOGIES DIVISION		
	86	85
SES	1	1
CS-15	11	11
CS-14	16	16
OTHER GS	54	54
TOTAL	82	82

FACILITIES OPERATIONS AND MAINTENANCE DIVISION		
	86	85
CS-14	1	1
OTHER GS	48	48
WG	162	162
TOTAL	189	189

PERSONNEL DIVISION		
	86	85
CS-15	1	1
OTHER GS	34	34
TOTAL	35	35

PROCUREMENT DIVISION		
	86	85
CS-15	1	1
CS-14	2	2
OTHER GS	91	91
TOTAL	94	94

FIELD SERVICES AND INSTRUMENTATION DIVISION		
	86	85
SES	1	1
CS-16	1	1
CS-15	9	9
CS-14	22	22
OTHER GS	65	65
TOTAL	98	98

SPACE PROPULSION TECHNOLOGY DIVISION		
	86	85
SES	1	1
CS-15	3	3
CS-14	14	14
OTHER GS	82	82
TOTAL	90	88

SHUTTLE/CENTAUR PROJECT OFFICE		
	86	85
SES	1	1
CS-15	1	1
CS-14	8	8
OTHER GS	12	12
TOTAL	20	20

FABRICATION AND SUPPORT TECHNOLOGIES DIVISION		
	86	85
CS-14	1	1
OTHER GS	27	27
WG	115	115
TOTAL	143	143

ENGINEERING DESIGN DIVISION		
	86	85
SES	1	1
CS-15	3	3
CS-14	7	7
OTHER GS	81	81
TOTAL	92	92

COMPUTER SERVICES DIVISION		
	86	85
SES	1	1
CS-15	4	4
CS-14	10	10
OTHER GS	122	122
TOTAL	137	137

HEALTH, SAFETY AND SECURITY DIVISION		
	86	85
CS-15	2	2
CS-14	2	2
OTHER GS	40	40
TOTAL	44	44

AEROTHERMODYNAMICS AND FLEETS DIVISION		
	86	85
SES	3	3
CS-14	8	8
CS-15	19	19
OTHER GS	72	72
TOTAL	102	102

ATLAS/CENTAUR PROJECT OFFICE		
	86	85
SES	1	1
CS-15	1	1
CS-14	1	1
OTHER GS	5	5
TOTAL	8	8

RELIABILITY AND QUALITY ASSURANCE OFFICE		
	86	85
CS-15	1	1
CS-14	7	7
OTHER GS	22	22
TOTAL	30	30

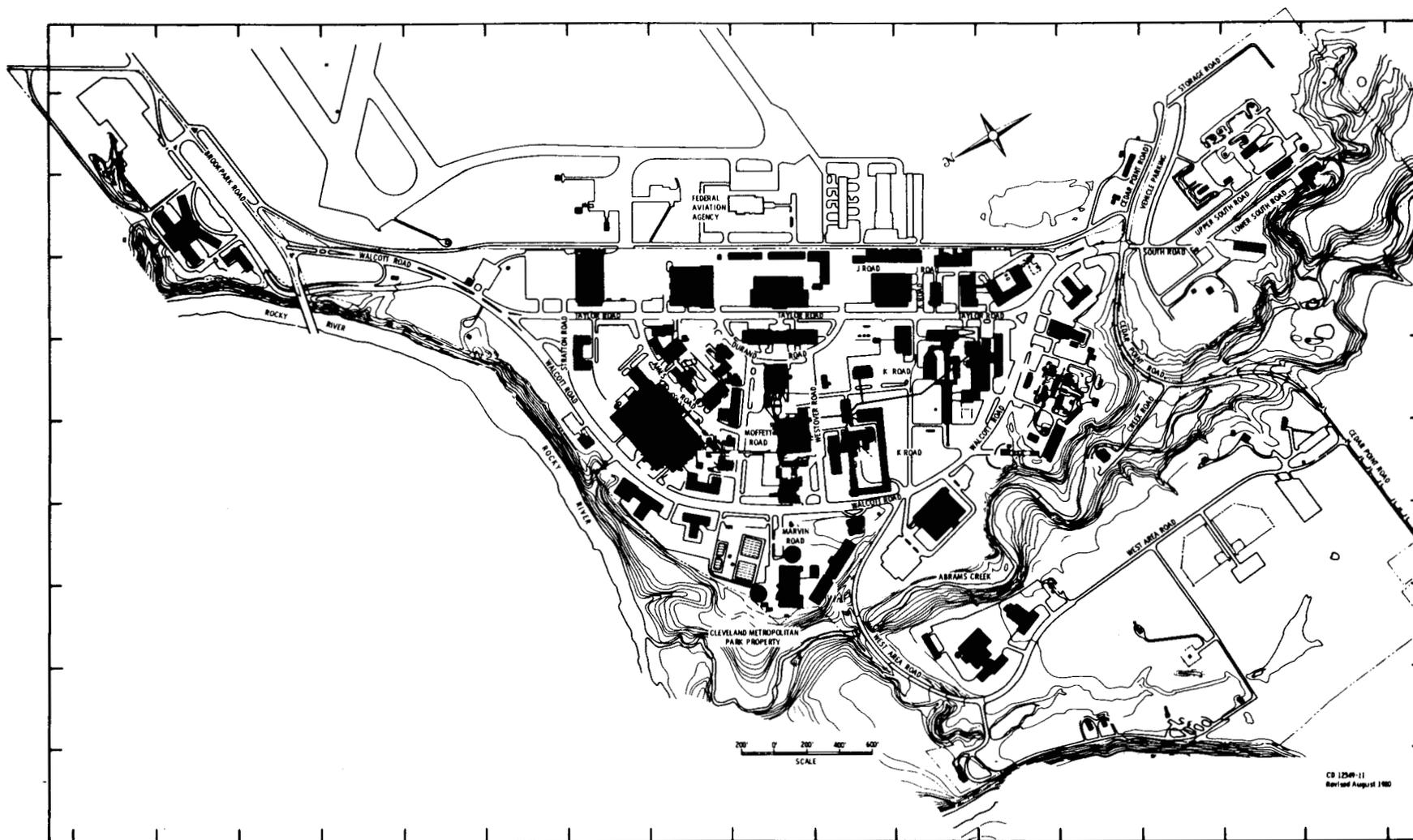
FACILITIES ENGINEERING DIVISION		
	86	85
SES	1	1
CS-15	4	4
CS-14	8	8
OTHER GS	63	63
TOTAL	76	76

LOGISTICS MANAGEMENT DIVISION		
	86	85
CS-14	1	1
OTHER GS	52	52
WG	1	1
TOTAL	54	54

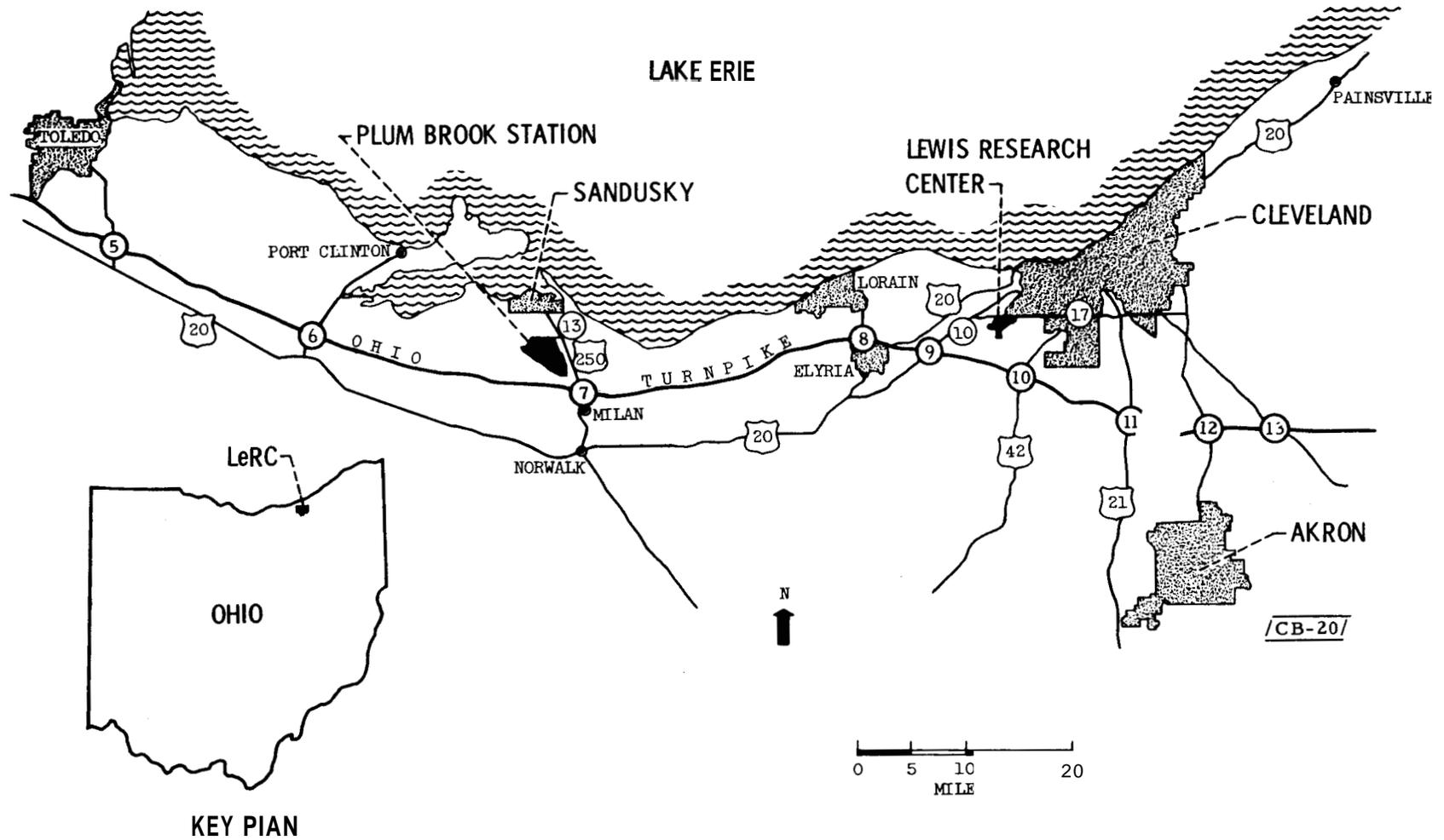
TECHNICAL INFORMATION SERVICES DIVISION		
	86	85
CS-14	1	1
OTHER GS	52	52
WG	6	6
TOTAL	59	59

JANUARY 10, 1986

LEWIS RESEARCH CENTER  
FISCAL YEAR 1985 ESTIMATES  
LOCATION PLAN



LEWIS RESEARCH CENTER  
FISCAL YEAR 1985 ESTIMATES  
AREA MAP

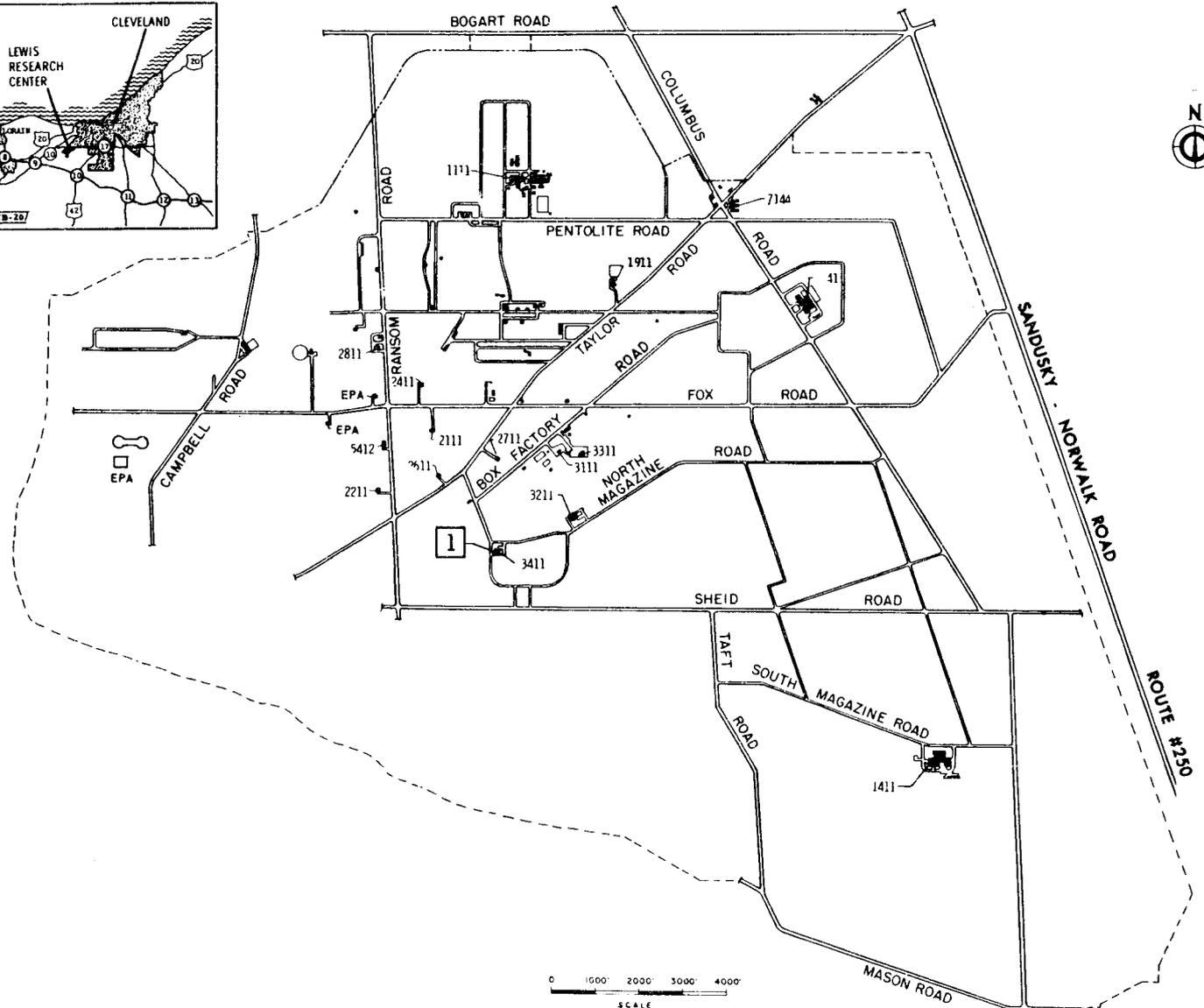
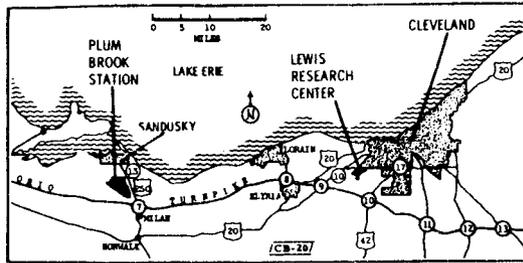


LEWIS RESEARCH CENTER  
FISCAL YEAR 1985 ESTIMATES  
CLEVELAND FACILITIES



LEWIS RESEARCH CENTER  
PLUM BROOK STATION  
FISCAL YEAR 1985 ESTIMATES

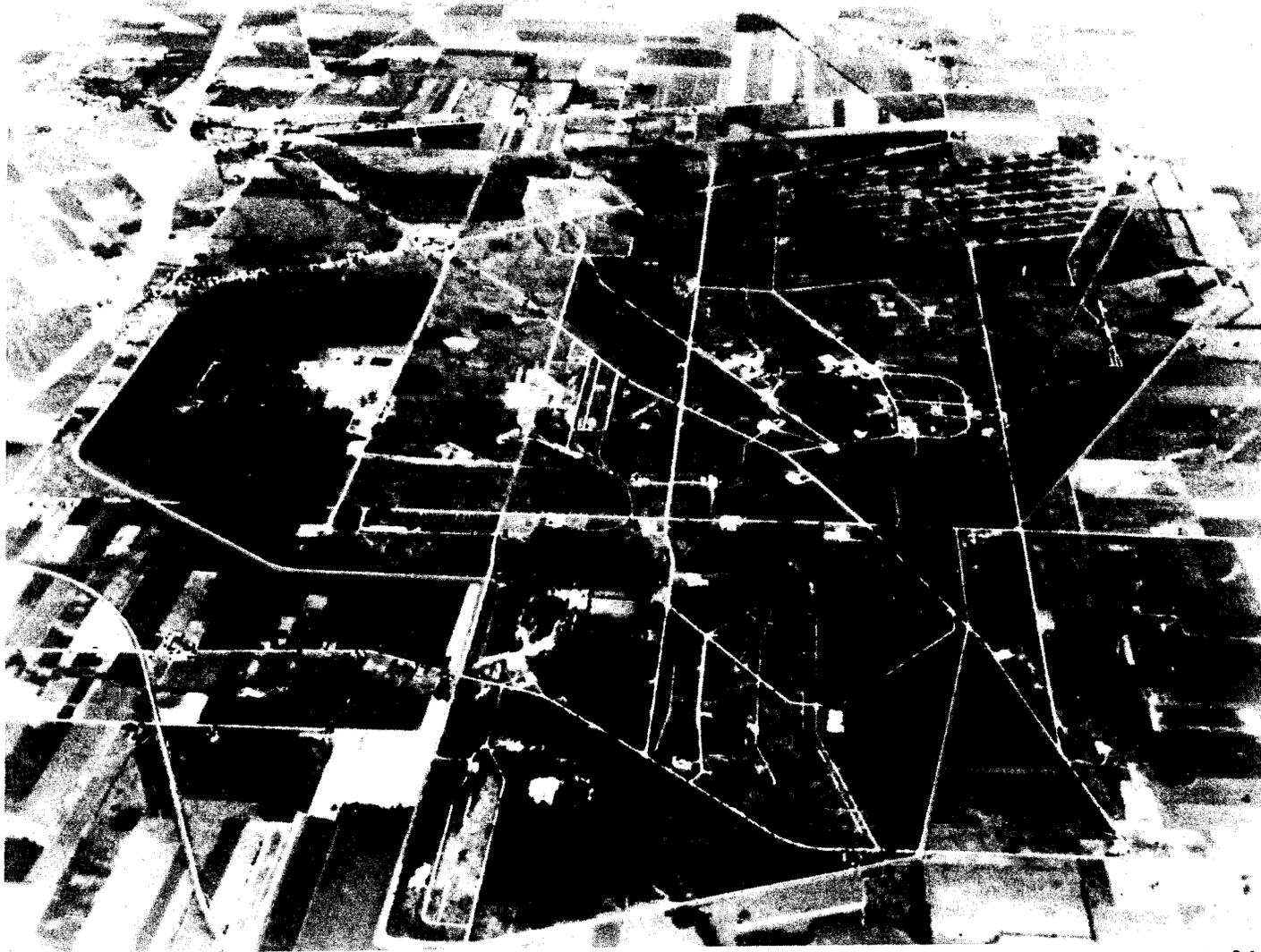
LOCATION PLAN



REVISED JULY 31, 1980

RPM 8-25

LEWIS RESEARCH CENTER  
FISCAL YEAR 1985 ESTIMATES  
**PLUM BROOK FACILITIES**



RPM 8-26

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1985 ESTIMATES

NASA HEADQUARTERS

DESCRIPTION

NASA Headquarters is located at 400 Maryland Avenue, SW, Washington, D.C., and occupies other buildings in the District of Columbia and Maryland.

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. These objectives are to:

- Extend our knowledge of the Earth, its environment, the solar system, and the universe;
- Expand practical applications of space technology;
- Develop, operate, and improve manned and unmanned space vehicles;
- Improve the civil and military usefulness of aeronautical vehicles, while minimizing their environmental effects and energy consumption;
- Disseminate pertinent findings to potential users; and
- Promote international cooperation in peaceful activities in space.

The following offices at Headquarters assist management 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. Included in these programs is the Space Shuttle, an essential element of the Space Transportation System (STS). Also included in the STS are the orbiters, engines, external tanks, solid rocket boosters, upper stages and ground and flight systems. This office develops and implements policy for all system users to interface with STS. Responsibilities also include development and implementation of appropriate transition policies for expendable launch vehicles to be transferred from the Government to the private sector. The Office of Space Flight promotes improvements in effectiveness, cost

efficiency and timeliness of STS operational performance. This office also maintains relationships with industry, international organizations, foreign entities, universities, the scientific community, and other Government agencies with respect to the space flight program, including the Spacelab program, in coordination with the Office of External Relations. Also included within this organization is the Space Station Task Force which is responsible for the development of the programmatic aspects of a space station as they evolve including mission analysis, requirements definition and program management. This organization reports directly to the Associate Deputy Administrator.

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 and Space Technology - Plans, directs, executes, and evaluates the aeronautical and space research and technology programs. The aeronautics program develops technology culminating in safer, more efficient, economical and environmentally acceptable air transportation systems which are responsive to national needs. The space research and technology program provides a technology base which anticipates the technical needs and provides technology options for future space activities. The Office of Aeronautics and Space Technology is also responsible for coordinating the total NASA program of supporting research and technology related to specific programs and projects to insure a comprehensive, properly balanced agency research and technology program.

Office of Space Tracking and Data Systems - 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 provides centralized planning and systems management for the administrative communications of NASA installations.

Office of External Relations - Plans, directs, executes and evaluates the Technology Utilization program, whose purpose is to enhance national economic growth and productivity through the transfer of NASA developed technology to the non-aerospace sectors of the economy.

The Headquarters responsibilities include providing a balanced Agency Headquarters workforce capable of:

- Planning, formulating, and advocating executive direction to national programs to implement the objectives stated in the National Aeronautics and Space Act of 1958, as amended.
- Administering, operational and logistical support to those Headquarters elements concerned with carrying out the mission of the National Aeronautics and Space Administration.
- Providing adequate facilities to house the workforce in Washington, D.C.

The Headquarters workforce consists of professional 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 NASA mission. The number of personnel authorized 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. Overall Agency direction is provided by the Administrator, and his personal office staff. The Agency currently has eight installations, and 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.

SUMMARY OF RESOURCES REQUIREMENTS

Funding Plan by Function

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related Cost.....	72,182	73,356	75,355	76,695
11. Travel.....	4,010	4,485	4,485	4,829
III. Operation of Installation.....	34,828	42,107	33,170	37,407
A. Facilities Services.....	(6,285)	(9,062)	(7,001)	(9,752)
B. Technical Services.....	(19,059)	(21,512)	(15,782)	(16,476)
C. Management and Operations .....	<u>(9,484)</u>	<u>(11,533)</u>	<u>(10,387)</u>	<u>(11,179)</u>
Total, fund requirements.....	<u>111,020</u>	<u>119,948</u>	<u>113,010</u>	<u>118,931</u>

Distribution of Permanent Workyears by Program

	1983 <u>Actual</u>	1984		1985
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
<b><u>RESEARCH AND DEVELOPMENT</u> .....</b>	<b><u>399</u></b>	<b><u>402</u></b>	<b><u>390</u></b>	<b><u>390</u></b>
Space Station.....	9	---	9	25
Space Transportation Capability Development.....	43	49	40	24
Space Science and Applications.....	210	215	207	207
Physics and astronomy.....	59	65	59	59
Life sciences.....	29	33	28	28
Planetary exploration.....	30	26	29	29
Space applications.....	<u>92</u>	<u>91</u>	<u>91</u>	<u>91</u>
Technology Utilization.....	<u>12</u>	<u>13</u>	<u>12</u>	<u>12</u>
Aeronautics and Space Technology.....	<u>122</u>	<u>122</u>	<u>119</u>	<u>119</u>
Aeronautical research and technology.....	73	73	71	71
Space research and technology.....	49	49	48	48
Tracking and Data Advanced Systems.....	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>
<b><u>SPACE FLIGHT CONTROL AND DATA COMMUNICATIONS</u> .....</b>	<b><u>201</u></b>	<b><u>196</u></b>	<b><u>194</u></b>	<b><u>194</u></b>
Shuttle Production and Operational Capability.....	25	22	22	22
Space Transportation Operations.....	123	123	120	120
Space and Ground Network Communications and Data Systems.....	53	51	52	52
Subtotal. direct workyears.....	600	598	584	584
<b><u>CENTER MANAGEMENT AND OPERATIONS SUPPORT</u> .....</b>	<b><u>834</u></b>	<b><u>859</u></b>	<b><u>839</u></b>	<b><u>839</u></b>
Total. full-time permanent workyears.....	1.434	1.457	1.423	1.423
Other than full-time permanent workyears.....	<u>149</u>	<u>136</u>	<u>135</u>	<u>135</u>
Total. Permanent Workyears.....	<u>1.583</u>	<u>1.593</u>	<u>1.558</u>	<u>1.558</u>

RESOURCES REQUIREMENTS BY FUNCTION

	1983	1984		1985
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
<b>I. <u>PERSONNEL AND RELATED COSTS</u>.....</b>	<b><u>72,182</u></b>	<b><u>73,356</u></b>	<b><u>75,355</u></b>	<b><u>76,695</u></b>
<u>Summary of Fund Requirements</u>				
<b>A. <u>Compensation and Benefits</u></b>				
1. <u>Compensation</u>				
a. Full-time permanent.....	58,339	58,505	60,296	61,184
b. Other than full-time permanent.....	2,885	2,767	2,811	2,843
c. Reimbursable detailees.....	682	599	682	691
d. Overtime and other compensation.....	<u>1,364</u>	<u>1,677</u>	<u>1,490</u>	<u>1,638</u>
Subtotal, Compensation.....	63,270	63,548	65,279	66,356
2. <u>Benefits</u> .....	<u>6,767</u>	<u>7,361</u>	<u>7,406</u>	<u>7,686</u>
Subtotal, Compensation and Benefits...	<u>70,037</u>	<u>70,909</u>	<u>72,685</u>	<u>74,042</u>
<b>B. <u>Supporting Costs</u></b>				
1. Transfer of personnel.....	495	586	646	713
2. Office of Personnel Management services.....	260	275	340	275
3. Personnel training.....	<u>1,390</u>	<u>1,586</u>	<u>1,684</u>	<u>1,665</u>
Subtotal, Supporting Costs.....	<u>2,145</u>	<u>2,447</u>	<u>2,670</u>	<u>2,653</u>
Total, Personnel and Related Costs.....	<u>72,182</u>	<u>73,356</u>	<u>75,355</u>	<u>76,695</u>

Explanation of Fund Requirements

	1983 <u>Actual</u>	<u>1984</u>		1985
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
(Thousands of Dollars)				
A. <u>Compensation and Benefits</u> .....	70,037	<del>70,909</del>	<u>72,685</u>	74,042
1. <u>Compensation</u> .....	<u>63,270</u>	<u>63,548</u>	<u>65,279</u>	66,356
a. Tull-time permanent .....	58,339	58,505	60,296	61,184

The current estimate for 1984 reflects a change from the 1984 budget estimate due to the recent pay increases.

Basis of Cost for Permanent Positions

In 1985 the cost of permanent workyears will be \$61,184,000. The increase from 1984 results from the following:

Cost of full-time permanent workyears in 1984.....	60,296
Cost increases in 1985.....	+2,023
Within grade and career advances:	
Full year effect of 1984 actions.....	+831
Partial year effect of 1985 actions.....	+469
Full year effect of 1984 pay increases.....	+493
Additional paid day in 1985.....	+230
Cost decreases in 1985.....	-1,135
Turnover savings and abolished positions:	
Full year effect of 1984 actions.....	-192
partial year effect of 1985 actions.....	-699
Alteration in the method of calculation of salaries paid...	-51
Reduction related to the Government-wde initiative to reduce the number of GS/GM 11-15 positions... ..	-193
Cost of full-time permanent workyears in 1985.....	<u>61,184</u>

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
b. Other than full-time permanent				
(1) Cost.....	2,885	2,767	2,811	2,843
(2) Workyears.....	170	157	156	156

The distribution of 1985 workyears is as follows:

Distribution of Other Than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Developmental programs.....	35
Summer employment programs.....	5
Youth opportunity programs.....	20
Other temporary.....	<u>96</u>
 Total.....	 <u>156</u>

The increase from the 1984 budget estimate to the 1984 current estimate is a result of the recent pay increase. The 1985 estimate is essentially level with 1984.

c. Reimbursable detailees.....	682	599	682	691
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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 increase from the 1984 budget estimate to the 1984 current estimate is attributable to the recent pay increase and an increase in the number of detailees. The 1985 budget estimate reflects essentially a level program from 1984.

	1983 Actual	1984		1985
		Budget Estimate	Current Estimate	Budget Estimate
d. Overtime and other compensation.....	1,364	1,677	1,490	1,638

(Thousands of Dollars)

The decrease from the 1984 budget estimate to the 1984 current estimate more accurately reflects 1983 experience. The increase from 1984 to 1985 reflects the full year cost of the pay increase.

2. <u>Benefits</u> .....	<u>6,767</u>	<u>7,361</u>	<u>7,406</u>	<u>7,686</u>
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The following are the amounts of contribution by category:

Civil Service Retirement Fund.....	4,186	4,225	4,411	4,532
Employee life insurance.....	163	180	183	188
Employee health insurance.....	1,217	1,474	1,512	1,620
Workmen's compensation.....	464	579	505	519
FICA.....	83	82	94	98
Medicare.....	551	603	626	651
Other benefits.....	<u>103</u>	<u>218</u>	<u>75</u>	<u>78</u>
Total.....	<u>6,767</u>	<u>7,361</u>	<u>7,406</u>	<u>7,686</u>

The increases in the 1984 current estimate from the 1984 budget estimate to the 1985 estimate is primarily due to the recent increased health benefits and pay increase. The workman's compensation estimates are those provided by the Department of Labor.

B. <u>Supporting Costs</u> .....	<u>2,145</u>	<u>2,447</u>	<u>2,670</u>	<u>2,653</u>
1. Transfer of personnel.....	495	586	646	713

The costs associated with transfer of personnel include movement of household goods, subsistence and temporary expenses, real estate and miscellaneous moving expenses related to change of duty station. The increase from the 1984 budget estimate to the 1984 current estimate reflects a revised number of relocations and an increase in money allowances authorized in recent legislation. The 1985 estimate reflects anticipated changes in costs to be paid.

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
2. Office of Personnel Management services.....	260	275	340	275

(Thousands of Dollars)

Headquarters reimburses the Office of Personnel Management (OPM) for investigation of new hires for the entire Agency. The cost of investigations is a function of two variables, the number of investigations to be conducted, and the unit charge made by the Office of Personnel Management to other agencies. Also included is a payment to OPM for Federal wage system surveys.

3. Personnel training... ..	1,390	1,586	1,684	1,665
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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 nongovernmental 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 in which groups of Headquarters and Field Center employees receive training in subjects of Agencywide interest. The increase from the 1984 budget to the 1984 current estimate reflects the emphasis on the development of the skills of civil service employees in the area of automatic data processing in order to improve efficiency and productivity. The 1985 estimate provides for a decreased level of training at anticipated cost levels.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
11. <u>TRAVEL</u> .....	<u>4,010</u>	<u>4,485</u>	<u>4,485</u>	<u>4,829</u>

(Thousands of Dollars)

Summary of Fund Requirements

A. Program Travel.....	2,336	2,687	2,687	2,837
B. Scientific and Technical Development Travel.....	512	523	523	653
C. Management and Operations Travel.....	<u>1,162</u>	<u>1,275</u>	<u>1,275</u>	<u>1,339</u>
Total, Travel.....	<u>4,010</u>	<u>4,485</u>	<u>4,485</u>	<u>4,829</u>

Explanation of Fund Requirements

A. <u>Program Travel</u> .....	2,336	2,687	2,687	2,837
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Program travel funds are used in support of NASA's research and development programs, such as the Space Transportation System, Aeronautics and Space Technology, Space Science and Applications, and other direct research and development programs. This category represents approximately 42 percent of the Headquarters travel requirements for 1985. The decrease from the 1984 budget estimate to the 1984 current estimate more accurately reflects 1983 experience. The 1985 estimate provides for planned travel requirements at anticipated travel price levels.

B. <u>Scientific and Technical Development Travel</u> .....	512	523	523	653
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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. Many of these meetings are working panels convened to solve certain problems for the benefit of the Government. In addition to anticipated increases in per diem and travel rates, \$100,000 is included in FY 1985 as part of the NASA-wide increase in funds for greater participation by Headquarters' scientists and engineers in technical meetings and symposia.

	1983 <u>Actual</u>	1984		1985
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
C. <u>Management and Operations Travel</u> .....	1,162	1,275	1,275	1,339

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 by functional managers in such areas as personnel, financial management, and procurement to assure Agency policies and procedures are being implemented throughout the agency; local transportation; and congressional travel. The 1985 estimate provides for planned travel requirements at anticipated travel price levels.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
<b>III. OPERATION OF INSTALLATION.....</b>	<b><u>34,828</u></b>	<b><u>42,107</u></b>	<b><u>33,170</u></b>	<b><u>37,407</u></b>

(Thousands of Dollars)

Summary of Fund Requirements

A. Facilities Services.....	6,285	9,062	7,001	9,752
B. Technical Services.....	19,059	21,512	15,782	16,476
C. Management and Operations.....	<u>9,484</u>	<u>11,533</u>	<u>10,387</u>	<u>11,179</u>
Total, Operation of Installation.....	<u>34,828</u>	<u>42,107</u>	<u>33,170</u>	<u>37,407</u>

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, rental of real property, acquisition, maintenance and repair of institutional facilities and equipment, and the cost of custodial services; 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 supplies, and related services.

The decrease from the 1984 budget estimate to the 1984 current estimate is primarily due to the delay and deferral of activities to accommodate the appropriation reduction, partial absorption of increased pay costs, and realignment of service to more accurately portray the cost of services. The 1985 budget estimate provides for projected increases in support contractor rates, supplies, materials, and equipment along with anticipated communication and rental of property rates.

<b>A. FACILITIES SERVICES.....</b>	<b><u>6,285</u></b>	<b><u>9,062</u></b>	<b><u>7,001</u></b>	<b><u>9,752</u></b>
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NASA Headquarters is comprised of a complex of buildings in the District of Columbia and Maryland. These are government-owned and leased buildings for which NASA must provide reimbursement to the General Services Administration (GSA) in accordance with P.L. 92-313.

Summary of Fund Requirements

	1983 <u>Actual</u>	-----1984-----		1985
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
(Thousands of Dollars)				
1. <u>Rental of Real Property</u> .....	4,892	8,006	5,667	8,293
2. <u>Maintenance and Related Services</u> .....	<u>1,123</u>	<u>772</u>	<u>772</u>	<u>811</u>
a. Facilities.....	1,123	772	772	811
b. Equipment. ....	---	---	---	---
3. <u>Custodial Services</u> .....	<u>270</u>	<u>284</u>	<u>562</u>	<u>648</u>
Total, Facilities Services.....	<u>6,285</u>	<u>9,062</u>	<u>7,001</u>	<u>9,752</u>

Explanation of Fund Requirements

1. <u>Rental of Real Property</u> .....	<u>4,892</u>	<u>8,006</u>	<u>5,667</u>	<u>8,293</u>
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Public Law 92-313 requires that agencies be charged for space and related services provided by the General Services Administration at approximate commercial equivalent rates. These funds provide for the cost of office space used by NASA Headquarters personnel. The decrease in the 1984 estimate is due to an adjustment to the rental rates by GSA. FY 1985 reflects rental rates as projected by GSA.

2. <u>Maintenance and Related Services</u> .....	<u>1,123</u>	<u>772</u>	<u>772</u>	<u>811</u>
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This estimate includes maintenance, repair and alterations of buildings such as partition changes, telephone changes and general buildings maintenance. The 1985 estimate includes anticipated supply and equipment cost increases.

3. <u>Custodial Services</u> .....	<u>270</u>	<u>284</u>	<u>562</u>	<u>648</u>
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These funds cover security guard 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 1984 current estimate reflects increased rates as projected by GSA and additional security in order to furnish adequate protection for classified defense information, government/personal property, and NASA employees. FY 1985 includes the full year funding of the additional security and GSA projected rates.

B. <u>TECHNICAL SERVICES</u> .....	<u>19,059</u>	<u>21,512</u>	<u>15,782</u>	<u>16,476</u>
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Summary of Fund Requirements

1. <u>Automatic Data Processing</u> .....	<u>12,371</u>	<u>14,091</u>	<u>12,105</u>	12,866
a. Equipment .....	4,107	3,121	5,187	5,240
b. Operations .....	8,264	10,970	6,918	7,626
2. <u>Scientific and Technical Information</u> .....	<u>5,972</u>	<u>6,767</u>	2,976	<u>2,865</u>
a. Library. ....	405	379	702	422
b. Education and Information.....	5,567	6,388	2,274	2,443
3. <u>Shop and Support Services</u> .....	<u>716</u>	<u>654</u>	<u>701</u>	<u>745</u>
Total, Technical Services.....	<u>19,059</u>	<u>21,512</u>	<u>15,782</u>	<u>16,476</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u> .....	<u>12,371</u>	<u>14,091</u>	<u>12,105</u>	<u>12,866</u>
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This estimate provides for the lease, purchase, maintenance, programming and operations services of automatic data processing (ADP) equipment. The decrease from the 1984 budget to the 1984 current estimate reflects the realignment of ADP support to more accurately portray the cost of these services. The 1985 estimate provides for approximately the same level of services as in 1984 at anticipated rates.

2. <u>Scientific and Technical Information</u> .....	<u>5,972</u>	<u>6,767</u>	<u>2,976</u>	<u>2,865</u>
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The activities contained in this subfunction are educational-informational programs and the NASA technical library.

The education and information programs provide for the gathering and dissemination of information about the Agency's programs to the mass communications media, the general public, and to the educational community at the elementary and secondary levels. Assistance to the mass communications media includes the gathering and exposition of newsworthy material in support of their requests, and takes such forms as press kits, news releases, television and radio information tapes and clips, and feature material. Research,

development, and operational missions in aeronautics and space provide substantive knowledge and serve as an educational stimulus to students and teachers. NASA responds to expressed needs of students by developing curriculum supplements in space-related areas such as physics, biology, chemistry, and math; assistance to over 1,000 teacher workshops and professional education meetings; and participation in science fairs. This program also provides for equal employment opportunity exhibits and films to relate to high schools, colleges and the public, and the key roles that women and minorities have in the United States space program.

The technical libraries provide reference acquisition, cataloging, translating and dissemination services to all NASA employees.

The decrease in the 1984 current estimate from the 1984 budget estimate reflects the realignment of the scientific and technical information support to more accurately portray the cost of these services. The 1985 estimate reflects funding of essentially the same level of contractual services as in 1984 with reduced requirements for equipment, supplies, and materials.

	1983	<u>1984</u>		1985
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
3. <u>Shop and Support Services</u> .....	<u>716</u>	<u>654</u>	<u>701</u>	<u>745</u>

These funds provide for the continuation of studies on parts applications, NASA-wide safety, reliability, quality assurance standards, graphic and photo processing services. The increase from the 1984 budget estimate to the 1984 current estimate is due to increased requirements and rates. The 1985 estimate provides a continuation of essentially the same level of service provided in 1984 at anticipated rates.

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
C. <u>MANAGEMENT AND OPERATIONS</u> .....	<u>9,484</u>	<u>11,533</u>	<u>10,387</u>	<u>11,179</u>

(Thousands of Dollars)

Summary of Fund Requirements

1. <u>Administrative Communications</u> .....	2,512	2,819	3,060	3,407
2. <u>Printing and Reproduction</u> ... ..	1,150	1,606	1,376	1,530
3. <u>Transportation</u> .....	556	537	601	661
4. <u>Installation Common Services</u> . . . . .	<u>5,266</u>	<u>6,571</u>	<u>5,350</u>	<u>5,581</u>
Total, Management and Operations.....	<u>9,484</u>	<u>11,533</u>	<u>10,387</u>	<u>11,179</u>

Explanation of Fund Requirements

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
1. <u>Administrative Communications</u> .....	<u>2,512</u>	<u>2,819</u>	<u>3,060</u>	<u>3,407</u>

Included in this category are the costs of leased lines, long distance tolls, telephone exchange services, and other communications. The 1984 and 1985 estimates reflect the expected rate increases due to divestiture.

2. <u>Printing and Reproduction</u> .....	<u>1,150</u>	<u>1,606</u>	<u>1,376</u>	<u>1,530</u>
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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 decrease from the 1984 budget estimate to the 1984 current estimate reflects a reduction in the level of printing activity. The 1985

estimate includes anticipated increases in the Government Printing Office rates and the cost of paper, supplies and materials.

3. Transportation..... 556 537 601 661

Transportation services include rental of trucks, as well as the movement of supplies, materials, equipment and related items. Also included is the cost of operating and maintaining the administrative aircraft which is assigned to the Jet Propulsion Laboratory. The increase from the 1984 budget estimate to the 1984 current estimate reflects 1983 experience. The increase in the 1985 estimate reflects anticipated increases in costs and replacement of a vehicle at the Jet Propulsion Laboratory.

4. Installation Common Services..... 5,266 6,571 5,350 5,581

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; contract histories; trucking and labor services; medical services; contractor incentive awards; Equal Opportunity community relations and fellowships; Administrator's representation allowance; overseas administration support and documentation; and administrative supplies, materials and equipment. The decrease in the 1984 estimate is due to partial application of the reductions required because of the appropriation reduction and pay raise absorption. The 1985 estimate provides for anticipated support contractor wage rate increases and increases in the cost of supplies and materials.

# ORGANIZATION AND STAFFING

## NASA HEADQUARTERS

### HEADQUARTERS

#### SUMMARY STAFFING

	FY 84	FY 85
EXCEPTED & SES	284	284
GM/GS-18	1	1
GM/GS-15	212	211
GM/GS-14	228	224
ALL OTHER GM/GS	653	656
WAGE BOARD	8	8
<b>TOTAL PERM</b>	<b>1435</b>	<b>1435</b>

#### ADMINISTRATOR

	FY 84	FY 85
EXCEPTED & SES	12	12
GM/GS-18	-	-
GM/GS-15	-	-
GM/GS-14	-	-
ALL OTHER GM/GS	13	13
WAGE BOARD	-	-
<b>TOTAL PERM</b>	<b>25</b>	<b>25</b>

#### CHIEF SCIENTIST

	FY 84	FY 85
EXCEPTED & SES	3	3
GM/GS-18	-	-
GM/GS-15	-	-
GM/GS-14	-	-
ALL OTHER GM/GS	1	1
WAGE BOARD	-	-
<b>TOTAL PERM</b>	<b>4</b>	<b>4</b>

#### CHIEF ENGINEER

	FY 84	FY 85
EXCEPTED & SES	6	6
GM/GS-18	-	-
GM/GS-15	15	15
GM/GS-14	8	8
ALL OTHER GM/GS	8	8
WAGE BOARD	-	-
<b>TOTAL PERM</b>	<b>35</b>	<b>35</b>

#### EQUAL OPPORTUNITY

	FY 84	FY 85
EXCEPTED & SES	4	4
GM/GS-18	-	-
GM/GS-15	2	2
GM/GS-14	13	13
ALL OTHER GM/GS	-	-
WAGE BOARD	-	-
<b>TOTAL PERM</b>	<b>22</b>	<b>22</b>

#### PROCUREMENT

	FY 84	FY 85
EXCEPTED & SES	11	11
GM/GS-18	-	-
GM/GS-15	13	13
GM/GS-14	36	36
ALL OTHER GM/GS	-	-
WAGE BOARD	-	-
<b>TOTAL PERM</b>	<b>84</b>	<b>84</b>

#### LEGISLATIVE AFFAIRS

	FY 84	FY 85
EXCEPTED & SES	3	3
GM/GS-18	-	-
GM/GS-15	5	5
GM/GS-14	2	2
ALL OTHER GM/GS	15	15
WAGE BOARD	1	1
<b>TOTAL PERM</b>	<b>26</b>	<b>26</b>

#### SMALL & DISADVANTAGED BUSINESS UTILIZATION

	FY 84	FY 85
EXCEPTED & SES	-	-
GM/GS-18	-	-
GM/GS-15	1	1
GM/GS-14	1	1
ALL OTHER GM/GS	1	1
WAGE BOARD	-	-
<b>TOTAL PERM</b>	<b>3</b>	<b>3</b>

STAFF ADVISORS  
AEROSPACE  
SAFETY ADVISORY PANEL  
PUBLIC AFFAIRS  
INTERNATIONAL AFFAIRS

#### INSPECTOR GENERAL

	FY 84	FY 85
EXCEPTED & SES	7	7
GM/GS-18	-	-
GM/GS-15	10	10
GM/GS-14	11	11
ALL OTHER GM/GS	69	69
WAGE BOARD	-	-
<b>TOTAL PERM</b>	<b>97</b>	<b>97</b>

#### GENERAL COUNSEL

	FY 84	FY 85
EXCEPTED & SES	6	6
GM/GS-18	-	-
GM/GS-15	13	13
GM/GS-14	2	2
ALL OTHER GM/GS	16	16
WAGE BOARD	-	-
<b>TOTAL PERM</b>	<b>37</b>	<b>37</b>

#### COMPTROLLER

	FY 84	FY 85
EXCEPTED & SES	8	8
GM/GS-18	-	-
GM/GS-15	14	14
GM/GS-14	20	20
ALL OTHER GM/GS	69	69
WAGE BOARD	-	-
<b>TOTAL PERM</b>	<b>111</b>	<b>111</b>

#### MANAGEMENT

	FY 84	FY 85
EXCEPTED & SES	22	22
GM/GS-18	-	-
GM/GS-15	1	1
GM/GS-14	47	47
ALL OTHER GM/GS	169	170
WAGE BOARD	-	-
<b>TOTAL PERM</b>	<b>290</b>	<b>290</b>

#### EXTERNAL RELATIONS

	FY 84	FY 85
EXCEPTED & SES	23	23
GM/GS-18	-	-
GM/GS-15	18	18
GM/GS-14	25	25
ALL OTHER GM/GS	62	62
WAGE BOARD	-	-
<b>TOTAL PERM</b>	<b>128</b>	<b>128</b>

#### AERONAUTICS AND SPACE TECHNOLOGY

	FY 84	FY 85
EXCEPTED & SES	30	30
GM/GS-18	-	-
GM/GS-15	42	42
GM/GS-14	9	9
ALL OTHER GM/GS	38	38
WAGE BOARD	-	-
<b>TOTAL PERM</b>	<b>119</b>	<b>119</b>

#### SPACE SCIENCE AND APPLICATIONS

	FY 84	FY 85
EXCEPTED & SES	42	42
GM/GS-18	-	-
GM/GS-15	61	61
GM/GS-14	27	27
ALL OTHER GM/GS	75	75
WAGE BOARD	1	1
<b>TOTAL PERM</b>	<b>207</b>	<b>207</b>

#### SPACE FLIGHT

	FY 84	FY 85
EXCEPTED & SES	41	41
GM/GS-18	-	-
GM/GS-15	56	56
GM/GS-14	33	33
ALL OTHER GM/GS	61	61
WAGE BOARD	-	-
<b>TOTAL PERM</b>	<b>191</b>	<b>191</b>

#### SPACE TRACKING AND DATA SYSTEMS

	FY 84	FY 85
EXCEPTED & SES	16	16
GM/GS-18	-	-
GM/GS-15	15	15
GM/GS-14	13	13
ALL OTHER GM/GS	9	9
WAGE BOARD	-	-
<b>TOTAL PERM</b>	<b>56</b>	<b>56</b>

## RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1985

### 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 (propellant formulation and testing), and Table Mountain, California (open air testing and astronomy).

At Pasadena, the Laboratory occupies 176 acres of land of which **156** acres are owned by NASA and 20 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 capital investment of the Jet Propulsion Laboratory, including the Deep Space Network, fixed assets in progress, and contractor-held facilities, as of September 30, 1983, was \$485,942,000.

The Jet Propulsion Laboratory is a Government-owned installation that is staffed and managed by the California Institute of Technology. Contract NAS7-918 between NASA and Caltech governs research, development, and related activities at the Laboratory with facilities being provided under a separate facilities contract **NAS7-270(F)**. The cost of operating JPL for NASA activities is borne by the Research and Development and 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 this appropriation in the NASA Headquarters budget. Accordingly, the costs presented in this special analysis are for comparison purposes only.

#### ROLES AND MISSION

The Jet Propulsion Laboratory is primarily responsible for the conduct of NASA automated missions concerned with deep space scientific exploration; tracking, data acquisition, reduction and analysis required by deep space flight; and development of advanced spacecraft propulsion, guidance and control systems. The Laboratory is also responsible for selected automated Earth-orbital projects. 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 which provides tracking and data acquisition services for all NASA projects involving missions beyond near-Earth orbits.

3. Continuing programs of scientific investigation, and research and analysis.

In more specific terms, the principal Laboratory activities in support of NASA can be categorized as follows:

Planetary 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 management responsibility for all of the Mariner missions, including design, fabrication, assembly and testing of the spacecraft. For two decades, beginning with the Mariner 2 flight to Venus in **1962**, these missions have provided an enormous scientific return. The two most recently completed missions in the Mariner series are those of Mariner **9**, which returned scientific data for nearly a year from a Martian orbit, and Mariner **10**, which gathered data in a close flyby of Venus followed by three separate encounters with Mercury.

The Jet Propulsion Laboratory was a major participant in the Viking project, carrying out, among other assignments, the development of the two orbiters which, with two Landers, reached Mars during the summer of **1976**. The Viking mission operations were repeatedly extended as the spacecraft far out-lived their design lifetime. In **1983**, operations were completed when the Viking Lander I ceased functioning after several years of transmitting important scientific information from the surface of Mars.

In the continuing series of planetary missions, JPL has management responsibility for the Voyager mission. Two Voyager spacecrafts were launched in **1977** and made close flybys of Jupiter and its major satellites in **1979**. In **1980** and **1981**, the Voyager spacecraft encountered Saturn. The Voyager planetary encounters obtained exceptionally unique scientific data. Voyager **2** is now enroute to Uranus for a flyby in **1986**. 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 management responsibility for the Galileo mission, which is planned to orbit Jupiter and send an instrumented probe into the planet's atmosphere. The probe will make direct measurements of the physical and chemical properties of the Jovian atmosphere. During its in-orbit lifetime of **20** months, the orbiter will observe Jupiter and its system of satellites at close range. JPL is

the management center for the Galileo project; JPL is developing the orbiter in-house, and the Ames Research Center is responsible for the probe development.

The International Solar Polar Mission is a cooperative effort between NASA and the European Space Agency (ESA). JPL is managing the development of the United States instruments which will fly on the ESA spacecraft plus the data analysis. In addition, JPL is providing mission support to ESA. ESA is developing the spacecraft and a set of their own instruments.

The Venus Radar Mapper, initiated in FY 1984, will obtain high resolution global radar imagery and altimetric and gravity data during its 243 days of orbiting of Venus to address fundamental questions regarding the origin and evolution of the planet. JPL is managing the project, including having responsibility for mission design and operations; and industry will develop of the spacecraft and synthetic aperture radar under contract to JPL. The mission will be launched in 1988.

Development of the Mars Geoscience/Climatology Orbiter (MGC0) will be initiated in FY 1985 leading to a launch in the 1990/1991 timeframe. MGC0 will make global studies of the composition and physical state of Martian materials, study their major surface forming processes and their time scales, and explore the structure and circulation aspects of the atmosphere. The Jet Propulsion Laboratory is the management center with responsibility for the scientific payload, but will contract with industry for development of the spacecraft.

physics and Astronomy - Consistent with its role as a center for Earth-orbital spacecraft development, JPL managed the Infrared Astronomical Satellite project. This was a cooperative mission with the Netherlands and the United Kingdom. The spacecraft, which was launched in January 1983, was designed and built in the Netherlands, while JPL was responsible for the science experiment development and system testing activities. Since completion of mission operations in November 1983, the analyses of the enormous quantity of scientific data obtained is continuing.

Space Applications - In support of the Space Applications program, JPL is a principal Center for work in oceanographic applications of space technology. The Laboratory also conducts significant activities in upper atmospheric research; in development and implementation of remote sensing techniques for Earth resources observations; and in geodynamics and plate tectonics research.

JPL is managing an atmospheric science satellite, the Solar Mesosphere Explorer, which was launched on October 6, 1981 into a sun-synchronous polar orbit. The spacecraft module was developed under a JPL contract with private industry, and the five science instruments were developed by the Laboratory for Atmospheric and Space Physics at the University of Colorado.

Spacecraft Operations - The Jet Propulsion Laboratory is responsible for the design, development, maintenance, and operation of NASA's worldwide Deep Space Network (DSN) and a Mission Control and Computing Center. The DSN tracking stations are located in California, Spain, and Australia, and support projects involving flights beyond near-Earth orbit. The Mission Control and Computing Center, located at JPL, is the location of actual day to day operations of deep-space missions such as Voyager. JPL is also implementing the Network Consolidation program which will co-locate the residual Space Tracking and Data Network (STDN) near-Earth tracking stations (after the TDRSS becomes fully operational) with the three DSN stations. These consolidated facilities will be managed by JPL and will provide a more efficient, technically advanced and cost effective means of operations.

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 development, autonomous systems, space power and propulsion systems, electronics, information systems, electronics, and basic research in such fields as fluid physics, polymer materials and applied mathematics. The Laboratory participates in scientific experiments on both JPL-managed and non-JPL-managed flight projects. This participation includes not only the performance of scientific investigations, but also a significant commitment to the development of scientific instruments for use in space missions. 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.

Simulated Research and Program Management Budget

Funding Plan by Function

	1983 <u>Actual</u>	1984		1985
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related Costs.....	164,942	161,580	180,497	182,472
11. Travel.....	6,009	5,580	6,408	6,779
III. Operation of Installation.....	37,064	35,740	38,028	40,544
A. Facilities Services .....	(21,709)	(20,050 )	(21,711 )	(23,128)
B. Technical Services .....	(5,364)	(5,280)	( 5,740)	( 6,084)
C. Management and Operations .....	(9,991)	(10,410)	(10,577)	(11,332)
Total, fund requirements .....	<u>208,015</u>	<u>202,900</u>	<u>224,933</u>	<u>229,795</u>

EXPLANATION OF FUND REQUIREMENTS

**I. PERSONNEL AND RELATED COSTS..... 164,942    161,580    180,497    182,472**

The increase from the 1984 budget estimate to the 1984 current estimate is due to the cost of the October 1, 1983 pay raise and increases in associated employee benefits. The increase from the 1984 current estimate to the 1985 estimate is due to the projected increase in workforce and anticipated higher costs of personnel benefits, such as health insurance and retirement costs, and social security contributions.

**II. TRAVEL..... 6,009    5,580    6,408    6,779**

The increase from the 1984 budget estimate to the 1984 current estimate is due to reassessment of requirements based on current programmatic activity. The increase from the 1984 current estimate to the

Distribution of JPL Workyears by NASA Program

	1983	1984		1985
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
<b><u>RESEARCH AND DEVELOPMENT</u></b> .....	<b><u>1,579</u></b>	<b><u>1,496</u></b>	<b><u>1,576</u></b>	<b><u>1,587</u></b>
Space Transportation Capability Development.....	<u>9</u>	<u>9</u>	<u>15</u>	<u>15</u>
Space Science and Applications.....	<u>1,310</u>	<u>1,192</u>	<u>1,310</u>	<u>1,326</u>
Physics and astronomy.....	207	87	124	101
Life sciences.....	15	27	24	21
Planetary exploration.....	761	717	790	832
Space applications.....	327	361	372	372
Technology Utilization.....	<u>6</u>	<u>4</u>	<u>4</u>	<u>3</u>
Aeronautics and Space Technology.....	<u>179</u>	<u>213</u>	<u>166</u>	<u>161</u>
Aeronautics.....	10	7	4	3
Space.....	169	206	162	158
Tracking and Data Advanced Systems.....	<u>75</u>	<u>78</u>	<u>81</u>	<u>82</u>
<b><u>SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS</u></b> .....	<b><u>426</u></b>	<b><u>428</u></b>	<b><u>444</u></b>	<b><u>433</u></b>
Shuttle Production and Operational Capability.....	7	6	6	6
Space and Ground Network Communication and Data Systems.....	419	422	438	427
Subtotal, direct workyears.....	2,005	1,924	2,020	2,020
<b><u>Direct Sppt</u></b> .....	<b><u>432</u></b>	<b><u>471</u></b>	<b><u>433</u></b>	<b><u>438</u></b>
<b><u>CENTER MANAGEMENT AND OPERATIONS</u></b> .....	<b><u>989</u></b>	<b><u>1,029</u></b>	<b><u>994</u></b>	<b><u>999</u></b>
Total, permanent workyears.....	<u>3,426</u>	<u>3,424</u>	<u>3,447</u>	<u>3,457</u>

1985 estimate is due to anticipated increases in air fares, rental car rates, and hotel costs.

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
<b>III. <u>OPERATION OF INSTALLATION</u>.....</b>	<b><u>37,064</u></b>	<b><u>35,740</u></b>	<b><u>38,028</u></b>	<b><u>40,544</u></b>
A. <u>Facilities Services</u> .....	(21,709)	(20,050)	(21,711)	(23,128)

The increase from the 1984 budget estimate to the 1984 current estimate primarily results from unanticipated increases in lease costs of buildings and to reassessment of equipment requirements. The increase from the 1984 current estimate to the 1985 estimate is due to anticipated increases in the cost of leased space and other facilities.

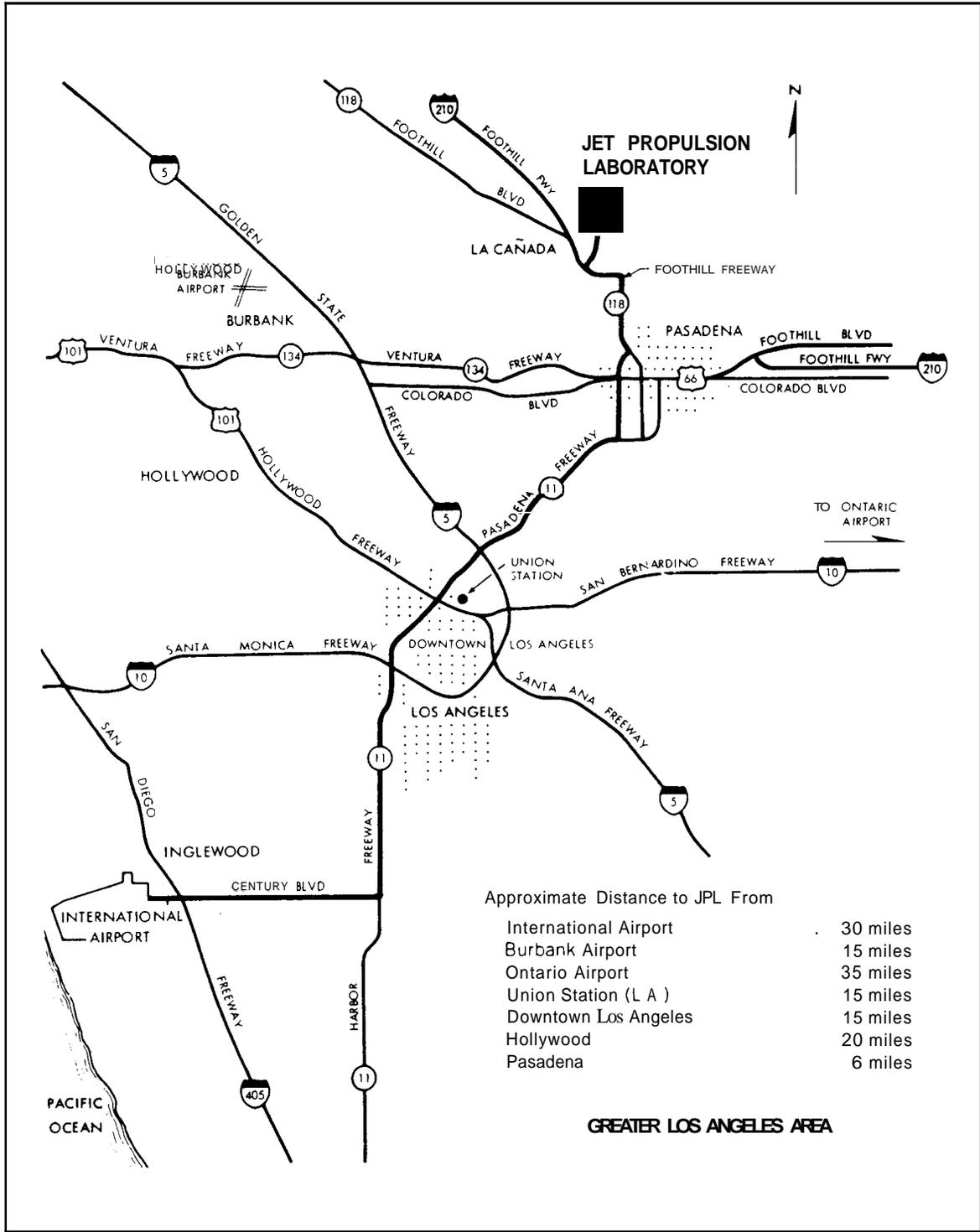
B. <u>Technical Services</u> .....	(5,364)	(5,280)	(5,740)	(6,084)
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The increase from the 1984 budget estimate to the 1984 current estimate reflects a reassessment of current requirements for engineering services associated with development of plans and specifications for facility modifications and improvements and for costs of reliability and quality assurance services. The 1985 estimate reflects increased costs for a continuing level of services.

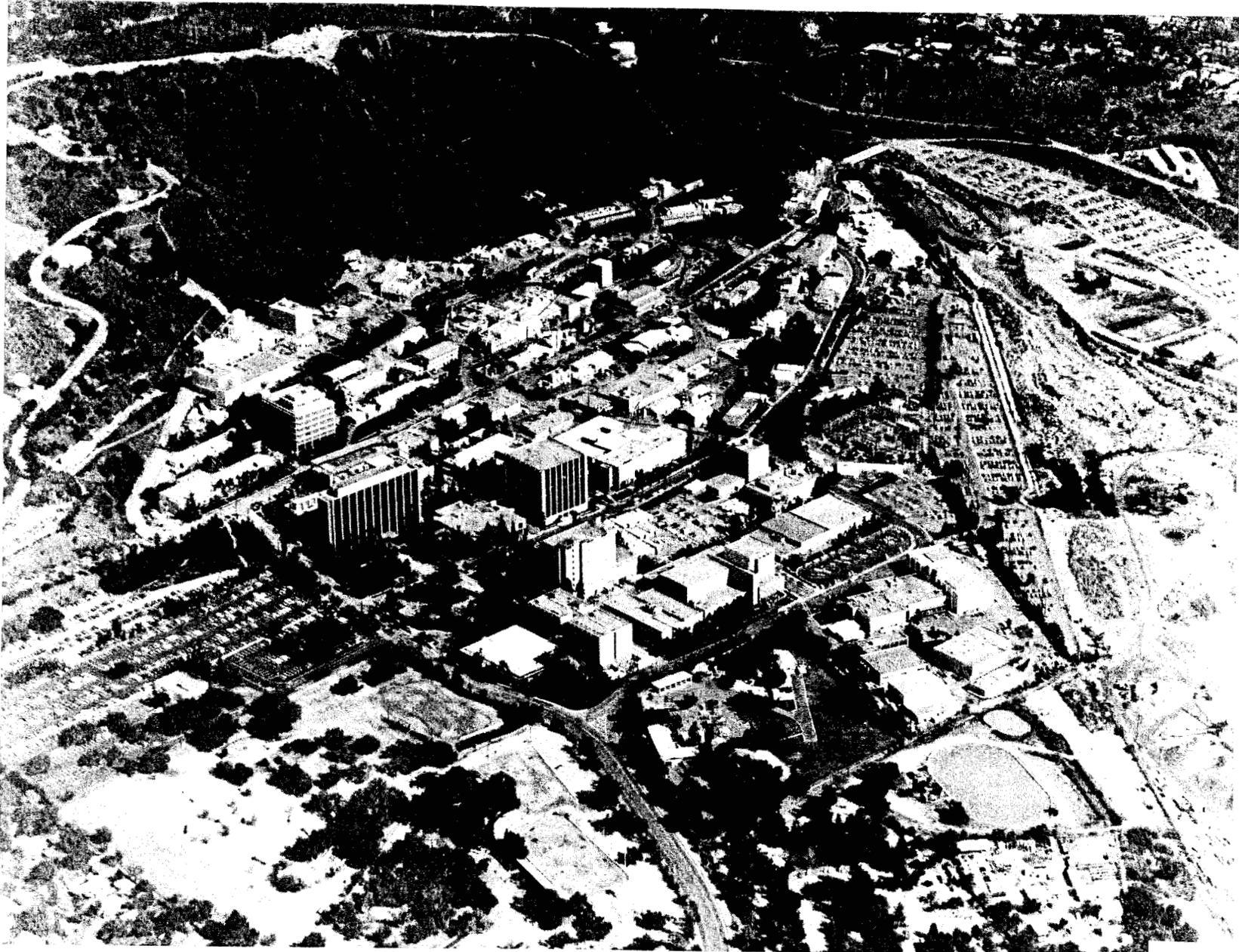
C. <u>Management and Operations</u> .....	(9,991)	(10,410)	(10,577)	(11,332)
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The increase from the 1984 budget estimate to the 1984 current estimate reflects higher levels of communications costs than previously estimated and increased consumption of supplies and materials. The increase from 1984 to 1985 is mainly attributable to the anticipated cost increases resulting from telephone service divestiture.

# JET PROPULSION LABORATORY



JET PROPULSION LABORATORY



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1985 ESTIMATES

MARY C AERONAUTICAL RESEARCH AND TECHNOLOGY  
OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY

	<u>1983</u> <u>Actual</u>	<u>1984</u>		<u>1985</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
Research and development.....	280,000	300,300	302,300	342,400
Construction of facilities.....	20,115	24,000	24,000	30,300
Research and program management.....	<u>247,324</u>	<u>265,100</u>	<u>300,800</u>	<u>314,400</u>
Total.....	<u>547,439</u>	<u>589,400</u>	<u>627,100</u>	<u>687,100</u>
Number of direct workyears associated with aeronautical research and technology.....	3,696	3,686	3,780	3,762

The objective of the aeronautical research and technology program is to conduct an effective and productive program that contributes materially to the enduring preeminence of U.S. civil and military aviation by conducting appropriate disciplinary and systems research at the leading edge of technology in those areas critical to the continued superiority of U.S. aircraft; maintaining the research centers in positions of excellence in facilities and technical staff; assuring timely transfer of research results to the U.S. aeronautical industry; assuring appropriate involvement of universities and industry; and providing aeronautical development support to other government agencies and U.S. industry. Conducted well in advance of and independent of specific applications, the aeronautical research and technology program includes both fundamental research in the aeronautical disciplines and systems research directed at interaction among disciplines, components, and subsystems applicable to general classes of advanced military and civil aircraft. The program involves participation by aeronautical manufacturers to ensure that the technology is compatible with practical design considerations and can be successfully transferred into use.

The FY 1985 estimates reflect the need to continue efforts both in the basic aeronautical disciplines and in areas of systems research and to maintain specialized facilities essential to aeronautical research.

Continuing emphasis in fluid and thermal physics will center on high Reynolds number cryogenic testing and turbulent drag reduction, while new emphasis will be applied to vortex flows and geometric modeling of, and grid generation for, complex aircraft configurations for advanced applications of computational aerodynamics. Areas of emphasis in materials and structures will include light alloy metals, new composite materials, high-temperature ceramics for heat engines, and the crash dynamics of composite structures. In the controls and guidance and human factors areas, research emphasis will be on flying qualities for highly augmented-controls aircraft, validation methodology for fault-tolerant systems, the human factors of advanced crew station automation, and the development of technology for improved simulation fidelity. In computer science, the major emphasis will be in concurrent processing architectures, algorithms, and techniques to support the agency's computational fluid physics research. Continued support of the two computer science research institutes and the university program will provide a strong research base in this critical area. In the numerical aerodynamic simulation program, the processing system development will continue with emphasis on bringing the first high-speed processor to full operational status by 1986.

In propulsion, emphasis will be placed on a broad spectrum of technologies offering the opportunity for potential advances. These include intermittent combustion engines for small aircraft; turbine engine components including inlets, nozzles, compressors, turbines, and combustors; and turbine engine systems technologies encompassing controls, gears, bearings, engine dynamics and stall recovery. Rotorcraft research will stress noise and vibration reduction and the unsteady aerodynamics of rotors. Areas of emphasis in high-performance aircraft research will include high angle-of-attack flight, vectored thrust and short takeoff/vertical landing, supersonic cruise/maneuverable aircraft, hypersonic propulsion, structures and configuration aerodynamics, and propulsion/airframe controls integration. Also included are efforts in the turbine engine hot section technology program to increase engine performance and durability. In subsonic aircraft research, emphasis will be placed on advanced composite structures technology, icing and lightning research, natural and controlled laminar flow, and technology problem areas identified in coordination with the Federal Aviation Administration as critical to improved air safety and operations.

The construction of facilities program for FY 1985, in support of aeronautical research and technology, includes the following major projects: construction of the numerical aerodynamic simulation (NAS) facility at Ames Research Center to house the NAS processing system network and modifications to the 8-foot high temperature wind tunnel at Langley Research Center.

The research and program management funding in **FY 1985** provides for the salaries and travel of **5,184** 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 program. The **FY 1985** operation of installation estimate includes increased funding for operational maintenance. These funds will be used for increased preventive maintenance at the centers, as well as increased funding for recertification of pressure vessels and other safety related items.



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1985 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1985 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Flight Control and Data Communications	Johnson Space Center, Bldgs. 35 and 5, 72-76-01	Guidance and Navigation Simulator (GNS)	Serves as a primary system for the Shuttle Mission Simulator (SMS) training load development work and provides a test bed for applicable SMS hardware modifications.	750	
Space Flight Control and Data Communications	Johnson Space Center, Bldg. 30, 72-77-05	Master Interface Timing	Provides central timing system for the Mission Control Center (MCC).	125	
Space Flight Control and Data Communications	Johnson Space Center, Bldg. 30, 72-78-01	Wide Band Recorder/Switch	Provides capability for switching and recording all data input to the MCC.	763	
Space Flight Control and Data Communications	Johnson Space Center, Bldg. 30, 72-78-02	Display Control/Shuttle Data Processing Complex Interface	Provides display control system and its interface to Shuttle Data Processing Complex.	1,617	
Space Flight Control and Data Communications	Johnson Space Center, Bldg. 30, 72-79-08	Wide Band Interface Equipment	Provides capability to bring independent payload high rate data streams into Payload Operations Control Center (POCC).	7	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1985 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1985 OBLIGATIONS (\$ IN THOUS. )	RELATED FACILITY PROJECT
Space Flight Control and Data Communications	Johnson Space Center, Bldg. 30, 72-82-04	Software Production Facility Configuration 3 Augmentation	Completes the purchase of the SPF systems and associated peripherals and supports the additional functions rehosted onto the SPF.	3,086	FY 86 CoF Project (608 #84-FA-20)
Space Flight Control and Data Communications	Johnson Space Center, Bldg. 5, 72-84-03	Shuttle Mission Simulator (SMS) Equipment Refurbishment/Replacement	Replaces SMS host computer, its peripheral hardware and SMS intelligent controllers due to obsolescence.	4,030	FY 86 CoF Project (608 #84-FA-06)
Space Flight Control and Data Communications	Johnson Space Center, Bldg. 30, 72-84-04	Data Reconfiguration Management System	Provides combined applications support for reconfiguration, logistics and nonreal-time computer support.	390	
Space Flight Control and Data Communications	Johnson Space Center, Bldg. 5, 72-84-05	Motion Base Aft Visual System	Provides the visual system for the motion base simulator aft crew station.	5,590	FY 82 MCRR Project 82206
Space Flight Control and Data Communications	Johnson Space Center, Bldg. 30, 72-84-06	Card Tester	Aids in repair of digital logic cards.	640	
Space Flight Control and Data Communications	Johnson Space Center, Bldg. 351 72-85-01	Support Requirements System (SRS) Storage Expansion	Provides expansion of the SRS mass storage to support the development effort of the SRS software and interfaces with the SMS.	800	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1985 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND FAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1985 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Flight Control and Data Communications	Johnson Space Center, Bldg. 35, 72-85-02	Shuttle Mission Simulator (SMS) and Guidance and Navigation Simulator (GNS) Centralized Mass Storage	Provides a centralized mass storage system to be interfaced with the SMS, GNS and SRS to provide multiple training loads and load initialization packages to all systems simultaneously.	1,210	
Space Flight Control and Data Communications	Johnson Space Center, Bldg. 5, 72-85-03	Centaur Simulation for SMS	Provides development of a high fidelity simulation of the Centaur payload carrier, in- cluding simulated malfunctions and telemetry downlink.	661	
Space Flight Control and Data Communications	Johnson Space Center, Bldg. 30, 72-85-04	Shuttle Data Reconfiguration System	Replaces the Data Retrieval and Formatting Technique (DRAFT) equipment presently used to generate background display formats for digital television equipment.	672	
Space Flight Control and Data Communications	Johnson Space Center, Bldg. 30, 72-85-05	Calibrated Ancillary System	Extracts ancillary data from the orbiter downlink, Cali- brating the data and sending the processed data to Goddard Space Flight Center.	74	
Space Flight Control and Data Communications	Johnson Space Center, Bldg. 30, 72-85-06	Reconfiguration Network <sup>1</sup> (RNET) Computer System	Expedites the delivery of the reconfiguration data and products to support the Shuttle flight rate and reduce reconfiguration cycle timeline.	1,864	FY 85 CoF Project (85JR-83034)
Space Flight Control and Data Communications	Johnson Space Center, Bldg. 30, 72-85-07	Mass Data Storage	Provides telemetry data reduction database and cataloging and storage of data in a shared online archival form.	471	FY 84 CoF Project (84204)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1985 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1985 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Flight Control and Data Communications	Kennedy Space Center, Pad B, 76-82-03	Operational Television (OTV) System	Provides remote viewing and recording of opera- tions of equipment at the launch pad, which may be inaccessible or too hazardous for on- the-scene observation.	2,168	
Space Flight Control and Data Communications	Kennedy Space Center, Pad B, 76-82-06	Payload Ground Handling Mechanism	Removes and installs payload into the Shuttle vehicle at the launch pad.	1,354	
Space Flight Control and Data Communications	Kennedy Space Center, Central Instrumentation Facility	Shuttle Inventory Management System (SIMS II)	Support USAF and NASA logistic functions for the Space Transportation System (STS).	1,056	
Space Flight Control and Data Communications	Kennedy Space Center, Mobile Launch Pad 3, 76-82-08	Permanent Measuring System	Provides for measuring and recording critical data for MLP-3 during launch and stacking activity.	1,494	
Space Flight Control and Data Communications	Kennedy Space Center, Mobile Launch Pad 3, 76- A4-03	Hazardous Gas Detection System	Measures concentrations of hazardous gases internal to purged Orbiter and Ground Support Equipment structure cavities.	266	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1985 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1985 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Flight Control and Data Communications	Kennedy Space Center, Mobile Launch Pad 3, 76-85-01	Operational Intercom System	Provides communications for MLP-3 to Launch Control Center for support of checkout and launch of the space shuttle.	3,927	
Space Flight Control and Data Communications	Kennedy Space Center, Launch Control Center, 76-85-02	Operational Television Video Switcher System	Increases capability of the Operational Television System.	400	
Space Flight Control and Data Communications	Marshall Space Flight Center, Bldg. 4663, 62-84-01	U-1100/82 Computer System	Supports major ADP require- ments and provides program support.	1,071	
Space Flight Control and Data Communications	Marshall Space Flight Center, Slidell Computer Complex, 62-84-05	External Tank High- Speed Storage Augmentation	High speed storage devices used with the U-1100/60 system.	400	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1985 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1985 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Flight Control and Data Communications	Marshall Space Flight Center, Slidell Computer Complex, 62-84-06	High Speed Storage Replacement	Stores and retrieves large volumes of data at a very high rate of speed for MSFC, KSC, Michoud, and other agencies.	1,220	
Space Flight Control and Data Communications	Marshall Space Flight Center, Slidell Computer Complex, 62-84-08	Communications/ Symbiont Processor Replacement (C/SP)	Expands remote terminal support through distributive communica- tions architecture.	526	
Space Flight Control and Data Communications	Marshall Space Flight Center, Slidell Computer Complex, 62-85-03	Sperry 1100/82 Computer System	Supports major Shuttle ADP requirements.	1,186	
Space Flight Control and Data Communications	Marshall Space Flight Center, Slidell Computer Complex, 62-85-04	Sperry 1100/62 Computer System	Supports Shuttle external tank ADP requirements in order to meet the scheduled build rate of the external tank.	341	
Space Flight Control and Data Communications	Marshall Space Flight Center, Bldg. 4663, 62-85-05	Mass Storage Augmentation	Provides mass storage for vast quantities of on-line, reduced telemetered and real-time data from Shuttle and Spacelab missions.	75	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1985 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1985 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Research and Development	Johnson Space Center, Bldg. 30, 72-81-04	FR80 Microfiche Upgrade	Upgrades and replaces FR80 equipment that pro- vides flight control mission and Shuttle Development Lab products.	310	
Research and Development	Johnson Space Center, Bldgs. 12 and 32A, 72-82-03	Central Computing Facility	Upgrades performance systems to meet the needs of future STS missions.	4,720	FY 81 CoY Project 8627 (\$175,000); FY 82 CoF Project 8686 (\$420,000); FY 84 CoF Project 9226 (\$150,000)
Research and Development	Johnson Space Center, Bldg. 4, 72-83-02	Mission Control Center Console Trainer (MCT)	Augments training provided during integrated Mission Control Center/Shuttle Mission Simulator simulations.	310	
Research and Development	Johnson Space Center, Various buildings on-site and off-site, 72-84-07	Intelligent/User Work Stations	Off-loads computer workloads and interface computers to increase user productivity.	906	
Research and Development	Marshall Space Flight Center, Bldy. TBD, 62-85-01	Engineering Analysis and Data Systems	Analyzes thermal, electrical, loads, and structural design characteristics that influence flight vehicle and payload performance.	5,000	
Research and Development	Marshall Space Flight Center, Bldy. 4663, 62-85-02	IBM 4341 Computer	Provides engineering analysis and program support for ADP workloads required by Shuttle propulsion systems, Spacelab systems and payloads, and Space Telescope.	131	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1985 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1985 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Applications	Goddard Space Flight Center, Space and Applications Computing Center (SACC), 51-81-01	SACC Upgrade	Continues multi-year replacements of current computing facility to meet OSSA program requirements.	2,650	
Space Applications	Goddard Space Flight Center, Building 22, 51-82-10	High Speed Computing Facility	Supplements and extends capability of existing Amdahl 470V/6 used in atmospheric sounding retrieval, data assembly, atmospheric modeling, numerical forecast development in support of Global Atmospheric Research Program (GARP) and NASA Climate Research Program.	5,950	
Aeronautical Research and Technology	Ams Research Center, NAS Facility, 21-84-03	Numerical Aerodynamic Simulation Processing System Network (NPSN)	Provides a large scale, high performance computational resource for solving three dimensional, viscous fluid flow equations specially oriented toward the solution of aerodynamic and fluid dynamic problems.	14,400	2180 (82)
Aeronautical Research and Technoiogy	Ams Research Center, Bldg. 233, Central Computer Facility, 21-85-01	Large Scale Scientific Processor (LSSP)	Provides large scale, very high speed vector processing capabilities in computational physics and computational fluid dynamics.	5,950	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1985 BUDGET

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Aeronautical Research and Technology	Ams Research Center, Bldg. 243, 7600 Computer Laboratory, 21-85-02	Cyber 170-825 Small, Medium Scale General Purpose Scientific Computer	Provides simultaneous program development and the running of real-time simulations on the CDC 7600 computer.	450	
Aeronautical Research and Technology	Ams Research Center, Bldg. 233, Central Computer Facility, 21-85-03	Mass Storage System (MSS)	Provides the main data storage and data management facilities for the Central Computer Facility computers.	1,550	
Aeronautical Research and Technology	Ams Research Center, Bldg. N-211, 21-85-04	B-200 Super King Air Aircraft	Provides inflight monitoring of research aircraft opera- tions and related logistics support for research programs.	1,300	
Aeronautical Research and Technology	Lewis Research Center, Bldg. 77, 22-85-01	Real-Time Simulation Computer System	Provides real-time simulation of propulsion systems.	700	
Aeronautical Research and Technology	Lewis Research Center, Bldg. 142, 22-85-02	Scientific/Engineering Computer System	Augments the computational capability of present computer, provides alternate path to the Cray, provides extended addressing for large scientific computer applications, and provides the installation a base system of many commercially available applications packages.	1,727	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1985 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1985 OBLIGATIONS (\$ IN THOUS. )	RELATED FACILITY PROJECT
Space and Ground Network, Communications and Data Systems	Goddard Space Flight Center, Bldg. 14, 51-80-02	Project Operations Control Center (POCC) Pilot Model	Supports mission control workload.	300	
Space and Ground Network, Communications and Data Systems	Goddard Space Flight Center, Bldg. 14, 51-80-04	Space Telescope Operations Control Center	Real-time operation of Space Telescope spacecraft - PORTS	1,700	
Space and Ground Network, Communications and Data Systems	Goddard Space Flight Center, Bldg. 14, 51-81-02A	General Purpose Mission Operations Computing Facility (MOCP).	Mission support analysis.	1,300	
Space and Ground Network, Communications and Data Systems	Goddard Space Flight Center, Bldg. 23, 51-82-04	Univac 1100/82 Computer and Peripherals	Spacelab output processor.	3,100	
Space and Ground Network, Communications and Data Systems	Goddard Space Flight Center, Bldg. 14, 51-82-05	Flight Dynamics System	Provides mission analysis and attitude computing for POCC's.	900	
Space and Ground Network, Communications and Data Systems	Goddard Space Flight Center, Bldg. 14, 51-82-06	Command Management System	Provides computing capability for POCC's.	1,200	
Space and Ground Network, Communications and Data Systems	Goddard Space Flight Center, Bldg. 14, 51-82-07	Orbit Computation System	Provides mission operation orbit computing support.	3,000	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1985 BUDGET

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Space and Ground Network, Communications and Data Systems	Goddard Space Flight Center, Bldg. 23, 51-82-09	Computer and Special Data Capture Equipment	Provides a capability to account for packetized data from Space Telescope.	600	
Space and Ground Network, Communications and Data Systems	Goddard Space Flight Center, Bldg. 3/14, 51-84-02	Multi-Satellite Operations Control Center (MSOCC-I) Upgrade	Upgrades real-time operations capability for supporting multiple spacecraft in the Control Center.	800	
Space and Ground Network, Communications and Data Systems	Goddard Space Flight Center, Bldg. 23, 51-84-03	Gamma Ray Observatory (GRO) Data Capture System	Captures science data from the GRO Spacecraft.	2,000	
Space and Ground Network, Communications and Data Systems	Goddard Space Flight Center, Bldg. 3/14, 51-84-04	Gamma Ray Observatory (GRO) Mission Control System	Monitors and Controls the GRO Spacecraft.	3,200	
Space and Ground Network, Communications and Data Systems	Goddard Space Flight Center, Bldg. 3/14, 51-84-06	Univac 1100/82 leased system in the Network Control Center (NCC)	Supports operational NCC for TDRSS.	1,900	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1985 ESTIMATES

SUMMARY OF CONSULTING SERVICES ESTIMATES

	<u>1983 Actual</u>	<u>1984</u>		<u>1985</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
<u>Research and Program Management</u>				
Consultants Employed by NASA.....	357	650	650	650
Contractual Services.....	<u>994</u>	<u>550</u>	<u>1,050</u>	<u>1,050</u>
Subtotal.....	1,351	1,200	1,700	1,700
<u>Research and Development</u>				
Contractual Services.....	<del>2,376</del>	<del>4,400</del>	<u>3,900</u>	<u>3,900</u>
Total, NASA.....	<u>3,727</u>	<u>5,600</u>	<u>5,600</u>	<u>5,600</u>

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 a 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:

Research and Program Management

Consultants Employed by NASA.....	357	650	650	650
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NASA hires experts and consultants for a variety of reasons, chiefly 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.

	1983 <u>Actual</u>	1984		1985
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
Consultant Services.....	994	550	1,050	1,050

NASA contracts with consulting services firms for studies of functional processes on a selected basis. In 1984 these studies are needed to provide independent assessment and expertise in such areas as ADP, EEO and utility rate validation.

Research-and Development

Contractual Services.....	2,376	4,400	3,900	3,900
Future Program Evaluation.....				2,100

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 that programmatic thrust is available. In addition, some funds are required to provide external expertise and input into organizational decisions, and evaluation of program effectiveness. In 1984, the largest portion of the funds will be used to support analyses conducted by the National Academy of Sciences in the Space Science and Applications, and Aeronautics and Space Technology program areas.

Studies of Future Operational Modes.....	.....			1,450
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These funds will provide for the contractual support of studies of future organizational structures to assure independent evaluation of the various options developed.

Other Consulting Studies.....	.....			350
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Funds will be provided for special studies in management areas. Studies in the area of management structure, and program evaluation and effectiveness are a valuable input to decision making. The specific studies are not defined in advance, but are approved based on demonstrated need.

DETAIL OF PERMANENT POSITIONS

	FY 1983 Number of <u>Positions</u>	FY 1984 Number of <u>Positions</u>	FY 1985 Number of <u>Positions</u>
Executive Level II.....	1	1	1
Executive Level III.....	1	1	1
Executive Level V.....	1	1	1
subtotal	3	3	3
<b>ES</b> .....	38	38	38
ES-5.....	113	113	113
ES-4.....	278	278	278
ES-3.....	58	58	58
ES-2.....	20	20	20
ES-1.....	13	13	13
Subtotal	520	520	520
GS-18.....	1	1	1
GS-16.....	5	5	5
<b>GS/GM-15</b> .....	1. 544	1. 540	1. 532
GS/GM-14.....	2. 870	2. 861	2. 845
GS/GM-13.....	5. 200	5. 190	5. 161
GS-12.....	2. 575	2. 571	2. 557
GS-11.....	1. 949	2. 002	1. 991
GS-10.....	290	290	290
GS-09.....	1. 180	1. 294	1. 397
GS-08.....	272	272	272
GS-07.....	1. 103	1. 103	1. 103
GS-06.....	678	678	678
GS-05.....	1. 083	1. 083	1. 083
GS-04.....	489	489	489
GS-03.....	170	170	170
GS-02.....	60	60	60
Subtotal	19. 469	19. 609	19. 634

	FY 83 Number of <u>Positions</u>	FY 84 Number of <u>Positions</u>	FY a5 Number of <u>Positions</u>
Excepted Appointments....	20	20	20
Ungraded .....	1,483	1,343	1,318
Total Permanent Positions, End of Year	21,495	21,495	21,495
Unfilled Positions, End of Year.....	<u>-36</u>	<u>---</u>	<u>---</u>
Total Permanent Employment, End of Year	<u>21,459</u>	<u>21,495</u>	<u>21,495</u>

**PERSONNEL SUMMARY**

Average GS/GM grade .....	11.24	11.22	11.21
Average ES salary..... ..	\$ 61,944	\$ 64,670	\$ 64,936
Average GS salary..... ..	35,816	37,488	37,724
Average salary, grades established by NASA Administrator.....	26,861	28,937	30,199
Average salary of ungraded positions..... ..	26,100	27,100	27,400

## Date Due

APR 15 1991	14		

UNITED STATES NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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