

NASA

National Aeronautics and
Space Administration

Budget Estimates

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Washington, D.C. 20546
FISCAL YEAR 1983

Volume III

Research and Program Management

Special Analyses

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1983 ESTIMATES

VOLUME III

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SUMMARY
INFORMATION

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1983 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 contractor research and development tasks necessary to meet the Nation's 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) maintain facilities and laboratories in a state of operational capability 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 FY 1983, an appropriation of \$1,178,900,000 is requested.

More than 21,200 civil service personnel at eight 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, which is vital to successfully manage 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 successfully operate the NASA installations and to efficiently and effectively accomplish NASA's approved missions.

In 1981 a Headquarters organizational change provided for the NASA field centers to report to the Program Associate Administrator responsible for the major portion of their technical program. Each of the eight NASA installations is assigned certain principal roles of fundamental importance in meeting NASA's overall program goals. These roles reflect the characteristic competence of each installation based on demonstrated capabilities and capacities. They are summarized by the cognizant program office as follows:

Office of Space Transportation Systems:

Johnson Space Center: Principal roles are management of the integrated Space Shuttle program and Orbiter development and production; 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: Principal roles are the launch of Space Shuttle development and test flights; the ground operational phase of the Space Transportation System; and the preparation and launch of payloads on expendable launch vehicles.

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

National Space Technology Laboratories: Principal roles are the support of Space Shuttle engine development 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: Principal roles are the development and operation of 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. In 1981, the Wallops Flight Center was consolidated with and designated an operational element and component installation of the Goddard Space Flight Center.

Office of Aeronautics and Space Technoloey:

Ames Research Center: Principal roles are 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 the primary landing site for Space Shuttle orbital test flights and a contingency landing site for operational missions. In 1981, the Dryden Flight Research

Office of Space Transportation Systems:

Johnson Space Center: Principal roles are management of the integrated Space Shuttle program and Orbiter development and production; 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: Principal roles are the launch of Space Shuttle development and test flights; the ground operational phase of the Space Transportation System; and the preparation and launch of payloads on expendable launch vehicles.

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

National Space Technology Laboratories: Principal roles are the support of Space Shuttle engine development 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: Principal roles are the development and operation of 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. In 1981, the Wallops Flight Center was consolidated with and designated an operational element and component installation of the Goddard Space Flight Center.

Office of Aeronautics and Space Technology:

Ames Research Center: Principal roles are 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 the primary landing site for Space Shuttle orbital test flights and a contingency landing site for operational missions. In 1981, the Dryden Flight Research

Center was consolidated with the ~~Ames~~ Research Center and became the Dryden Flight Research Facility, an operational element and component installation of ~~Ames~~.

Langley Research Center: Principal roles are 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: Principal roles are aeronautical and space propulsion research and technology; space communications research and technology; space energy systems research and technology; and management of the Centaur expendable launch vehicle program.

The 1983 budget provides the necessary resources to apply these in-house capabilities to appropriate program activities. Detailed data on funding requirements is provided in the section on each installation. A summary description of, and the funding required by functional category, are as follows:

1. Personnel and Related Costs (\$829,900,000): Includes salaries and benefits for NASA permanent and temporary civil service employees, and for personnel of other Government agencies detailed to NASA. This category also includes supporting 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 (\$24,100,000): 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 development, launch and tracking sites; for contract management; for flight mission support; for meetings and technical seminars; and for permanent and temporary relocations. Payments to interagency motor pools are included under Operation of Installation (Management and Operations).

3. Operation of Installation (\$324,900,000): Operation of Installation 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 (\$179,881,000): 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 (\$55,526,000): Includes the cost of general purpose automatic data processing for management activities; the dissemination of scientific and technical information derived from the research and development programs; education and informational programs; shops and other essential technical services.
- C. Management and Operations (\$89,493,000): 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

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Amended Budget Estimate</u> (Thousands)	<u>Current Estimate</u> of Dollars)	
I. Personnel and Related Costs.....	797,787	799,634	830,034	829,900
11. Travel.....	17,171	24,100	24,100	24,100
III. Operation of Installation.....	256,106	290,566	290,566	324,900
A. Facilities Services.....	(136,290)	(157,890)	(156,149)	(179,881)
B. Technical Services	(49,413)	(51,611)	(52,053)	(55,526)
C. Management and Operations.....	<u>(70,403)</u>	<u>(81,065)</u>	<u>(82,364)</u>	<u>(89,493)</u>
Total.....	<u>1,071,064</u>	<u>1,114,300</u>	<u>1,144,700^{a/}</u>	<u>1,178,900</u>

SUMMARY OF CHANGES FROM THE 1982 BUDGET ESTIMATE TO THE 1982 CURRENT ESTIMATE

The changes that have occurred in NASA's Research and Program Management plans in the past year are summarized as follows :

The original 1982 request of \$1,136,300,000 was adjusted downward by \$22,000,000 as part of the President's 1981 Budget Amendment. Subsequent to the passage of the 1982 appropriations, a further reduction of \$11,000,000 was made pursuant to Title V of PL 97-101. Added to the revised appropriation of \$1,103,300,000 is the cost of revised salary rates implemented in FY 1982 which total \$41,400,000. This results in a net increase in the current 1982 plan of \$8.4 million from the original request. These changes are summarized as follows:

^{a/} Includes \$1,103.3M funded by PL 97-101 and \$41.4M increased pay cost for which a funding source has not yet been determined .

(In thousands of dollars)

1982 Budget Estimate	\$1,136,300
March 1981 Budget Amendment	- 22,000
(Personnel and Related Costs - 20,708)	
(Travel -1,292)	
Revised 1982 Request	<u>\$1,114,300</u>
Reduction pursuant to Title V of PL 97-101..	-11,000
Additional costs because of increased salary rates	<u>41,400</u>
1982 Current Estimate... ..	<u>\$1,144,700</u>

The source of the additional \$41.4 million above the adjusted appropriation is still under consideration by the Office of Management and Budget.

In addition to the fund reductions, the permanent civil service plan of 22,713 was reduced 1,061 (840 in the March 1981 Budget Amendment, and 221 as a result of the application of Title V of PL 97-101) to 21,652 for 1982.

BASIS OF THE 1983 ESTIMATE

The budget estimate for 1983 of \$1,178,900,000, an increase of \$34,200,000 over the current 1982 plan, provides for the personnel and related costs of 21,219 permanent civil service employees, a further reduction of 433 from the current 1982 plan (a 654 reduction below the 1981 actual); the minimum level of travel required to support agency missions; anticipated wage levels in support contracts, with no increase in effort provided; utilities at increased rates with a small projected reduction in consumption; and a constant level of supplies, materials, equipment and other contracts at anticipated price levels. The Research and Program Management appropriation for 1983, by functional category, is summarized as follows:

1. Personnel and Related Costs (\$829,900,000): The 1983 estimate for Personnel and Related Costs is based on 21,219 permanent civil service positions. The decrease of \$134,000 results from the combination of the further decline in permanent civil service positions (-433), the full effect of 1982 changes, and the net effect of within-grade and career advances and turnover savings.

2. Travel (\$24,100,000): The 1983 estimate, which is level with 1982, reflects a decreased level of travel offset by expected increases in travel costs.

3. Operation of Installation (\$324,900,000): The 1983 plan provides about the same level of support to the operations of the various NASA centers as in 1982 at anticipated price levels for 1983. The amounts by subcategory are as follows:

- A. Facilities Services (\$179,881,000): The 1983 estimate, an increase of \$23,732,000 over the 1982 current estimate, covers anticipated support contractor and utility rate increases, a small reduction in utility consumption, and supplies, materials, and equipment at anticipated 1983 price levels.
- B. Technical Services (\$55,526,000): The \$3,473,000 increase in 1983 covers anticipated contractor rate increases as well as increased costs of supplies, materials and equipment in this subcategory.
- C. Management and Operations (\$89,493,000): The \$7,129,000 increase in this subcategory is needed to provide for the increased costs of supplies, materials and equipment, and anticipated escalation of contract rates. The replacement of one small administrative aircraft is included.

In summary, the 1983 budget requirement of \$1,178,900,000 is to provide for a permanent civil service workforce of 21,219 permanent employees and to support the activities at eight NASA installations and Headquarters, consistent with the research and development and construction of facilities program plans.

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 representative 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 the functional category. As noted above, the 1983 funds will provide for 21,219 full-time permanent civil service employees.
 - 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 an 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, and social security contributions for non-permanent personnel. Payments for severance pay are made to former employees involuntarily separated through no fault of their own.

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 consist 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 involved and the geographical distribution of NASA installations and contractors throughout the entire United States impose the requirement 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 projects in the flight phase 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 provide 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 includes travel 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 Installations. 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 includes the recurring day-today maintenance of facilities (grounds, 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 case of equipment, related maintenance and other services are reflected for office, shop, laboratory and other facilities equipment as well as administrative intercommunications 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 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 materia 1.

3. Shop Support and Services: Shop support and 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, long distance tolls, 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 PERMANENT CIVIL SERVICE BY INSTALLATION

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Amended Budget Estimate</u>	<u>Current Estimate</u>	
Johnson Space Center	3.380	3.489	3.346	3.293
Kennedy Space Center	2.155	2.201	2.133	2.112
Marshall Space Flight Center	3.385	3.561	3.351	3.285
National Space Technology Laboratories	105	103	104	104
Goddard Space Flight Center	3.699	3.839	3.661	3.623
Ames Research Center	2.058	2.119	2.037	2.021
Langley Research Center	2.895	2.980	2.866	2.845
Lewis Research Center	2.690	2.835	2.663	2.479
Headquarters	1.506	1.586	1,491	1,457
Budget Amendment	<u>---</u>	<u>-840</u>	<u>---</u>	<u>---</u>
 Total. Permanent Civil Service	 <u>21.873</u>	 <u>21.873</u>	 <u>21.652</u>	 <u>21.219</u>

SUMMARY OF BUDGET PLAN BY INSTALLATION

(Thousands of Dollars)

Johnson Space Center	176.051	180.411	186.635	192.396
Kennedy Space Center	150.200	162.960	163.441	169.500
Marshall Space Flight Center	164.985	171.150	170.840	177.704
National Space Technology Laboratories	5.506	5.624	6.086	6.252
Goddard Space Flight Center	162.448	172.019	170.066	173.638
Ames Research Center	94.843	101.688	102.689	104.893
Langley Research Center	120.776	127.620	127.951	131.303
Lewis Research Center	99.886	108.036	106.960	110.591
Headquarters	96.369	106.792	110.032	112.623
Budget Amendment	<u>---</u>	<u>-22.000</u>	<u>---</u>	<u>---</u>
 Total	 <u>1.071.064</u>	 <u>1.114.300</u>	 <u>1.144.700</u>	 <u>1.178.900</u>

DISTRIBUTION OF PERMANENT CIVIL SERVICE BY PROGRAM

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u> <u>Budget</u> <u>Estimate</u>
		<u>Amended</u> <u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u> (Thousands of Dollars)	
<u>SPACE TRANSPORTATION SYSTEMS AND OPERATIONS.....</u>	<u>6,347</u>	<u>6,584</u>	<u>6,379</u>	<u>6,164</u>
Space shuttle.....	4,527	3,712	3,937	1,639
Space flight operations	1,448	2,602	2,070	4,152
Expendable launch vehicles.....	372	270	372	373
<u>SPACE SCIENCE AND APPLICATIONS.....</u>	<u>4,174</u>	<u>4,277</u>	<u>4,051</u>	<u>4,071</u>
Physics and astronomy.....	1,793	1,688	1,843	1,942
Planetary exploration	239	220	227	205
Life sciences.....	262	265	264	263
Space applications	1,821	2,014	1,671	1,616
Technology utilization.....	59	90	46	45
<u>AERONAUTICS AND SPACE TECHNOLOGY.....</u>	<u>5,305</u>	<u>5,704</u>	<u>5,311</u>	<u>5,158</u>
Aeronautical research and technology	3,729	3,762	3,748	3,764
Space research and technology	1,344	1,432	1,383	1,394
Energy technology	232	510	180	---
<u>SPACE TRACKING AND DATA SYSTEMS.....</u>	<u>743</u>	<u>741</u>	<u>789</u>	<u>792</u>
Tracking and data acquisition	743	741	789	792
Subtotal, Direct Positions.....	16,569	17,306	16,530	16,185
<u>CENTER MANAGEMENT AND OPERATIONS SUPPORT POSITIONS .</u>	<u>5,304</u>	<u>5,407</u>	<u>5,122</u>	<u>5,034</u>
Budget hendment.....	---	-840	---	---
Total, Permanent Civil Service.. ..	<u>21,873</u>	<u>21,873</u>	<u>21,652</u>	<u>21,219</u>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1983 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	Headquarters
<u>Personnel and Related Costs</u>										
1981 Actual.....	797,787	133,136	80,437	131,156	3,769	132,444	75,312	97,566	82,854	61,113
1982 Budget.....	820,342	133,289	84,491	133,256	3,749	135,602	76,852	99,853	87,772	65,478
1982 Budget Amendment	799,634									
1982 Current.....	830,034	137,991	84,183	132,760	3,933	136,553	78,330	100,584	87,973	67,727
1983 Estimate.....	829,900	137,479	83,431	132,529	4,020	135,950	78,391	100,654	89,086	68,360
<u>Travel</u>										
1981 Actual.....	17,171	3,477	1,137	2,539	118	2,572	1,558	1,783	997	2,990
1982 Budget.....	25,392	4,962	2,277	3,698	382	3,789	2,260	2,540	1,554	3,930
1982 Budget Amendment	25,000									
1982 Current.....	24,100	4,709	1,687	3,413	147	3,684	2,109	2,536	1,545	4,270
1983 Estimate.....	24,100	4,709	1,687	3,413	147	3,684	2,109	2,536	1,545	4,270
<u>Facilities Services</u>										
1981 Actual.....	136,290	20,051	45,343	15,559	517	13,631	9,765	12,741	12,705	5,978
1982 Budget.....	157,890	22,602	48,156	16,273	611	19,183	14,113	15,870	14,756	6,326
1982 Budget Amendment	157,890									
1982 Current.....	156,149	23,158	51,795	16,544	568	16,317	12,264	15,194	14,308	6,001
1983 Estimate.....	179,881	27,093	58,077	18,774	643	18,498	14,411	17,498	16,307	8,580
<u>Technical Services</u>										
1981 Actual.....	49,413	7,005	7,792	6,346	107	3,849	2,667	2,487	1,005	18,155
1982 Budget.....	51,611	5,556	8,888	6,832	140	4,071	2,466	2,747	969	19,942
1982 Budget Amendment	51,611									
1982 Current.....	52,053	6,052	8,653	6,901	145	4,165	3,109	2,984	570	19,474
1983 Estimate.....	55,526	6,492	10,014	8,092	160	4,161	2,610	3,452	627	19,918
<u>Management and Operations</u>										
1981 Actual.....	70,403	12,382	15,491	9,385	995	9,952	5,541	6,199	2,325	8,133
1982 Budget.....	81,065	14,002	19,148	11,091	742	9,374	5,997	6,610	2,985	11,116
1982 Budget Amendment	80,165									
1982 Current.....	82,364	14,725	17,123	11,222	1,293	9,347	6,877	6,653	2,564	12,560
1983 Estimate.....	89,493	16,623	16,291	14,896	1,282	11,345	7,372	7,163	3,026	11,495
<u>TOTAL</u>										
1981 Actual.....	1,071,064	176,051	150,200	164,985	5,506	162,448	94,843	120,776	99,886	96,369
1982 Budget.....	1,136,300	180,411	162,960	171,150	5,624	172,019	101,688	127,620	108,036	106,792
1982 Budget Amendment	1,114,300									
1982 Current.....	1,144,700	186,635	163,441	170,840	6,086	170,066	102,689	127,951	106,960	110,032
1983 Estimate.....	1,178,900	192,396	169,500	177,704	6,252	173,638	104,893	131,303	110,591	112,623

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; purchase (for replacement only, of one aircraft, for which partial payment may be made by exchange of at least one existing administrative aircraft and such other existing aircraft as may be considered appropriate), hire, maintenance and operation of administrative aircraft; purchase (not to exceed [twenty-four] *seventeen* for replacement only) and hire of passenger motor vehicles; and maintenance and repair of real and personnel property, and not in excess of \$75,000 ~~per~~ project for construction of new facilities and additions to existing facilities, repairs, and rehabilitation and modification of facilities; ~~【\$1,114,300,000】~~ *\$1,178,900,000*. *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 \$25,000 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, 1982*; *additional authorizing legislation to be proposed*.)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND PROGRAM MANAGEMENT

Program and Financing (in thousands of dollars)

identification code	Budget plan			Costs and obligations		
	1981 actual	1982 est	1983 est	1981 actual	1982 est	1983 est
Program by activities:						
Direct program:						
1.	448,363	467,500	493,830	446,241	467,500	493,830
2.	143,928	150,130	162,150	143,239	150,130	162,150
3.	119,516	124,210	136,040	118,911	124,210	136,040
4.	76,420	79,900	86,530	76,117	79,900	86,530
5.	210,479	217,965	234,200	209,566	217,965	234,200
6.	23,046	14,125	14,075	22,936	14,125	14,075
7.	49,312	49,470	52,075	49,082	49,470	52,075
Total direct program	1,071,064	1,103,300	1,178,900	1,066,092	1,103,300	1,178,900
Reimbursable program:						
1.	17,047	21,184	20,950	17,293	21,184	20,950
2.	5,611	6,803	6,880	5,693	6,803	6,880
3.	4,702	5,629	5,760	4,770	5,629	5,760
4.	4,913	3,622	3,670	4,985	3,622	3,670
5.	14,358	9,880	9,930	14,568	9,880	9,930
6.	3,022	640	600	3,064	640	600
7.	1,803	2,242	2,210	1,829	2,242	2,210
Total reimbursable program	51,456	50,000	50,000	52,202	50,000	50,000
Total program costs, funded	1,122,520	1,153,300	1,228,900	1,118,294	1,153,300	1,228,900
Change in selected resources (undelivered orders)				4,226		
1000 Total	1,122,520	1,153,300	1,226,300	1,122,520	1,153,300	1,228,900
Financing:						
Offsetting collections from:						
11 00				— 34,113	— 33,100	— 33,100
14 00				— 17,343	— 16,900	— 16,900
25 00				336		
39 00				1,071,400	1,103,300	1,178,900
Budget authority:						
40.00				1,071,400	1,114,300	1,178,900
40.00					— 11,000	
Relation of obligations to outlays:						
71.00				1,071,064	1,103,300	1,178,900
72.40				65,101	83,081	83,081
74.40				— 83,081	— 83,081	— 83,081
77.00				— 2,800		
90.00				1,050,284	1,103,300	1,178,900

INSTALLATION
JUSTIFICATION

JOHNSON
SPACE CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1983 ESTIMATES

LYNDON B. JOHNSON SPACE CENTER

DESCRIPTION

The Lyndon B. Johnson Space Center 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, 1981 was \$918,348,000.

CENTER ROLES AND MISSIONS

The Johnson Space Center (JSC) was established in November 1961, in response to the need for NASA to designate a primary Center to manage the design, development and manufacture of manned spacecraft; for selection and training of astronaut crews; and the conduct of manned space flight missions. This need continued as the Nation proceeded towards more ambitious undertakings such as the Apollo program, the Skylab program, the Apollo-Soyuz Test Project 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:

- o 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. Includes Shuttle configuration management, Shuttle sustaining engineering and Orbiter operational procurement.

- o Environmental and Crew Support Systems - develop and demonstrate Environmental Control and Life Support Subsystems (EC/LSS) and Extravehicular Activity (EVA) systems suitable for the space transportation systems and other advanced needs.
- o Food Systems Technology - develop nutritional requirements and food processing systems in support of human space flight.
- o Environmental Effects Analysis - manage efforts to develop the data base and conduct analyses to ascertain any environmental impact of STS operations.
- o Supporting Technology Advanced Developments - development of prototypes, long lead time systems and new procedures and software for advanced systems.
- o 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.

Life Sciences:

- o Medical Research - establish human baseline data, investigate and develop countermeasures to solve space medicine problems, and develop information techniques and equipment to support medical operations and medical experiments.
- o Spacelab Payloads - development of Spacelab life sciences research capability through common operating research equipment development. Define and develop in-flight biomedical experiments.

Lunar and Planetary Geosciences - develop and maintain the 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. Current emphasis includes the application of Landsat and other data to agricultural crop forecasting.

SUPPORTING

Technology Experiments in Space - management of Orbiter experiments program. Definition and development of experiments in areas consistent with other JSC space roles.

SUMMARY OF RESOURCES REQUIREMENTS

Funding Plan BY Function

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
I. Personnel and Related Costs.. .. .	133,136	133,289	137,991	137,479
II. Travel.....	3,477	4,962	4,709	4,709
III. Operation of Installation.....	39,438	42,160	43,935	50,208
A. Facilities Services.....	(20,051)	(22,602)	(23,158)	(27,093)
B. Technical Services.....	(7,005)	(5,556)	(6,052)	(6,492)
C. Management and Operations .. .	(12,382)	(14,002)	(14,725)	(16,623)
Total, fund requirements.. .. .	<u>176,051</u>	<u>180,411</u>	<u>186,635</u>	<u>192,396</u>

Distribution of Permanent Positions by Proeram

	<u>1981</u>	<u>1982</u>		<u>1983</u>
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems and Operations</u>	<u>2,473</u>	<u>2,564</u>	<u>2,503</u>	<u>2,456</u>
Space shuttle.....	1,943	1,536	1,582	1,000
Space flight operations.....	530	1,028	921	1,456
<u>Space Science and Applications</u>	<u>332</u>	<u>348</u>	<u>274</u>	<u>271</u>
Planetary exploration.....	38	43	38	38
Life sciences.....	110	109	113	114
Physics and astronomy.....	14	---	15	15
Space applications.....	166	192	104	100
Technology utilization.....	4	4	4	4
<u>Aeronautics and Space Technology</u>	<u>31</u>	<u>38</u>	<u>30</u>	<u>30</u>
Aeronautical research and technology.....	5	5	5	5
Space research and technology.....	26	25	25	25
Energy technology.....	---	8	---	---
Subtotal, direct positions.....	<u>2,836</u>	<u>2,950</u>	<u>2,807</u>	<u>2,757</u>
<u>Center Management and Operations</u>				
<u>Support Positions</u>	<u>544</u>	<u>539</u>	<u>539</u>	<u>536</u>
Total, permanent positions.....	<u>3,380</u>	<u>3,489</u>	<u>3,346</u>	<u>3,293</u>

PROGRAM DESCRIPTION

Permanent Positions
(Civil Service)

SPACE SHUTTLE..... 1,000

The **1983** staffing provides for continuation of the Shuttle production activities to support a schedule consistent with the major program milestones. Activities will continue consistent with a phased delivery of the total Orbiter fleet. Procurement of necessary initial flight and ground support equipment will be continued. 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, avionics, etc.) and to lower elements within the subsystems.

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

Although major Shuttle flight system elements have been individually managed through designated Shuttle element project offices and related provisioning 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, and 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 communications and tracking systems ground testing; providing expertise in guidance, navigation, control, instrumentation and electrical power

distribution; management and operation of environmental test chambers; analysis and evaluation of the Orbiter hydraulics system, auxiliary power unit, orbital maneuvering system components, reaction control engine performance, and 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, 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 Space 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 controls, solid rocket booster control and recovery interface, power and control, and external tank propellant control and instrumentation.

Avionics and software testing and checkout in the Electronics Systems' Test Laboratory and the Shuttle Avionics Integration Laboratory effectively supported the Approach and Landing Test (ALT) effort and will continue through Orbital Flight Testing (OFT) and into the operations era. Their purpose is to verify the functional performance of the Shuttle Integrated Avionics System, validate the system design, and verify compatibility of the various radio frequency communication links.

The Shuttle Mission Simulator (SMS) is the primary flight crew training facility and is supplemented by a number of part task trainers and specialized training devices. Design and program modifications must be implemented to maintain configuration with Orbiter vehicle modifications and Shuttle program changes. The Mission Control Center (MCC) involves the management of the design, development, integration, and testing of all MCC software required to support the program. This includes modifications to old programs, new or replacement programs, their integration in the MCC, and integration of the MCC software and hardware. Shuttle Orbiter flight requirements pose a major design change to the MCC software and require new programs for telemetry, command, tracking, and communications.

SPACE FLIGHT OPERATIONS.....

1,456

Space Flight Operations staffing provide for Shuttle operational flight program management including vehicle system integration; Mission Control Center (MCC) and Payload Operations Control Center (POCC) operations; crew equipment and crew training; and flight and mission planning and operations. Staffing also supports Spacelab and Upper Stage development and integration; mission planning for Spacelab, Inertial Upper Stage (IUS) and Spinning Solid Upper Stage (SSUS); implementing specific payload requirements for optional services; and advanced program management.

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; and the development of nominal and contingency flight profiles for all Shuttle missions. This includes conceptual level profile development and analysis, beginning about two years before the flight, and operational profile development and analysis, accomplished immediately prior to the flight. 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 vehicle 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 at launch minus twelve and three months, respectively, 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.

The MCC is being upgraded for the STS Operations programs (STS-5 and subsequent) to support high flight density and secured DOD operations, and is being augmented with a Payload Operations Central Center (POCC) to support attached payloads. Design and implementation necessary for this upgrade includes the display, control, data handling and interface, communications, and computer hardware/software systems which are being replaced, modified, and/or supplemented. The STS operations upgrade will provide mission support for up to three Orbiters simultaneously (two in flight and one on pad or simulation), and an ability to separate a secure data string for DOD Shuttle mission support. The POCC augmentation will provide Command and Control support for attached payload flights.

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 will continuously be made to keep up with 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 transition of support into a Software Production Facility.

Support of the Spacelab development effort at the Johnson Space Center 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.

Orbiter avionics software development in the STS Operations area will provide for payload support. This will include general capabilities for Spacelab, Inertial Upper State (IUS), and Spinning Solid Upper State (SSUS), with flexibility available to implement specific payload requirements as optional services.

The advanced programs objective is to provide technical as well as programmatic data for the definition and evaluation of potential future space programs and systems. In support of these activities, advanced studies are conducted to obtain significant performance and reliability improvements, reduce future program risks and development costs through the effective use of new technologies, and examine concepts and techniques which can reduce STS operations costs and mission turnaround times. The advanced studies effort will assess the technology maturity for a Space Operations Center and examine innovative design concepts which would allow modular development of such a center. A Satellite Services Systems Analysis will be conducted to survey capabilities of proposed equipment to enhance deployment, retrieval, and servicing of payloads. Technology developments in support of Power Extension Package definition and development will be completed. Engineering and supporting studies will be conducted for all of these major disciplines.

Permanent Positions
(Civil Service)

PLANETARY EXPLORATION,..... **38**

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 must make an active contribution to our knowledge of the compositions, structures and evolutionary histories of the solid bodies of the solar system. Therefore, 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 cooperation with the planetary science community.

LIFE SCIENCES..... 114

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. 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 medical contingencies in flight involving onboard health services, training for crewmen, ground-based medical support and medical evaluation of proposed crew members. These 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 experiments for dedicated Life Sciences Spacelab experiments and integration for human experiments. To this end, science experiments have been selected and experiment hardware development have 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 Positions
(Civil Service)

PHYSICS AND ASTRONOMY..... 15

JSC is assigned mission management responsibilities for the Earth looking remote sensing mission OSTA-3. These responsibilities include the end-to-end mission planning, real time mission control, mission requirements definition, and experiment integration. The Center will also have mission management responsibility for dedicated life science Spacelab missions.

SPACE APPLICATIONS..... 100

The resource 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 for agricultural crop identification, crop acreage and yield estimation, forest mapping and inventory, soil moisture measurement, and vegetation cover monitoring. Studies of data systems and techniques associated with these and other applications are also being conducted.

Flight projects responsibilities at JSC include airborne instrumentations and 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 which provide data to investigators.

Permanent Positions
(Civil Service)

TECHNOLOGY UTILIZATION.....

4

The Technology Utilization program transfers new knowledge and innovative technology resulting from NASA's research and development programs for application in industry, medicine and important public sector areas such as urban development. The Technical Planning Office at JSC provides program office direction for the Technology Utilization program at JSC and provides engineering support to analyze the feasibility of applying space technology to ground-based operations, such as: telecare, feeding the elderly, and the bioisolation garment.

AERONAUTICAL RESEARCH AND TECHNOLOGY.....

5

The Center is continuing its efforts in fire testing aircraft fuselage sections fabricated with newly developed materials. This project provides the aircraft industry with test data and results of flammability tests on fuselage components based on full-scale fire testing. In addition, JSC is evaluating the Electromechanical Flight Control concept as an eventual replacement for aircraft hydraulic systems and will support NASA activities in all-electric airplane technology.

SPACE RESEARCH AND TECHNOLOGY.....

25

Systems and design studies are being performed to: develop technology, fabricate and test components of a Synthetic Aperture Imaging Radar (SAIR); research fuel cell and electrolysis cell technology to demonstrate suitability to large orbital energy conversion and storage requirements; identify viable propulsion system designs and propellant alternatives which could replace hydrazine fuel in a second-generation Shuttle auxiliary propulsion system; collect data, using the Shuttle Development Flight Instrumentation, 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 Space Transportation Systems; develop berthing/docking systems technology required for future large space systems; design, fabricate and test advanced thermal protection systems.

CENTER MANAGEMENT AND OPERATIONS SUPPORT.....

536

Center Management and Operations Support is support or services being provided to all Johnson 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 immediate staff, e.g., Legal, Patent Counsel, Equal Opportunity, Technical Planning, 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 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

	1981	1982		1983
	<u>Actual</u>	Budget	Current	Budget
		Estimate	Estimate	Estimate
		(Thousands	of	
		Dollars)		
I. <u>PERSONNEL AND RELATED COSTS</u>	<u>133.136</u>	<u>133.289</u>	<u>137.991</u>	<u>137.479</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions	114.942	115.190	118.746	117.546
b. Other than full-time permanent				
positions	1.688	2.243	2.498	2.585
c. Reimbursable detailees	2.684	2.823	3.141	3.386
d. Overtime and other compensation	<u>1,167</u>	<u>1.014</u>	<u>850</u>	<u>839</u>
Subtotal. Compensation	120.481	121.270	125.235	124.356
2. <u>Benefits</u>	<u>11.920</u>	<u>11.298</u>	<u>11.896</u>	<u>12.263</u>
Subtotal. Compensation and Benefits	132.401	132.568	137.131	136.619
B. <u>Supporting Costs</u>				
1. Transfer of personnel	221	171	250	250
2. Personnel training	<u>514</u>	<u>550</u>	<u>610</u>	<u>610</u>
Subtotal. Supporting Costs	<u>735</u>	<u>721</u>	<u>860</u>	<u>860</u>
Total. Personnel and Related Costs	<u>133.136</u>	<u>133.289</u>	<u>137.991</u>	<u>137.479</u>

Explanation of Fund Requirements

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
A. <u>Compensation and Benefits</u>	132,401	132,568	137,131	136,619
1. <u>Compensation</u>	120,481	121,270	125,235	124,356
a. Permanent positions..	114,942	115,190	118,746	117,546

The current estimate for 1982 reflects a change from the 1982 budget estimate due to the recent pay increases, partially offset by a reduction in permanent positions in 1982.

Basis of Cost for Permanent Positions

In 1983, the cost of permanent positions will be \$117,546,000. The decrease from 1982 results from the following:

Cost of permanent positions in 1982.....	118,746
Cost increases in 1983.....	+1,808
Within grade and career advances:	
Full year effect of 1982 actions.....	+773
Partial year effect of 1983 actions.....	+456
Full year effect of 1982 pay increase.....	+579
Cost decreases in 1983.....	-3,008
Turnover savings and abolished positions:	
Full year effect of 1982 actions.....	-693
Effect of 1983 actions.....	-2,315
Cost of permanent positions in 1983.....	<u>117,546</u>

	<u>1981</u> Actual	<u>1982</u>		<u>1983</u> Budget Estimate
		Budget Estimate (Thousands of Dollars)	Current Estimate Dollars)	
b. Other than full-time permanent position				
1. cost.....	1,688	2,243	2,498	2,585
2. Workyears.....	151	206	208	208

The distribution of 1983 workyears is as follows:

Distribution of Other than Full-Time Permanent Workyears.

<u>Program</u>	<u>Workyears</u>
Cooperative training	81
Summer programs	24
Opportunity programs	51
Other temporary employment.....	<u>52</u>
Total.....	<u>208</u>

The increase in the 1982 current estimate from the 1982 budget estimate reflects a buildup of the Cooperative Training Program.

c. Reimbursable detailees.....	2,684	2,823	3,141	3,386
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The military personnel detailed to the Johnson Space Center on a reimbursable basis are individuals experienced in manned flight and related fields. Each individual performs a function essential and critical to the current and future programs. The increase from the 1982 budget estimate to the 1982 current estimate is attributable to the military pay increase. The increase in the 1983 estimate is due to the full year cost of four additional detailees who are astronaut and mission specialist candidates.

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
d. Overtime and other compensation... ..	1,167	1,014	850	839

Overtime in 1982 will be used primarily for the orbital test flights, e.g., crew training, trajectory optimization, data reduction, integration laboratory, and related support activities. The decrease from the 1982 budget estimate to the 1982 current estimate reflects a revised overtime plan. The 1983 estimate is essentially level with 1982.

2. <u>Benefits</u>	<u>11,920</u>	<u>11,298</u>	<u>11,896</u>	<u>12,263</u>
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The following are the amounts of contribution by category:

Civil Service Retirement Fund.....	8,062	8,047	8,497	8,374
Employee life insurance.....	332	323	337	393
Employee health insurance.....	2,345	2,062	2,405	2,455
Workmen's compensation... ..	671	762	464	771
FICA.....	48	45	53	53
Other Benefits.....	<u>462</u>	<u>59</u>	<u>140</u>	<u>217</u>
Total.....	<u>11,920</u>	<u>11,298</u>	<u>11,896</u>	<u>12,263</u>

The increase from the 1982 budget estimate to the 1982 current estimate is due primarily to the October 1981 pay increase. The workmen's compensation estimates for 1982 and 1983 reflect estimates based on Department of Labor billings. The increase from 1982 to 1983 is primarily due to the effect of the October 1981 pay raise.

B. <u>Supporting Costs</u>	<u>735</u>	<u>721</u>	<u>860</u>	<u>860</u>
1. Transfer of personnel.....	221	171	250	250

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 in the 1982 budget over the 1982 current estimate reflects an increased number of relocations that is more consistent with previous experience and current hiring plans. The 1983 estimate is level with 1982.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</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)	
2. Personnel training	514	550	610	610

The purpose of the JSC training program is to continue the development of skills and knowledge of civil service employees in order to more efficiently support JSC roles and missions. The increase from the 1982 budget estimate to the 1982 current estimate is due to a greater than anticipated rise in tuition costs. The 1983 estimate is level with the 1982 plan.

	1981	1982		1983
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		Estimate	Estimate	Estimate
		(Thousands of Dollars)		
11. <u>TRAVEL</u>	<u>3,477</u>	<u>4,962</u>	<u>4,709</u>	<u>4,709</u>
<u>Summary of Fund Requirements</u>				
A. Program Travel.....	3,127	4,449	4,309	4,309
B. Scientific and Technical Development Travel..	113	98	153	153
C. Management and Operations Travel.....	<u>237</u>	<u>415</u>	<u>247</u>	<u>247</u>
Total, Travel.....	<u>3,477</u>	<u>4,962</u>	<u>4,709</u>	<u>4,709</u>

Explanation of Fund Requirements

A. <u>Program Travel</u>	<u>3,127</u>	<u>4,449</u>	<u>4,309</u>	<u>4,309</u>
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Program travel is specifically required for accomplishment of the Center's mission and accounts for approximately 90 percent of the travel budget for 1983. The decrease in the 1982 current estimate from the 1982 budget reflects the amended 1982 budget. In 1982 and 1983 travel provides for the transition of STS operations from verification of performance to actual operational use. 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 1983 estimate reflects expected increases in travel costs offset by scheduling less travel.

B. <u>Scientific and Technical Development Travel</u>	<u>113</u>	<u>98</u>	<u>153</u>	<u>153</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 retain their technical currentness and to benefit from exposure to technological advances outside JSC, 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. Symposia and technical seminars related to the earth observation program and lunar samples are a major requirement in this area. The increase in the 1982 current estimate from the 1982 budget estimate reflects primarily the increased costs for domestic and foreign technical seminars although there is also some increase in travel requirements. The 1983 estimate provides for anticipated cost increases at a decreased level of travel.

	<u>1981 Actual</u>	<u>1982</u>		<u>1983 Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
C. <u>Management and Operations Travel</u>	<u>237</u>	<u>415</u>	<u>247</u>	247

Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters and other NASA Centers; and local transportation. The decrease between the 1982 budget estimate reflects the amended 1982 reduced travel budget. The 1983 estimate reflects decreased travel to offset anticipated increases in travel costs.

III. <u>OPERATION OF INSTALLATION</u>.....	<u>39,438</u>	<u>42,160</u>	<u>43,935</u>	<u>50,208</u>
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Summary of Fund Reauirements

A. Facilities Services.....	20,051	22,602	23,158	27,093
B. Technical Services.....	7,005	5,556	6,052	6,492
C. Management and Operations.....	<u>12,382</u>	<u>14,002</u>	<u>14,725</u>	<u>16,623</u>
Total, Operation of Installation.....	<u>39,438</u>	<u>42,160</u>	<u>43,935</u>	<u>50,208</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.

Increased funding from 1981 to the 1982 current estimate and into 1983 are for projected increases in the cost of support services throughout the majority of institutional support areas; significant cost increases in administrative communications (FTS) and purchased utilities; and Shuttle mission related increased effort in such areas as utilities, ADP operations, technical documentation, and graphics. The increase in 1982 from the budget to the current estimate reflects higher costs for communications (FTS) and utility rates.

	<u>1981</u>	<u>1982</u>		<u>1983</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)		
A. <u>FACILITIES SERVICES</u>	<u>20,051</u>	<u>22,602</u>	<u>23,158</u>	<u>27,093</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 complex encompasses 2,799,041 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 7,000 personnel plus an additional 4,000 personnel located off-site at nearby facilities and Ellington Air Force Base. Many of the test facilities are utilized on schedules involving more than one shift or during off-peak hours. 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

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
1. <u>Maintenance and Related Services</u>	7,005	7,294	7,062	8,028
2. <u>Custodial Services</u>	3,748	4,820	4,355	4,751
3. <u>Utility Services</u>	<u>9,298</u>	<u>10,488</u>	<u>11,741</u>	<u>14,314</u>
Total, Facilities Services.....	<u>20,051</u>	<u>22,602</u>	<u>23,158</u>	<u>27,093</u>

Explanation of Fund Reaquirements

1. <u>Maintenance and Related Services</u>	<u>7,005</u>	<u>7,294</u>	<u>7,062</u>	<u>8,028</u>
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This activity includes routine maintenance and facilities support for applicable facilities at JSC and its component installations at White Sands Test Facility and Ellington Air Force Base. Also included are such activities as support for utility systems, administrative office alterations, and painting. This provides for mowing and edging of 620 acres of improved land and mowing another 695 acres of unimproved land, and cultivation, mulching, fertilizing, insect control, and care of trees and shrubs. Also included is 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 reduction from the 1982 budget estimate to the 1982 current estimate reflects a reduction of contractor effort and deferrals of selected facility maintenance. The 1983 budget includes an increase for minor facility work that has been deferred from prior years as well as increases for negotiated support contractor wages for an unchanging level of support.

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
2. <u>Custodial Services</u>	<u>3,748</u>	<u>4,820</u>	<u>4,355</u>	<u>4,751</u>

This activity involves support contractor effort at JSC to provide security guard services, janitorial services, fire fighting, and ambulance services. Funding provides janitorial services to some 2.55 million square feet of floor space, including highly specialized services to cleanroom areas. Also included are such activities as light bulb replacement, trash removal, and laundry services. **This** activity will provide for fire protection and protection of property and personnel and other related activities, including:

- a. Industrial safety and inspections including insuring compliance with OSHA regulations.
- b. Maintenance of alarms and fixed fire fighting equipment.
- c. Technical interface with the Houston Fire Department for actual fire fighting activities.
- d. Protection of all Government facilities and equipment.
- e. Badging of all on-site personnel and official visitors.
- f. Protecting classified information, maintaining area surveillance and traffic control.

The reduction from the 1982 budget estimate to the 1982 current estimate reflects a reduction of contractor effort. The 1983 budget provides for increases for negotiated support contractor wages for an unchanging level of support.

3. <u>Utility Services</u>	<u>9,298</u>	<u>10,488</u>	<u>11,741</u>	<u>14,314</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 1982 budget estimate to the 1982 current estimate and subsequently into 1983 reflects rate increases for natural gas and electricity plus a modest increase in electricity consumption between the 1982 budget estimate and 1982 current estimate attributed to Shuttle mission activities.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
B. <u>TECHNICAL SERVICES</u>	<u>7,005</u>	<u>5,556</u>	<u>6,052</u>	<u>6,492</u>

(Thousands of Dollars)

Summary of Fund Requirements

1. <u>Automatic Data Processing</u>	<u>4,969</u>	<u>3,332</u>	<u>3,457</u>	<u>3,659</u>
a. <u>Equipment</u> ..	3,172	562	617	563
b. <u>Operations</u> ..	1,797	2,770	2,840	3,096
2. <u>Scientific and Technical Information</u> ..	<u>1,570</u>	<u>1,593</u>	<u>1,909</u>	<u>2,084</u>
3. <u>Shop Support and services</u>	<u>466</u>	<u>631</u>	<u>686</u>	<u>749</u>
Total, Technical Services.....	<u>7,005</u>	<u>5,556</u>	<u>6,052</u>	<u>6,492</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u> ...	<u>4,969</u>	<u>3,332</u>	<u>3,457</u>	<u>3,659</u>
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This activity provides accounting and management information to satisfy requirements of NASA management and external authority. Included is support of all JSC administrative functions and prior to 1982, the lease and maintenance costs of all multiuse ADP equipment within JSC's Central Computer Facility. Currently, these hardware systems include three Univac 1108's, one Univac 1100/81, one Univac 1110, one Univac 9300, one IBM 370/155, one CDC 3200, and one Mohawk (data entry) computer system. Also included is associated peripheral equipment such as three microfilm processors, one Xerox 9700 printer, various terminals, and keypunch equipment. This category also provides 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 increase between the 1982 budget estimate and the 1982 current estimate and into 1983 is due to negotiated support contractor wage increases.

	1981	1982		1983
	<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. <u>Scientific and Technical Information.....</u>	<u>1,570</u>	<u>1,593</u>	<u>1,909</u>	<u>2,084</u>

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. Funding provides support for two principal functions: a JSC public affairs program and a technical documentation and forms distribution program. The Public Affairs program includes: 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 increase from the 1982 budget estimate to the 1982 current estimate and into 1983 is due to an increase in public affairs and technical documentation effort related to the Shuttle missions.

3. <u>Shop Support and Services.....</u>	<u>466</u>	<u>631</u>	<u>686</u>	<u>749</u>
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These funds provide for support contractor effort to provide JSC with services in areas such as graphics, publications, audio-visual materials, microfilm and microfiche, and editing of JSC publications. Graphic materials are prepared for use in presentations and senior management reviews. Various kinds of film are processed and reproductions and reprints made. The increase in 1982 and 1983 is primarily attributable to an increase of support contractor effort in graphics due to the Shuttle mission activity. The 1983 estimate provides for approximately the same level of effort as 1982 with an increase to cover negotiated contractor wage increases.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</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</u>	<u>12,382</u>	<u>14,002</u>	<u>14,725</u>	<u>16,623</u>

Summary of Fund Requirements

1. Administrative Communications.....	3,660	3,302	4,721	5,362
2. Printing and Reproduction.....	172	765	189	200
3. Transportation.....	1,978	1,150	2,230	2,427
4. Installation Common Services.....	<u>6,572</u>	<u>8,785</u>	<u>7,585</u>	<u>8,634</u>
Total, Management and Operations.....	<u>12,382</u>	<u>14,002</u>	<u>14,725</u>	<u>16,623</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u>	<u>3,660</u>	<u>3,302</u>	<u>4,721</u>	<u>5,362</u>
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Communications support for JSC and WSTF consists of local telephone service, long distance telephone service, and various kinds of other communications services. The major part of this category provides for 3,904 Centrex lines and 7,138 telephone instruments at JSC. Also included are 362 telephones at WSTF and local telephone service at Draper Labs, Cambridge, MA.; Grumman, Bethpage, NY; and SAMS0, El Segundo, CA. About 141 local circuits at JSC and three at WSTF for fire alarms, burglar alarms, public address systems, and other specialized uses are also included in this category. This category includes the cost for FTS, commercial toll calls, two dedicated voice circuits between WSTF and Las Cruces, NM, and two teletype circuits between JSC and GSA in Austin, TX. These funds provide specialized services such as teletype and wire news services. In addition, the operation and maintenance of a closed circuit TV system is provided along with eight radio networks for fire, security, custodial, and other uses. The 1982 current estimate and 1983 estimate are higher due to actual and anticipated FTS cost increases. A modest increase is also included for local telephone instruments and Centrex lines necessitated by Shuttle activity.

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
2. <u>Printing and Reproduction</u>	<u>172</u>	<u>765</u>	<u>189</u>	<u>200</u>

Basic printing requirements are handled by maintaining an on-site printing plant operated by JSC personnel. This printing plant produces approximately 59,300,000 units of printing each year. In addition to this on-site printing plant, JSC must also purchase from private firms, through Government Printing Office contracts, about 52,200,000 units each year. This purchased printing is a combination of overflow requirements that cannot be handled on-site and printing which requires greater or different capabilities than those available at the on-site plant. The 1982 current estimate and 1983 budget estimate are lower than the 1982 budget estimate as they reflect the requirements for administrative support only.

3. <u>Transportation</u>	<u>1,978</u>	<u>1,150</u>	<u>2,230</u>	<u>2,427</u>
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Transportation functions at JSC include administrative aircraft maintenance and fuel costs, lease of trucks, maintenance of vehicles, and provision of drivers and dispatchers from GSA. The 1982 current estimate and the 1983 estimate are higher than the 1982 budget estimate as the funding of GSA drivers and dispatchers has been transferred from the Installation Common Services category. The increase from 1982 to 1983 also reflects increases due to negotiated contractor wage increases.

4. <u>Installation Common Services</u>	<u>6,572</u>	<u>8,785</u>	<u>7,585</u>	<u>8,634</u>
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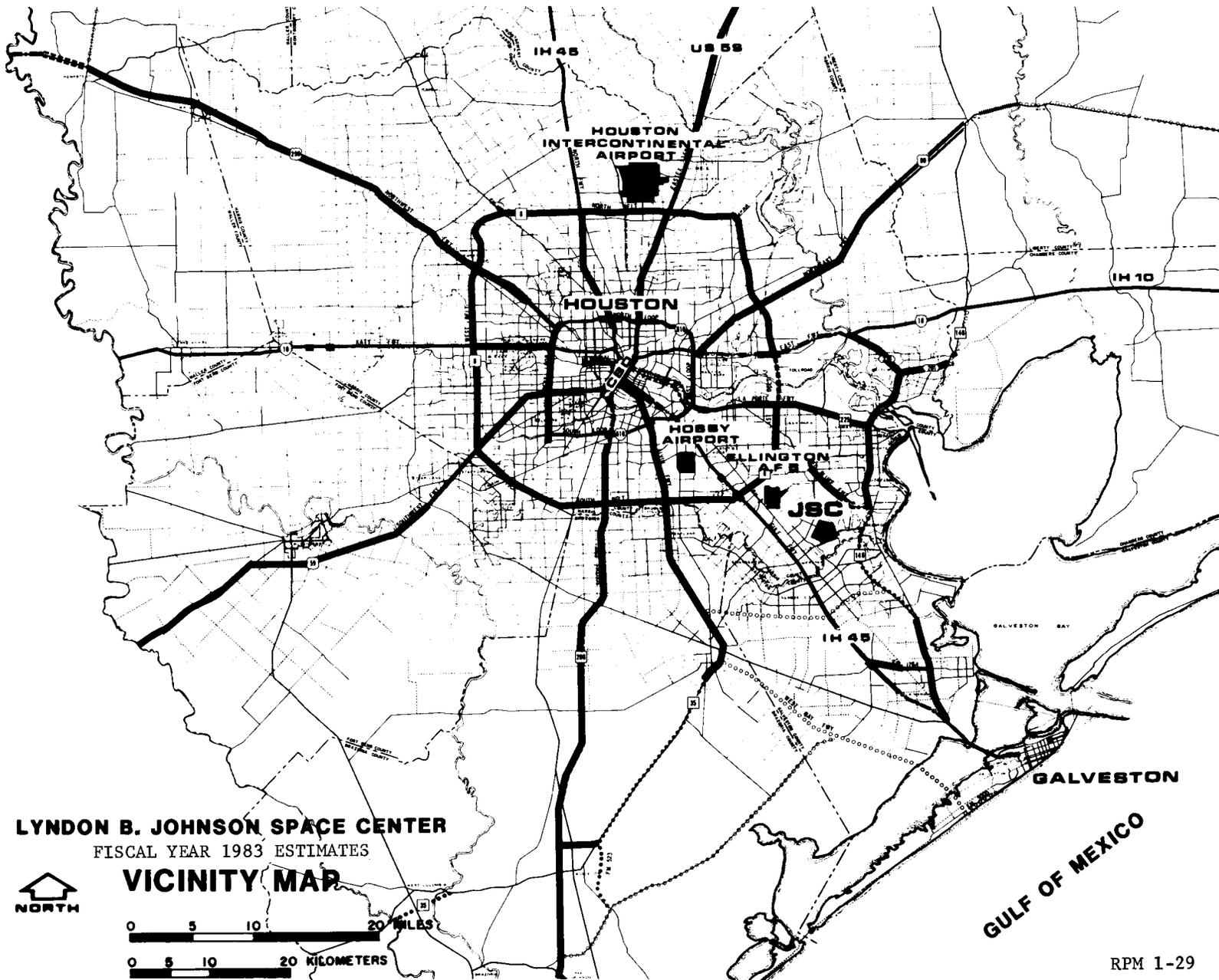
These services support Center management and staff activities, provide medical services, and cover various installation support services. Center management and staff functions include legal, personnel, procurement, and EEO activities. Medical services provided include occupational medicine and environmental health, consisting of the operation of the JSC on-site clinic; emergency assistance at EAFB; providing physicals for JSC personnel at Downey, Ca.; medical consultation and crew test support; industrial hygiene; radiological health; and an environmental health laboratory. Installation support services include administrative supplies, materials and equipment at the Center and at WSTF; identification and cataloging of supply requests into the proper Federal Supply Groups, 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 to the U.S. Postal Service for postage on official mail; 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 1982 budget estimate to the 1982 current estimate is due to a reduction in supplies and materials and to the transfer of funding for GSA drivers and dispatchers *to* the Transportation category. The increase from 1982 to 1983 is primarily support contractor rate increases and a small increase to purchase administrative equipment deferred from prior years.

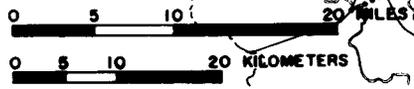
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS





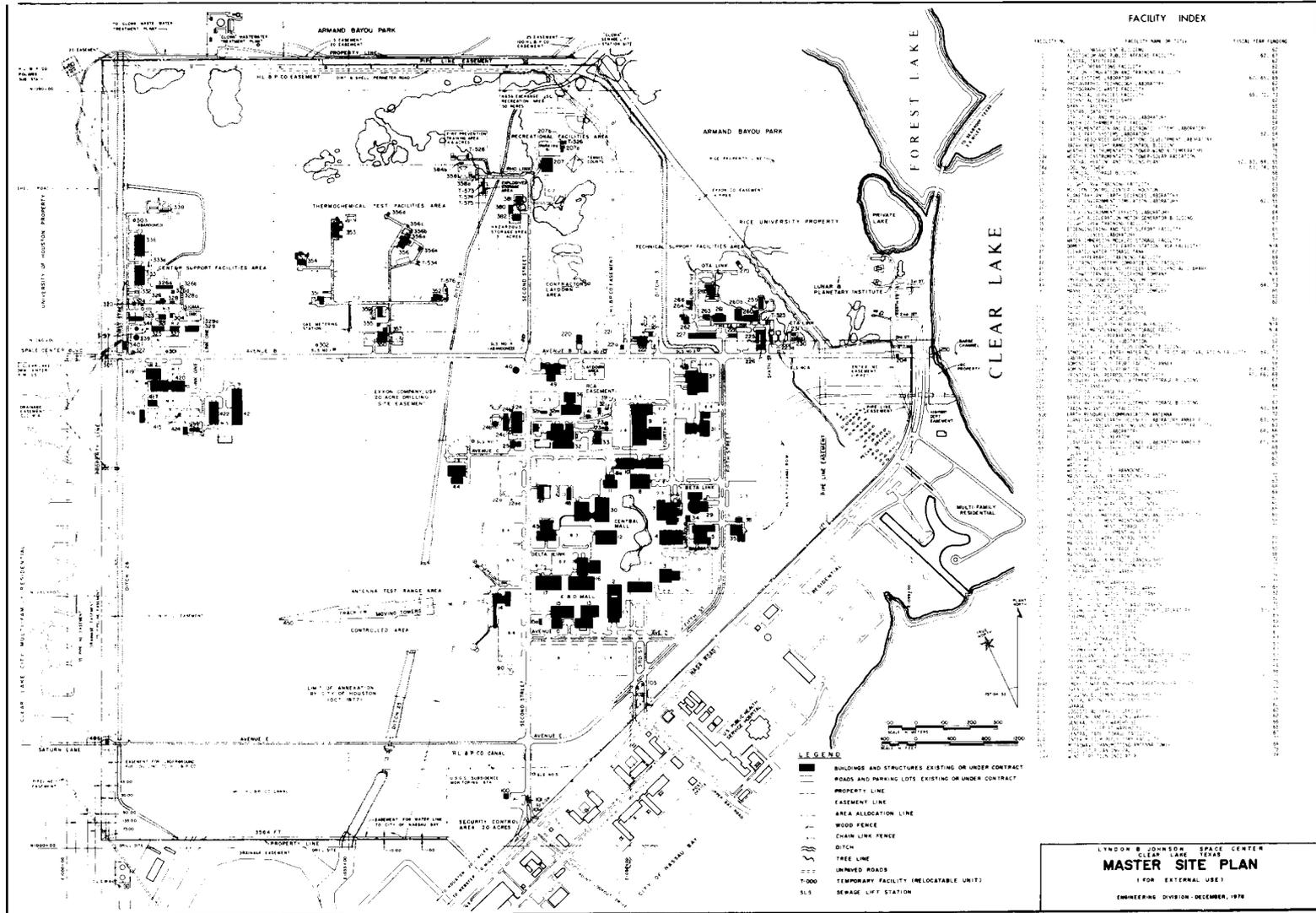
LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1983 ESTIMATES

VICINITY MAP



GULF OF MEXICO

LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1983 ESTIMATES



LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1983 ESTIMATES
AERIAL VIEW



KENNEDY
SPACE CENTER

1

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1983 ESTIMATES

JOHN F. KENNEDY SPACE CENTER

DESCRIPTION

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

Space Shuttle flights began at KSC in 1981 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.

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, 1981, was \$1,866,806,000.

CENTER ROLES AND MISSIONS

The Kennedy Space 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. This site was chosen because of its unique geographical characteristics, climate, local growth capability, accessibility, and availability. The Center has since grown to become the major free world launch site with a unique civil service staff of unparalleled expertise in the field of 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 are:

Space Transportation System (STS) Ground Operations - includes Space Shuttle launch preparation, launch, recovery and refurbishment, Spacelab and Spacelab payloads ground 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.

OF RESOURCES REQUIREMENTS

Funding Plan By Function

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
I. Personnel and Related Costs.. .. .	80,437	84,491	84,183	83,431
II. Travel.....	1,137	2,277	1,687	1,687
III. Operation of Installation.....	68,626	76,192	77,571	84,382
A. Facilities Services.....	(45,343)	(48,156)	(51,795)	(58,077)
B. Technical Services.....	(7,792)	(8,888)	(8,653)	(10,014)
C. Management and Operations .. .	<u>(15,491)</u>	<u>(19,148)</u>	<u>(17,123)</u>	<u>(16,291)</u>
Total, fund requirements.....	<u>150,200</u>	<u>162,960</u>	<u>163,441</u>	<u>169,500</u>

Mstribution of Permanent Positions by Program

	1981	1982		1983
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems and Operations</u>	<u>1,525</u>	<u>1,627</u>	<u>1,503</u>	<u>1,480</u>
Space shuttle.....	1,179	1,198	1,151	87
Space flight operations.....	226	361	233	1,274
Expendable launch vehicles	120	68	119	119
<u>Space Science and Applications</u>	<u>70</u>	<u>4</u>	<u>76</u>	<u>87</u>
Physics and astronomy.....	64	0	71	82
Life sciences.....	4	2	3	3
Technology utilization.....	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>
Subtotal. direct positions.....	1,595	1,631	1,579	1,567
<u>Center Management and Operations</u>				
<u>Support Positions</u>	<u>560</u>	<u>570</u>	<u>554</u>	<u>545</u>
Total. permanent positions.....	<u>2,155</u>	<u>2,201</u>	<u>2,133</u>	<u>2,112</u>

PROGRAM DESCRIPTION

Permanent Positions
(Civil Service)

SPACE SHUTTLE..... ..

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The Kennedy Space Center has been assigned the Launch and Landing Project of the Space Shuttle program. Major roles of this responsibility include launch systems development and Space Transportation Systems (STS) ground systems development. In 1983, these roles **will** continue to be performed for the operational Shuttle system.

Although construction of most new launch support facilities and modifications of most existing facilities will be completed, 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 not only equipment provided by KSC contractors, but also equipment to be supplied by the development contractors as part of their flight vehicle contracts.

The Orbital Flight Test launches land at the Dryden Flight Research Facility. The first Shuttle landing at KSC is scheduled for early FY 1983. Although installation and checkout of initial operational systems **will** be complete and the ground support equipment installed, there are ongoing new requirements and modifications to existing systems, including the Launch Processing System (LPS).

The Shuttle roles at KSC will continue in support of preparations for Launch Pad B construction activities, Launch Complex 39 modifications, and other modifications to facilities or equipment to meet Shuttle requirements.

SPACE FLIGHT OPERATIONS..... ..

1,274

The conduct of the Space Flight Operations program at KSC includes the Space Transportation System (STS) ground operations, Spacelab, Inertial Upper Stages, Payload Support, and multimission support for particular flights.

Orbiter 102, used in the Orbital Flight Test Program, will have some of its modifications to the operational configuration performed at KSC. Orbiter 099 is scheduled to arrive at KSC in 1982 and Orbiter 103 is scheduled for arrival in late 1983.

The ground 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 Shuttle Vehicle, 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, disassembly, and refurbishment of the expended Solid Rocket Boosters. KSC will also continue the refurbishment of selected existing support equipment for reuse in the Shuttle system. KSC has responsibility for contingency landing site preparations for ferrying the Orbiter back to KSC.

The Center's role in the Spacelab program is similar to that of the Shuttle; that is, KSC is responsible for launch site development and for ground operations. With delivery of the Spacelab engineering model in 1981 and Spacelab flight equipment, KSC will undertake the responsibility for verifying the Spacelab flight and ground systems and ensuring that the experiments that are to be mounted on or in the Spacelab are compatible with the Spacelab, with each other, and with safety requirements. The first Spacelab flight unit arrives at KSC in preparation for the first flight in 1983.

The upper stages currently consist of the Inertial Upper Stage (IUS) and the Spinning Solid Upper Stage (SSUS). The IUS and SSUS are expendable, propulsive stages intended for use in the deployment of Shuttle transported payloads to high energy orbits not attainable by the Shuttle alone.

The IUS is being developed by the Air Force, and delivery of the first flight unit is expected in 1982. KSC will be responsible for mating the spacecraft to the IUS. Design review of the IUS integration activities will continue with the first flight scheduled for early 1983.

Under current plans the SSUS will be developed, checked out and mated to a payload by the SSUS commercial developer. KSC will have responsibility for integration of the SSUS and its payload and then into the Shuttle payload bay.

KSC will provide facilities and support to the various payload developers and experimenters during processing at KSC. Thus, KSC, in concert with other NASA organizations must analyze potential payload users. Based on experience gained during the Expendable Launch Vehicle program, KSC will monitor the 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.

Permanent Positions
(Civil Service)

EXPENDABLE LAUNCH VEHICLES.....

119

The Center is responsible for the launch preparation, checkout, and launch of the current inventory of expendable launch vehicles. **This** includes the Atlas Centaur and Delta. Launches at both the Eastern Space and Missile Center and Vandenberg Air Force Base are the responsibility of KSC. Seven launches are scheduled for 1983.

PHYSICS AND ~~ASTRONOMY~~.....

82

KSC is responsible for planning and coordinating the Level IV integration and launch site support of mission experiments for Spacelab Missions. Interfaces **will** be 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.....

3

In 1983, the Kennedy Space Center **will** continue its support role in the definition, development, and integration of biomedical experiments into 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 benefit of man through technological advancement.

TECHNOLOGY UTILIZATION.....

2

The objectives of the Technology Utilization program at KSC are to encourage the use of and to expedite the application of new NASA technology in other sectors, and to impart a better understanding of the technology transfer process and its potential impacts.

Permanent Positions
(Civil Service)

CENTER MANAGEMENT AND OPERATIONS SUPPORT.....

545

Center Management and Operations Support is support or services being provided 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 - 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 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

	1981	1982		1983
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		Estimate	Estimate	Estimate
		(Thousands of Dollars)		
I. <u>PERSONNEL AND RELATED COSTS</u>.....	<u>80,437</u>	<u>84,491</u>	<u>84,183</u>	<u>83,431</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions	68,942	71,846	71,527	71,435
b. Other than full-time permanent positions..	1,325	1,724	1,525	1,534
c. Reimbursable detailees.....	83	---	37	---
d. Overtime and other compensation.....	<u>2,295</u>	<u>2,295</u>	<u>2,592</u>	<u>2,532</u>
Subtotal, Compensation.....	72,645	75,865	75,681	75,561
2. <u>Benefits</u>	<u>7,282</u>	<u>7,327</u>	<u>7,554</u>	<u>7,335</u>
Subtotal, Compensation and Benefits.....	<u>79,927</u>	<u>83,192</u>	<u>83,235</u>	<u>82,896</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel	238	1,006	598	335
2. Personnel training	<u>272</u>	<u>293</u>	<u>350</u>	<u>200</u>
Subtotal, Supporting Costs.....	<u>510</u>	<u>1,299</u>	<u>948</u>	<u>535</u>
Total, Personnel and Related Costs..	<u>80,437</u>	<u>84,491</u>	<u>84,183</u>	<u>83,431</u>

Explanation of Fund Requirements

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
A. <u>Compensation and Benefits</u>	79,927	83,192	83,235	82,896
1. <u>Compensation</u>	72,645	75,865	75,681	75,561
a. Permanent positions	68,942	71,846	71,527	71,435

The current estimate for 1982 reflects a change from the 1982 budget estimate due to the recent pay Increases partially offset by a reduction in permanent positions in 1982.

Basis of Cost for Permanent Positions

In 1983, the cost of permanent positions will be \$71,435,000. The decrease from the 1982 level results from the following:

Cost of permanent positions in 1982.....	71,527
Cost increases in 1983.....	+1,554
Within grade and career advances:	
Full year effect of 1982 actions.....	+802
Partial year effect of 1983 actions.....	+491
Full year effect of 1982 pay increase.....	+261
Cost decreases in 1983.....	-1,646
Turnover savings and abolished positions:	
Full year effect of 1982 actions.....	-589
Effect of 1983 actions.....	-1,057
Cost of permanent positions in 1983.....	<u>71,435</u>

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
b. Other than full-time permanent positions				
(1) cost.....	1,325	1,724	1,525	1,534
(2) workyears	122	148	134	134

The distribution of 1983 workyears is as follows:

Distribution of Other than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Cooperative training.....	59
Summer employment.....	12
Opportunity programs.....	30
Other temporary employment....	<u>33</u>
Total.....	<u>134</u>

The decrease from the 1982 budget estimate to the 1982 current estimate is due to a reduction in the length of summer employment. The 1983 estimate is essentially level with 1982.

c. Reimbursable detailees.....	83	---	37	---
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The personnel detailed to Kennedy Space Center on a reimbursable basis are individuals experienced in Shuttle operations and related fields. The increase from the 1982 budget estimate to the 1982 current estimate provides for the extension of one military detailee through 1982.

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
d. Overtime and other compensation.....	2,295	2,295	2,592	2,592

(Thousands of Dollars)

Overtime and other compensation includes overtime, holiday pay and incentive awards. The increase in the 1982 current estimate over the 1982 budget estimate reflects the effect of the October 1981 pay increase. The 1983 estimate is level with 1982.

2. <u>Benefits</u>	7,282	7,327	7,554	7,335
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The following are the amounts of contribution by category:

Civil Service Retirement Fund.....	4,974	5,372	5,162	5,004
Employee life insurance.....	220	230	230	230
Employee health insurance.....	1,541	1,299	1,642	1,517
Workmen's compensation.....	225	322	485	551
FICA.....	32	24	35	33
Other benefits.....	290	80	---	---
Total.....	<u>7,282</u>	<u>7,327</u>	<u>7,554</u>	<u>7,335</u>

The increase from 1982 budget estimate to the 1982 current estimate is primarily due to the October 1981 pay increase. The workmen's compensation estimates for 1982 and 1983 reflect estimates based on Department of Labor billings. The decrease from 1982 to the 1983 estimate reflects decreased level of benefits associated with the lower compensation level in 1983.

B. <u>Supporting Costs</u>	<u>510</u>	<u>1,299</u>	<u>548</u>	<u>535</u>
1. Transfer of personnel.....	238	1,006	598	335

Transfer of personnel costs include actual expenses involved in the movement and temporary storage of employee's household goods, subsistence and temporary expenses, real estate costs, and miscellaneous moving expenses. The decrease from the 1982 budget estimate to the 1982 revised

estimate reflects revised plans. The 1983 estimate reflects the decrease in the level of activity over 1982 current estimate adjusted for rising real estate costs.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of	<u>Current</u> <u>Estimate</u> Dollars)	
2. Personnel training.....	272	293	350	200

The purpose of the KSC training program is to continue the development of the skills and knowledge of civil service employees in order to more efficiently support KSC roles and missions. The increase from the 1982 budget estimate to the 1982 current estimate is due to the rephrasing of scheduled training programs from 1981 to 1982. The 1983 estimate reflects lower requirements as STS becomes operational.

11. TRAVEL.....	<u>1,137</u>	<u>2,277</u>	<u>1,687</u>	<u>1,687</u>
<u>Summary of Fund Requirements</u>				
A. Program Travel.....	828	1,415	1,276	1,276
B. Scientific and Technical Development Travel.....	24	17	6	6
C. Management and Operations Travel.....	<u>285</u>	<u>845</u>	<u>405</u>	<u>405</u>
Total Travel.....	<u>1,137</u>	<u>2,277</u>	<u>1,687</u>	<u>1,716</u>

<u>Explanation of Fund Requirements</u>				
A. Program Travel.....	<u>828</u>	<u>1,415</u>	<u>1,276</u>	<u>1,276</u>

Program travel is directly related to the accomplishment of KSC's mission and accounts for approximately 80 percent of the Center's travel budget. Program travel reflects the Center's involvement in the design, manufacturing, and testing of Shuttle ground system equipment, design and construction of facilities, and the activation of systems manufactured at off-site locations. The

reduction between the 1982 budget estimate and the current estimate is due to adjustments in the STS schedule. During 1982, effort will be directed toward satisfactory orbital flight tests. Travel to Dryden Flight Research Facility, the landing site of the orbital flight tests, will be required. The Spacelab Engineering Model has been delivered to KSC, and the first flight unit has been accepted. Support of this schedule requires significant travel to Europe to participate with the European Space Agency (ESA) in combined procedures development and to run subsystem and system tests on the engineering model. The 1983 estimate reflects decreased travel to offset expected increases in travel costs.

	<u>1981</u>	<u>1982</u>		<u>1983</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)		
B. <u>Scientific and Technical Development Travel.....</u>	<u>24</u>	<u>17</u>	<u>6</u>	<u>6</u>

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 decrease from the 1982 budget estimate to the 1982 current estimate reflects a reduction in travel due to more urgent requirements in the other travel categories. The 1983 estimate reflects decreased travel to offset expected increases in travel costs.

C. <u>Management and Operations Travel.....</u>	<u>285</u>	<u>845</u>	<u>405</u>	<u>405</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 area as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters, and other NASA Centers; and local transportation. The decrease from the 1982 budget estimate to the 1982 current estimate reflects the amended 1982 reduced travel budget. The 1983 estimate reflects decreased travel to offset expected increases in travel costs.

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
III. OPERATION OF INSTALLATION.....	<u>68,626</u>	<u>76,192</u>	<u>77,571</u>	<u>84,382</u>
<u>Summary of Fund Requirements</u>				
A. Facilities Services.....	45,343	48,156	51,795	58,077
B. Technical Services.....	7,792	8,888	8,653	10,014
C. Management and Operations.....	<u>15,491</u>	<u>19,148</u>	<u>17,123</u>	<u>16,291</u>
Total, Operation of Installation.....	<u>68,626</u>	<u>76,192</u>	<u>77,571</u>	<u>84,382</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 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 (KSC) is located on 139,305 acres and has a complex of facilities which are made up of test and office buildings, as well as launch operations facilities. This complex encompasses 5,573,438 gross square feet of building space, including 13 major buildings. Also included are 14 technical facilities. Many of the test facilities are utilized on more than one shift. The needs of KSC's component installations on Cape Canaveral Air Force Station (CCAFS) 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. As an economy measure, KSC provides many centralized institutional and administrative services to the total Center population.

The decrease from the 1982 budget estimate to the 1982 current estimate reflects 1981 experience, where rate increases in utility and support contractor areas are offset by reductions in purchases of supplies and equipment and some reductions in minor services. The increase in 1983 is due to rate increases in both the utility and support contractor areas.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
A. <u>FACILITIES SERVICES</u>	<u>45,343</u>	<u>48,156</u>	<u>51,795</u>	<u>58,077</u>
<u>Summary of Fund Requirements</u>				
1. <u>Rental of Real Property</u>	<u>21</u>	<u>23</u>	<u>23</u>	<u>32</u>
2. <u>Maintenance and Related Services</u>	<u>11,775</u>	<u>11,084</u>	<u>12,729</u>	<u>13,818</u>
a. <u>Facilities</u>	11,364	10,489	12,315	13,283
b. <u>Equipment</u>	411	595	414	535
3. <u>Custodial Services</u>	<u>19,587</u>	<u>20,175</u>	<u>22,009</u>	<u>24,916</u>
4. <u>Utility Services</u>	<u>13,960</u>	<u>16,874</u>	<u>17,034</u>	<u>19,311</u>
Total, Facilities Services.....	<u>45,343</u>	<u>48,156</u>	<u>51,795</u>	<u>58,077</u>

Explanation of Fund Requirements

	<u>1981</u>	<u>1982</u>		<u>1983</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>	21	23	23	32

This provides for the rental of on and off-site facilities for news and reception centers for NASA guests attending launches and other major public events. The increase from the 1982 current estimate to 1983 supports additional launch activity in 1983 as the Space Transportation System becomes operational.

2. <u>Maintenance and Related Services</u>	11,775	11,084	12,729	13,818
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This activity involves the operation and maintenance of institutional facilities, systems, and equipment. It includes office and facility space utilization analysis, corrosion control, grounds maintenance, inspecting, siting and related facility engineering, and maintenance and repair of heavy equipment. These funds also provide building materials, hardware, metals, plumbing supplies, electrical materials, and general maintenance and operating supplies used by support contractors performing the maintenance functions.

The increase from the 1982 budget estimate to the 1982 current estimate is primarily support contractor rate increases and additional facility maintenance effort supporting STS operations. The 1983 increase reflects increased support contractor rates.

3. <u>Custodial Services</u>	19,587	20,175	22,009	24,916
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This category includes fire protection, security and janitorial services. The demand for these services continues to increase as the Shuttle program accelerates and the system becomes operational. Funding provides janitorial services to two million square feet of KSC's floor areas, including highly specialized services to cleanroom areas and orbiter support equipment. Funds provide fire protection services for KSC property and personnel including: support of hazardous tests and operations involving shuttle orbiter landings; performing fire drills; performing fire inspections of facilities and equipment; and fighting fires. Security protection of personnel and property at 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; protecting classified information; and maintaining area surveillance and traffic control. Remaining activities in this category consist of: pest control services, laundry services, and supplies and equipment used by the support contractor performing the function.

The increase from the 1982 budget estimate to the 1982 current estimate is support contractor rate increases and additional security workyears to support STS operations based on 1981 experience. The increase in 1983 is expected support contractor rate increases plus additional security and fire protection workyears to support additional launches and provide a fire crew for the second orbiter.

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
4. <u>Utility Services</u>	<u>13,960</u>	<u>16,874</u>	<u>17,034</u>	<u>19,311</u>

The major utility at KSC is electrical energy purchased from Florida Power 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 CCAFS. Water services are purchased from the City of Cocoa and sewage treatment is accomplished on-site. At VAFB, utility services are purchased through the Air Force. Utility plant operations and maintenance and utility distribution systems maintenance are provided by a support contractor and by the Air Force at CCAFS and VAFB.

The increase from the 1982 budget estimate to the 1982 current estimate is rate increases in utilities and support contractor areas offset by reductions in utilities consumption and a minor decrease in contractor workyears. The increase in 1983 is due to utility and support contractor rate increases.

	1981 Actual	1982		1983 Budget Estimate
		Budget Estimate	Current Estimate	
B. <u>TECHNICAL SERVICES</u>	<u>7,792</u>	<u>8,888</u>	<u>8,653</u>	<u>10,014</u>

Summary of Fund Reuirements

1. <u>Automatic Data Processing</u>	<u>5,109</u>	<u>5,106</u>	<u>5,695</u>	<u>7,581</u>
a. Equipment.....	974	1,367	1,593	2,822
b. Operations.....	4,135	3,739	4,102	4,759
2. <u>Scientific and Technical Information</u>	<u>1,993</u>	<u>3,121</u>	<u>2,221</u>	<u>1,610</u>
a. Library... ..	504	506	553	619
b. Education and information.....	1,489	2,615	1,668	991
3. <u>Shop Support and Services</u>	<u>690</u>	<u>661</u>	<u>737</u>	<u>823</u>
Total, Technical Services.....	<u>7,792</u>	<u>8,888</u>	<u>8,653</u>	<u>10,014</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u>	<u>5,109</u>	<u>5,106</u>	<u>5,695</u>	<u>7,581</u>
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These funds provide general management ADP programs including the lease, purchase and maintenance of ADP equipment and programming and operations services. A support contractor provides programming services for payroll, general accounting, supply, procurement, preventive maintenance, contract surveillance, personnel, security, and resources and financial management reports and related management information.

The increase from the 1982 budget estimate to the 1982 current estimate is the partial year effect of the operation and maintenance of a new electronic security system including some equipment purchases and support contractor rate increases. The 1983 increase is the purchase of a replacement for an obsolete and maintenance intensive computer; the first full year funding for the operation and maintenance of the electronic security system and anticipated contractor rate increases.

	<u>1981 Actual</u>	<u>1982</u>		<u>1983</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
2. <u>Scientific and Technical Information.....</u>	<u>1,993</u>	<u>3,121</u>	<u>2,221</u>	<u>1,610</u>

This funding provides for operation of a technical library at KSC and for technical and administrative documentation services, including support to 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 in hard copy and microfiche. The contractor also operates a Space Shuttle/Spacelab documents repository which catalogs, classifies, and indexes documents for storage and retrieval; and provides document reference and distribution services.

Technical documentation is provided by a support contractor who prepares publications pertaining to the receipt, checkout, and launch of space vehicles, Shuttle/Spacelab activities, design engineering functions, and various institutional areas. Subject matters include tracking, facility modifications, booster recovery, launch processing, vehicle tests, checkout operations, safety procedures, materials analysis, radiological control, contingency plans, and future programs. 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.

The decrease from the 1982 budget estimate to the 1982 current estimate as well as the 1983 reduction is a realignment of costs to benefitting program elements to reflect the impact of STS operations.

	<u>1981</u> Actual	<u>1982</u>		<u>1983</u>
		<u>Budget</u> Estimate (Thousands of Dollars)	<u>Current</u> Estimate	Budget Estimate
3. <u>Shop Support and Services</u>	<u>690</u>	<u>661</u>	<u>737</u>	<u>a23</u>

These funds provide for a support contractor to perform technical support services, such as coordinating institutional activities to assure a constant state of readiness to support test/launch operations. It includes disaster and hurricane planning and training of all KSC personnel engaged in hazardous occupations. The increase from the 1982 budget estimate to the 1982 current estimate represents a small increase in contractor workyears required to promote better safety standards for STS hazardous activities, plus rate increases. The increase in 1983 is anticipated contractor rate increases.

C. <u>MANAGEMENT AND OPERATIONS</u>	<u>15,491</u>	<u>19,148</u>	<u>17,123</u>	<u>16,291</u>
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Summary of Fund Requirements

1. Administrative Communications.....	2,567	2,014	2,586	1,557
2. Printing and Reproduction.....	3,361	3,830	4,038	3,707
3. Transportation.....	4,054	3,622	3,746	4,282
4. Installation Common Services.....	<u>5,509</u>	<u>9,682</u>	<u>6,753</u>	<u>6,745</u>
Total, Management and Operations.....	<u>15,491</u>	<u>19,148</u>	<u>17,123</u>	<u>16,291</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u>	<u>2,567</u>	<u>2,014</u>	<u>2,586</u>	<u>1,557</u>
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These funds provide for the costs of local telephone service, Federal Telecommunications Systems (FTS), long distance tolls, and special communication services in support of all NASA civil

service and institutional contractor personnel located at KSC, CCAFS, 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 tele-type, wire news services and lease and maintenance of various small electrical/electronic systems such as printers which support major communications systems.

The increase from the 1982 budget estimate to the 1982 current estimate is due primarily to significant FTS rate increases experienced in 1981. The decrease in 1983 is the realignment of costs to benefiting program elements to reflect the impact of STS operations.

	<u>1981</u>	<u>1982</u>		<u>1983</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)		
2. <u>Printing and Reproduction</u>	<u>3,361</u>	<u>3,830</u>	<u>4,038</u>	<u>3,707</u>

This category includes printing and reproduction services for KSC's institutional population, civil service and contractor. A support contractor provides the major part of the printing effort, while copier service is provided through several smaller contracts. Technical printing includes printing of a wide variety of technical materials, microfilming, duplicating, photostating, blue printing, and other photographic reproductions. Administrative printing includes long lead time items such as form production and minor efforts, the KSC house organ, and miscellaneous special requirements for duplicating, photostating, blueprinting, microfilming, and other photographic reproductions. Services are performed by other government agencies or by commercial firms under contract to the Government Printing Office (GPO). Office copier service is provided in central service centers and individual offices where workload justifies assignment.

The increase from the 1982 budget estimate to the 1982 current estimate is due in part to a delay in realigning printing costs to users. The decrease in 1983 reflects the first full year of realigned costs.

3. <u>Transportation</u>	<u>4,054</u>	<u>3,622</u>	<u>3,746</u>	<u>4,282</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. Funding also covers the movement of supplies and equipment by common carrier. 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 from the 1982 budget estimate to the 1982 current estimate is primarily rate increases on the support contract and the interagency motor pool. The 1983 increase provides for expected rate increases and meets additional requirements as the number of launches increase.

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
4. <u>Installation Common Services</u>	<u>5,509</u>	<u>9,682</u>	<u>6,753</u>	<u>6,745</u>

These funds provide for logistics services, mail and distribution services, medical services, and a wide variety of minor contracts for special and one-time services. A support contractor provides a broad range of logistics services including receipt, storage, and issue of supplies and equipment, as well as maintaining various supply management systems. Mail and distribution services, provided by support contract, include distribution of interoffice mail, classified document control, operation of the KSC branch post office, and postage.

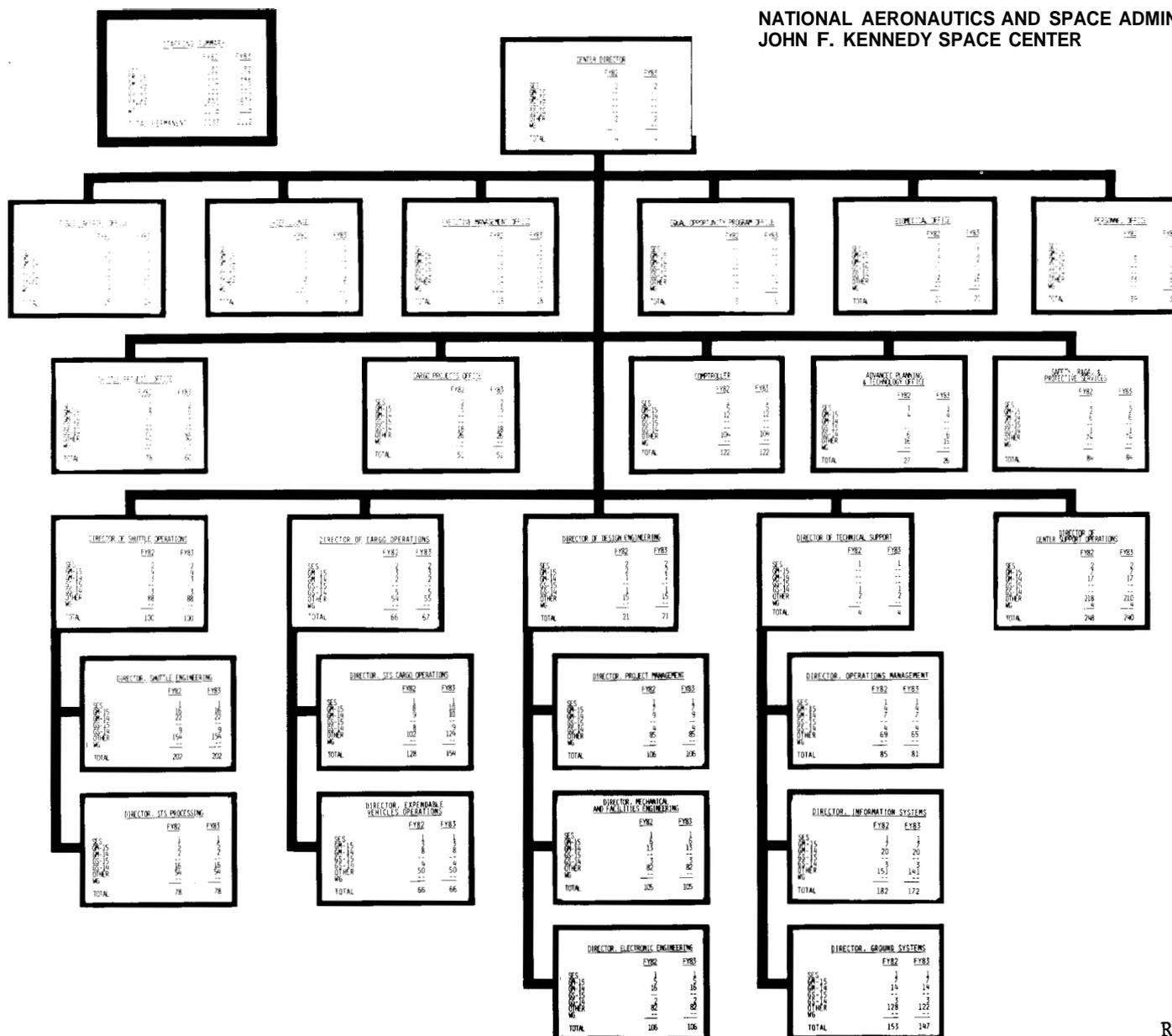
Two major types of medical services are provided, occupational medicine and environmental health. Occupational medicine includes emergency and first aid care for the workforce, guests, and tour visitors; health maintenance and counseling for civil service employees; and a variety of physical examinations and special programs for health maintenance, applied research, and job certification for civil service and contractor personnel. The contractor has also been charged with insuring Occupational Safety and Health Administration standards compliance. The medical program operates on a three-shift basis to provide emergency and ambulance services and special standby service in support of hazardous tests and operations.

Environmental health consists of industrial hygiene, radiological health, and environmental sanitation program elements. This includes, but is not limited to: monitoring hypergolic substances and other toxins; the maintenance of a centerwide toxic substances inventory; surveillance of the potable water supply and distribution; sewage treatment and disposal; treatment and disposal of

industrial wastes, solid wastes management and disposal; selection and use of pesticides; the surveillance of operations producing atmospheric, water, and soil pollution and surveillance of sanitation practices in all food services areas.

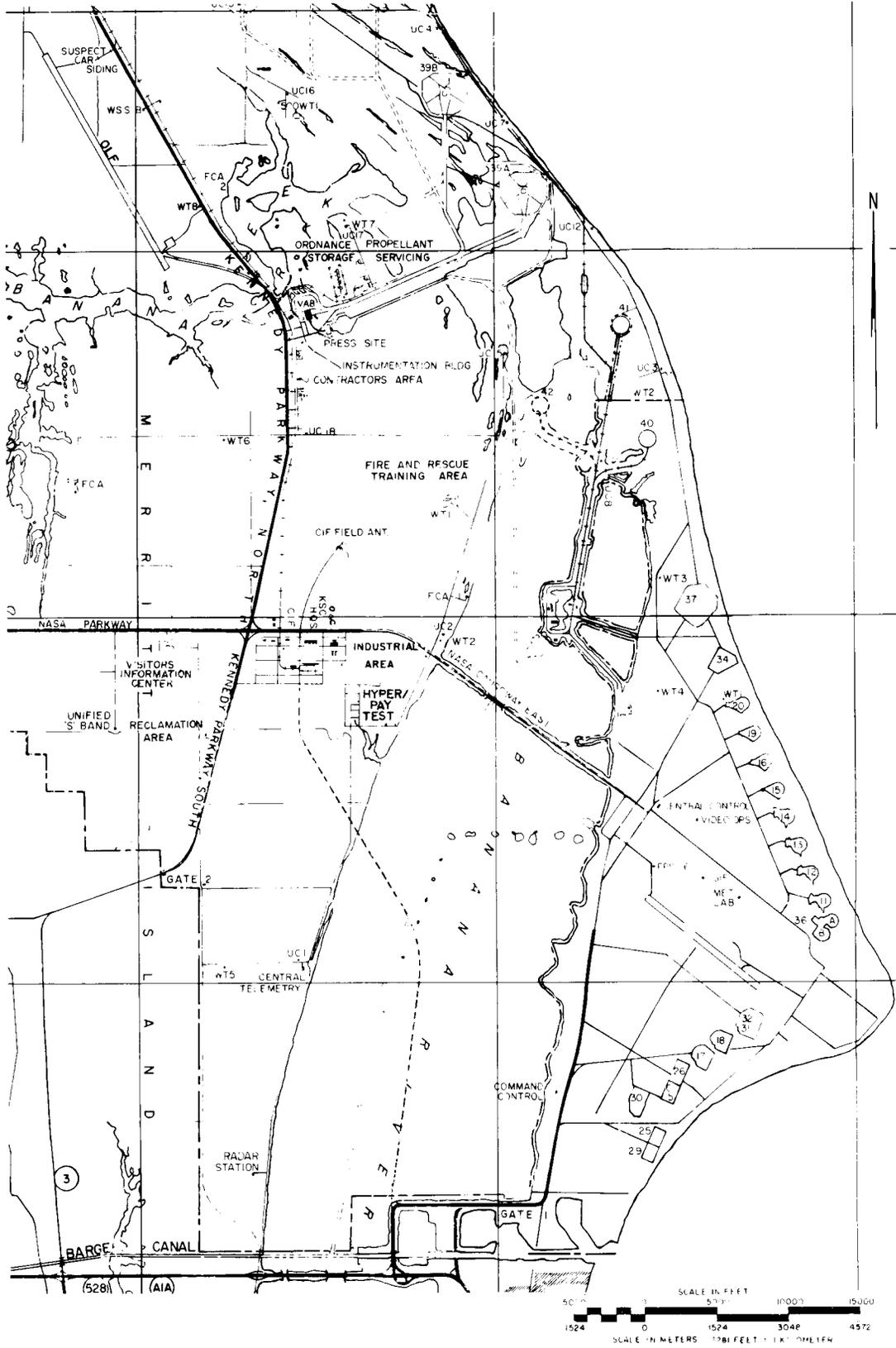
This category also covers lease, maintenance, and purchase of administrative equipment. Rentals are primarily for special purpose office equipment more economical to lease than purchase. Maintenance is provided for all government-owned administrative equipment in active service. Purchases are largely 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. The decrease from the 1982 budget estimate to the 1982 current estimate reflects reductions in administrative services to provide funds for more urgent needs in other Operation of Installation functions. The 1983 budget estimate provides for expected support contractor rate increases offset by additional reductions and deferments in administrative services.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN F. KENNEDY SPACE CENTER



JOHN F. KENNEDY SPACE CENTER, NASA FISCAL YEAR 1983 ESTIMATES LOCATION PLAN

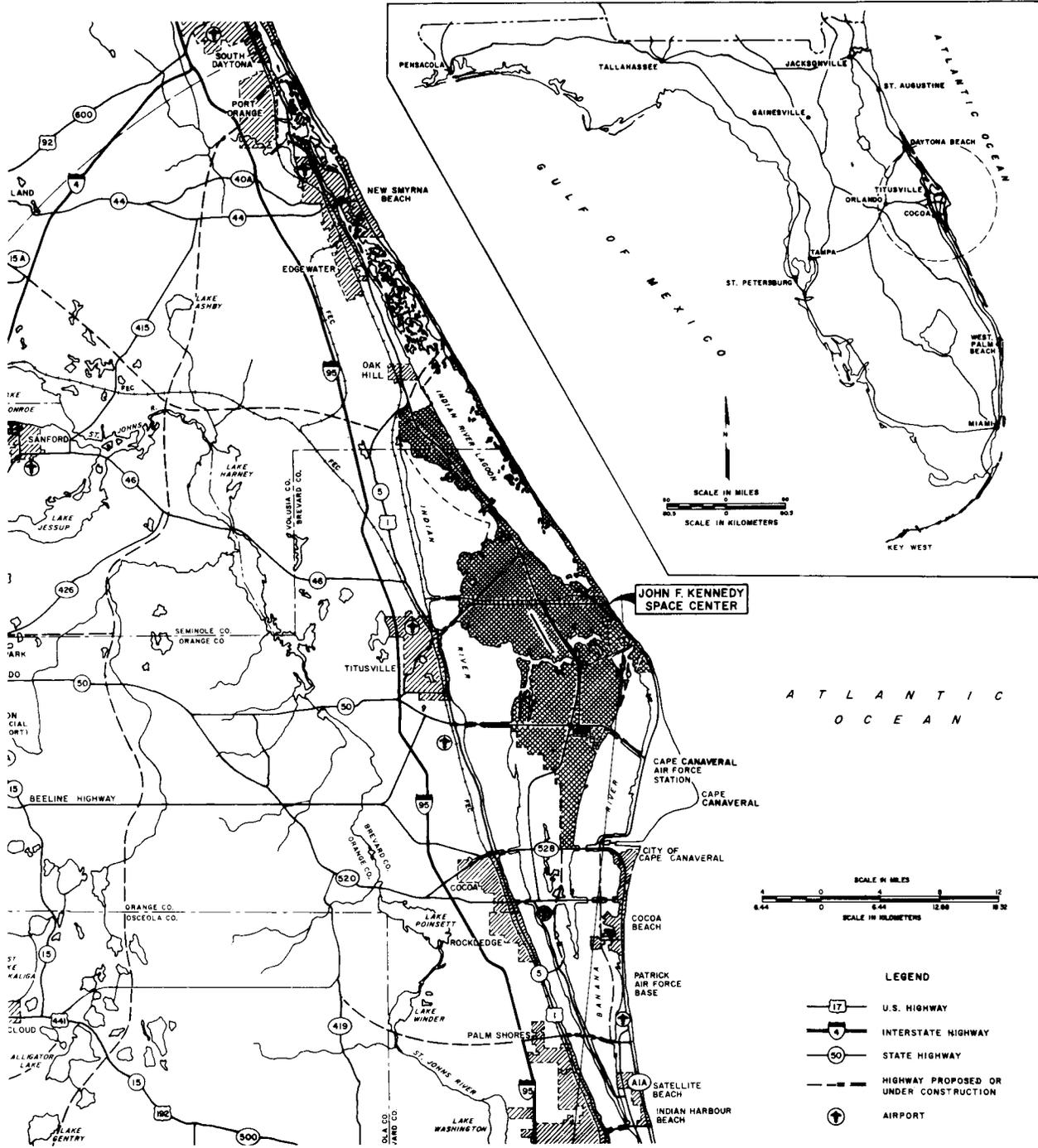
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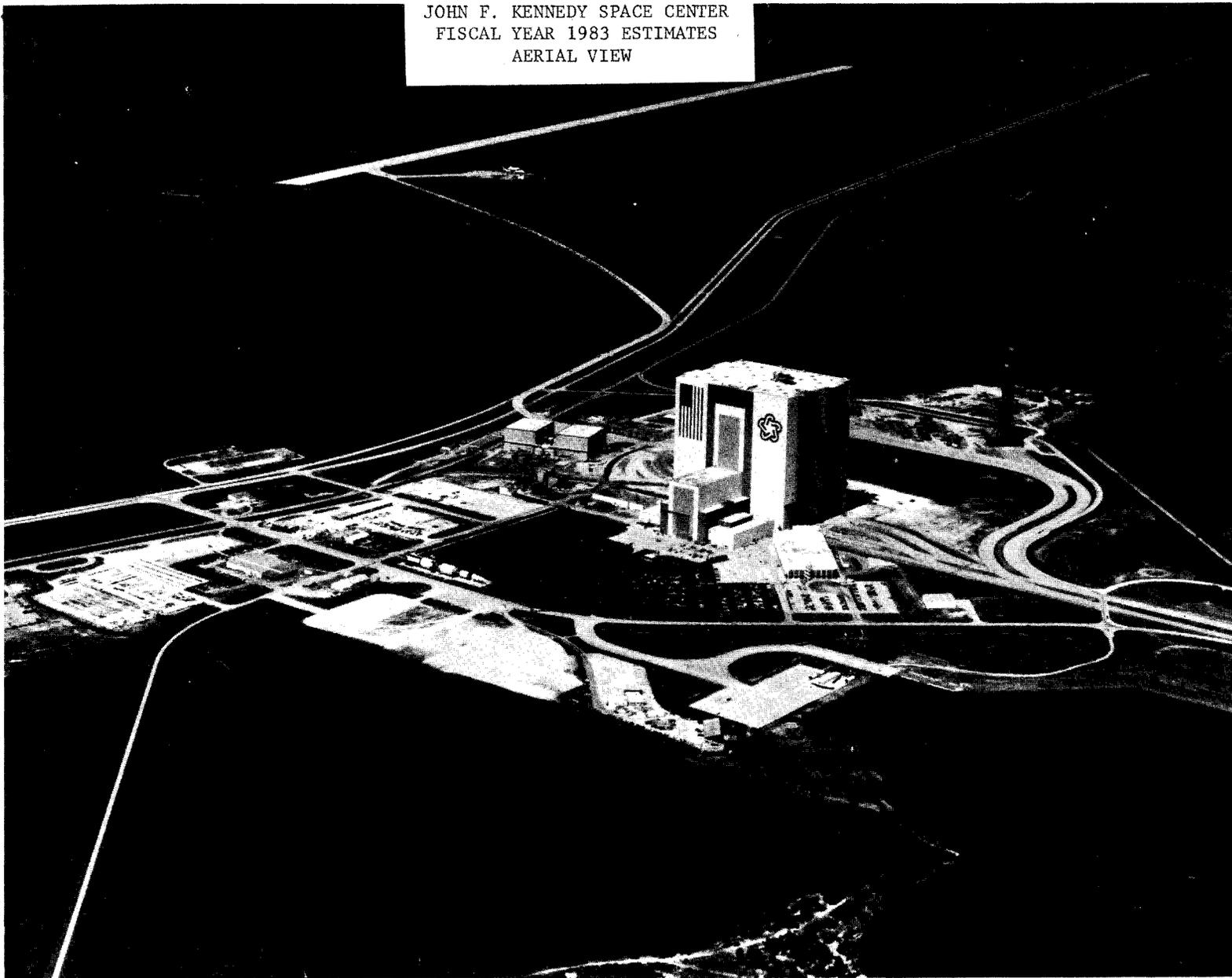
JOHN F. KENNEDY SPACE CENTER, NASA FISCAL YEAR 1983 ESTIMATES

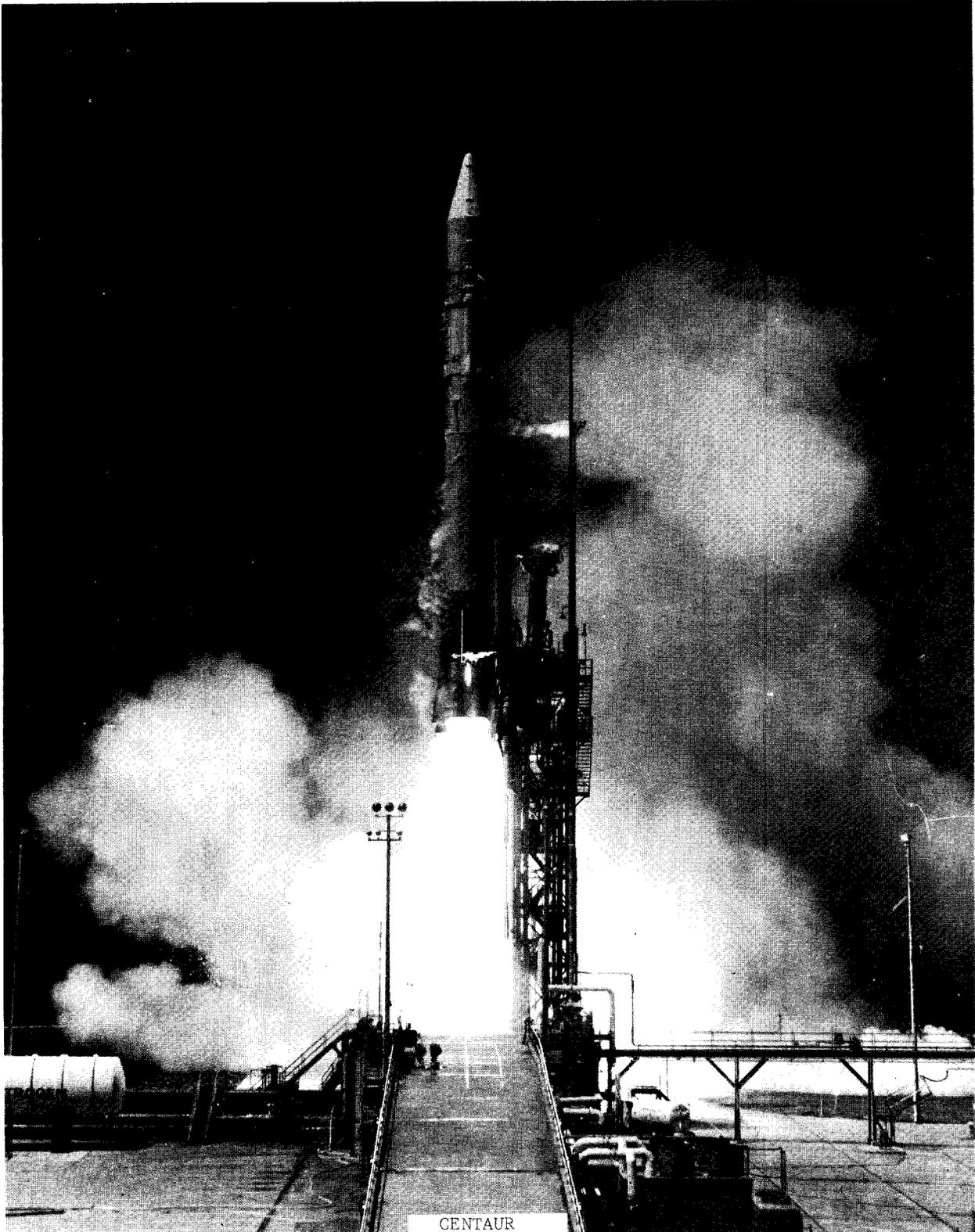
AREA MAP

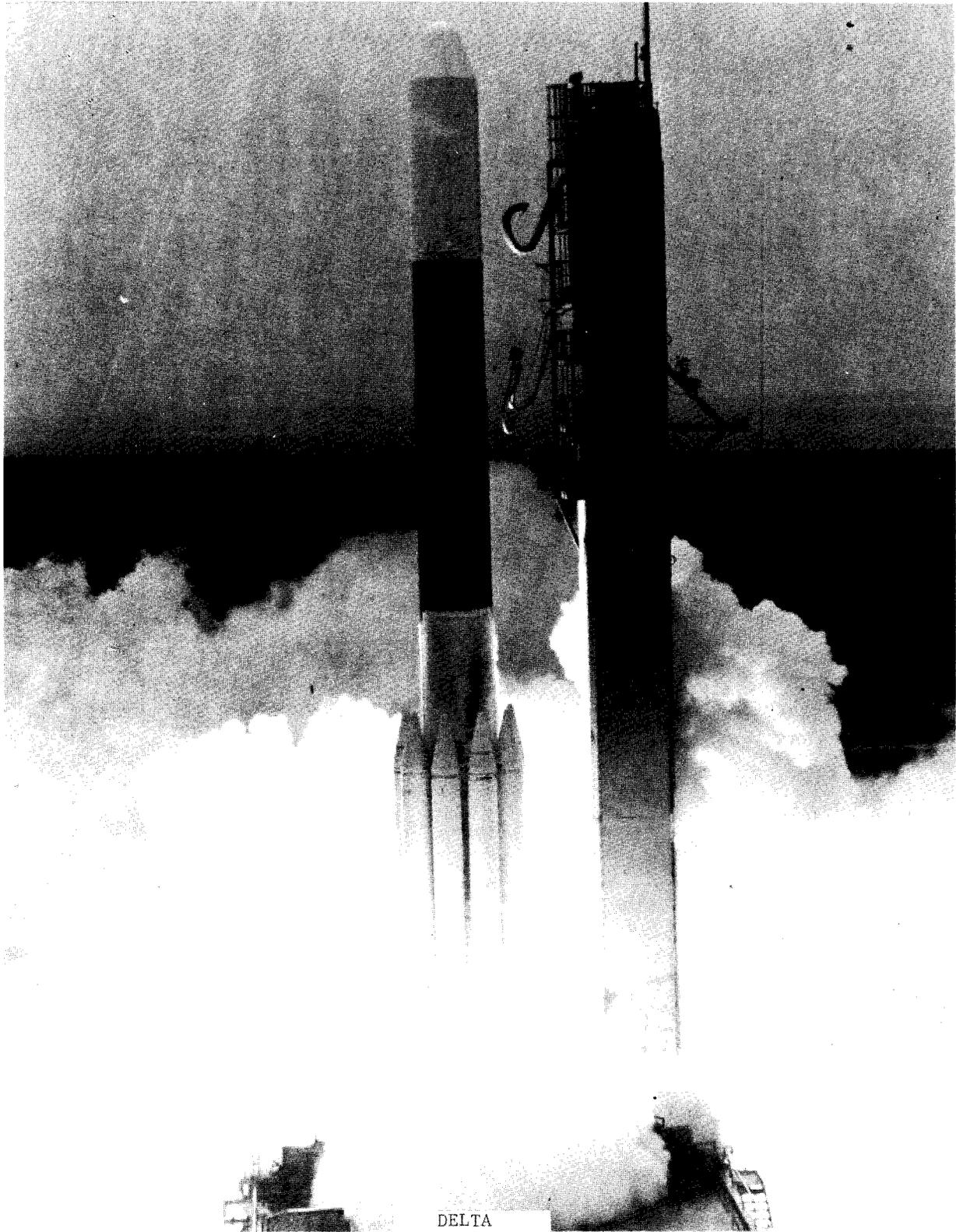
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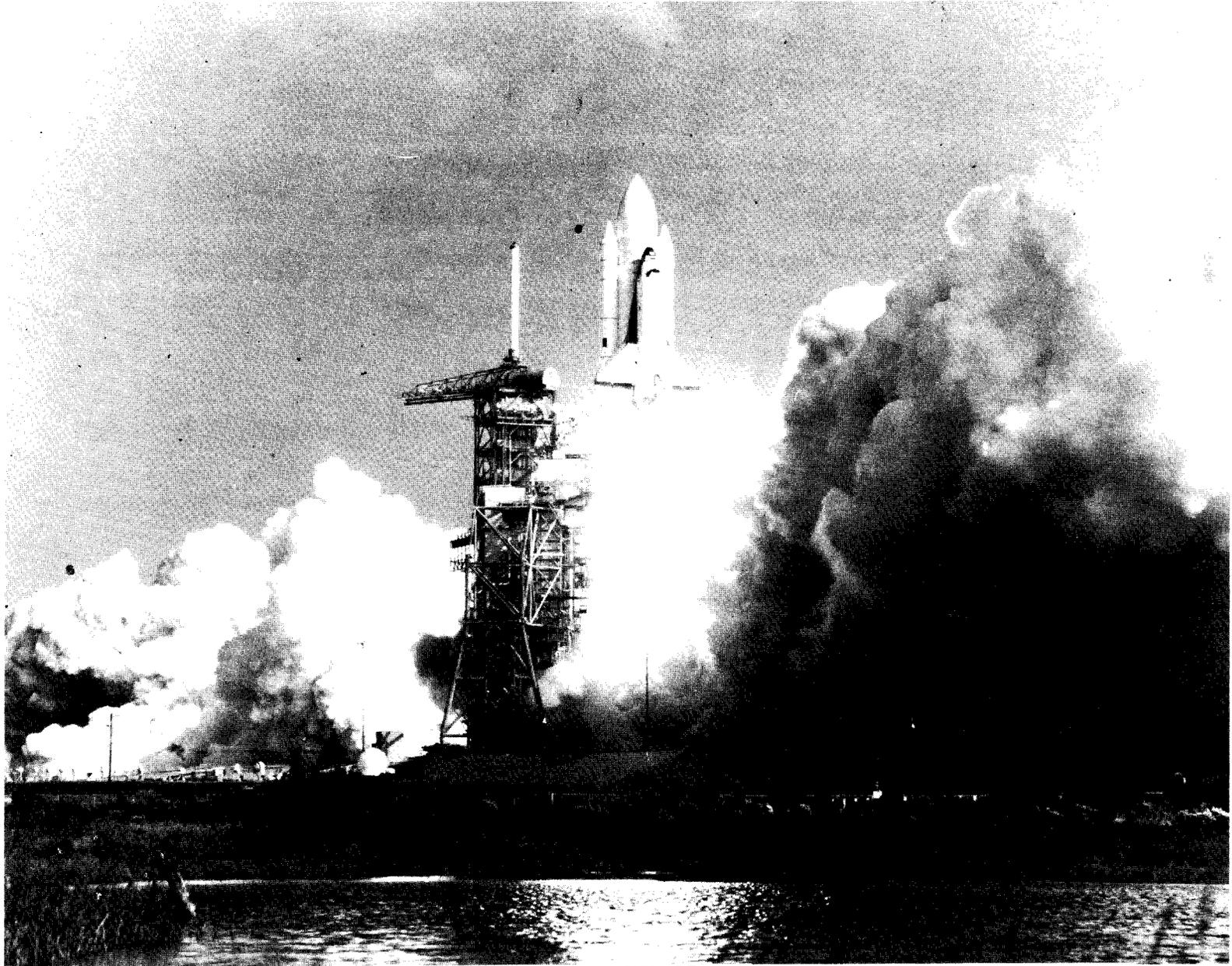


JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1983 ESTIMATES
AERIAL VIEW



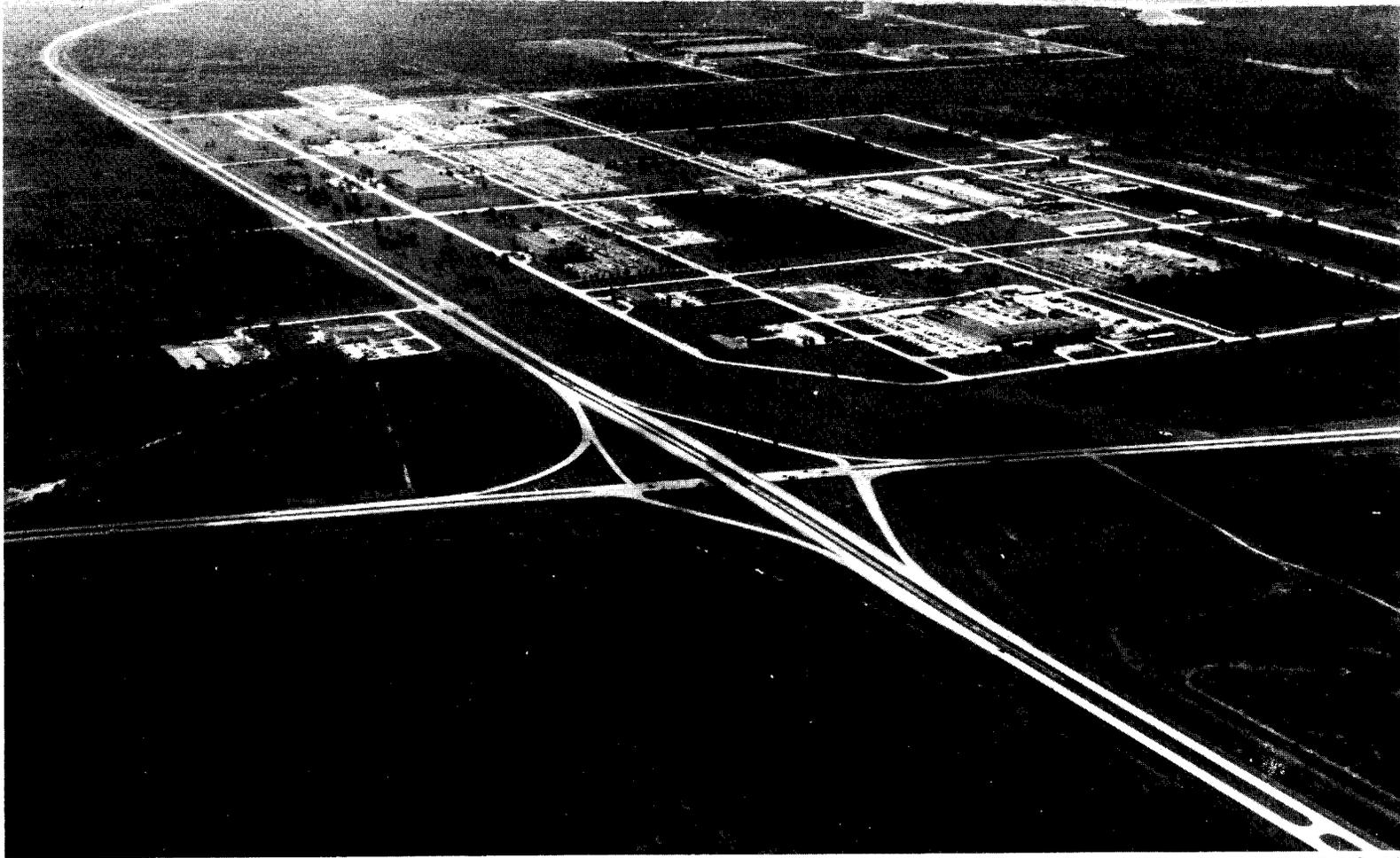






SPACE SHUTTLE

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1983 ESTIMATES
INDUSTRIAL AREA



MARSHALL SPACE
FLIGHT CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1983 ESTIMATES

GEORGE C. MARSHALL SPACE FLIGHT CENTER

DESCRIPTION

Operations at the 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 an irrevocable 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 3,257,543 gross square feet of space, including the main assembly plant which has an area of 43 acres under one roof. 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, the National Space Technology Laboratories, other NASA centers, and associated contractors, as well as other government agencies as designated.

A number of the individual facilities at MSFC and its component installations are unique within NASA, the nation, and the rest of the free world. The combined capability of the science and engineering laboratories, special development facilities, and test facilities, provide a unique national resource for the designing, developing, and testing of 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, 1981, was \$787,880,000.

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 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 onsite 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, development and procurement of major propulsion-oriented systems and subsystems. Current focus is on space transportation systems, including Space Shuttle Main Engine, Solid Rocket Booster, External Tank; and Inertial Upper Stage in cooperation with the Air Force. Advanced program efforts are focused on the definition of unmanned launch vehicles, utilizing the existing technology.

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

- Spacelab - focus is on systems engineering interface with European Space Agency and procurement.
- Advanced Studies - focus is on orbital systems and advanced transportation systems.

- Advanced Development - technology advances focused on advanced missions.

Space Transportation System (STS) Sustaining Engineering - provide sustaining engineering for STS hardware.

Spacelab Mission Management and Payload Development - management of Spacelab Missions 1, 2 and 3, and definition and development of combinations of payloads, facilities, experiments and instruments for 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, and spacecraft studies of the Advanced X-Ray Astrophysics Facility, and the Gravity Probe B.

Space Power Systems - free-flying as attached to other spacecraft or as docked to the Shuttle Orbiter, providing power, communications, stabilization, and supporting services.

Space Processing - developing space processing discipline base, 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 REQUIREMENTS

Funding Plan By Function

	<u>1981</u>	<u>1982</u>		<u>1983</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)		
I. Personnel and Related Costs.. .. .	131,156	133,256	132,760	132,529
II. Travel.....	2,539	3,698	3,413	3,413
III. Operation of Installation.....	31,290	34,196	34,667	41,762
A. Facilities Services.....	(15,559)	(16,273)	(16,544)	(18,774)
B. Technical Services.....	(6,346)	(6,832)	(6,901)	(8,092)
C. Management and Operations.. .. .	<u>(9,385)</u>	<u>(11,091)</u>	<u>(11,222)</u>	<u>(14,896)</u>
Total, fund requirements	<u>164,985</u>	<u>171,150</u>	<u>170,840</u>	<u>177,704</u>

Distribution of Permanent Positions By Program

	<u>1981</u>	<u>1982</u>		<u>1983</u>
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems and</u>				
<u>Operations</u>	<u>1,758</u>	<u>1,849</u>	<u>1,757</u>	<u>1,651</u>
Space shuttle.....	1,202	784	1,006	426
Space flight operations.....	556	1,065	751	1,225
<u>Space Science and Applications</u>	<u>940</u>	855	<u>895</u>	929
Physics and astronomy.....	700	548	666	693
Space applications.....	234	296	223	230
Technology utilization.....	6	11	6	6
<u>Aeronautics and Space Technology</u>	<u>137</u>	278	<u>155</u>	172
Aeronautical research and technology.....	11	11	11	11
Space research and technology.....	126	142	144	161
Energy technology.....	---	125	---	---
Subtotal, direct positions..	<u>2,835</u>	<u>2,982</u>	<u>2,807</u>	<u>2,752</u>
<u>Center Manaeement and Operations Support</u>				
<u>Positions</u>	<u>550</u>	<u>579</u>	<u>544</u>	<u>533</u>
Total, permanent positions.....	<u>3,385</u>	<u>3,561</u>	<u>3,351</u>	<u>3,285</u>

PROGRAM DESCRIPTION

Permanent Positions
(Civil Service)

SPACE SHUTTLE.....

426

The major MSFC Shuttle element assignments consist of: (1) the Space Shuttle Main Engine (SSME); (2) the Solid Rocket Booster (SRB); (3) the External Tank (ET); (4) planning, preparation and conduct of major Shuttle systems tests; and (5) Shuttle system level analysis, test and integration tasks such as: ascent control and stability analysis; flight predictions; structural dynamic analysis and modeling; systems safety and risk analysis. Test activities that will continue in FY 1983 are the main engine system level testing at the National Space Technology Laboratories (NSTL) and at the Santa Susana Facility to provide Full Power Level (FPL) certification in FY 1983 and to demonstrate the engine flight life. The SSME Control Simulation Laboratory in the Systems Dynamic Laboratory will continue in operation to assist in flight planning and to investigate system failure modes and anomalies. SRB refurbishment design and procedures will be verified during OFT to assure meeting the design reuse goals and the high performance motors will be verified with the development motor 5 and qualification motor 4 firing. Producibility and productivity efforts in design will be pursued to reduce cost per flight, reduce weight, improve producibility, and improve overall Shuttle system performance. Continuing efforts in configuration management, interface control documentation, logistics, and ground operations will require significant effort in FY 1983. Support will be provided to the Air Force for activation of the Western Space and Missile Center.

During FY 1981, three performance augmentation concepts providing increased payload capability for the Space Shuttle were evaluated. These were: (1) Liquid Boost Module; (2) filament wound (composite) SRM case; and (3) uprated SSME (up to 115% thrust). The filament wound case (FWC) has been selected in FY 1982 for development and it will provide a payload increase of 5,500 pounds. FY 1983 activation will consist of design, development, and testing leading to initial fabrication for the first flight articles.

SPACE FLIGHT OPERATIONS.....

1,225

The Space Flight Operations program includes Space Transportation System Operations; Spacelab; Space Transportation System Operation Capability Development; and Advanced Programs. The STS Operations Capability Development activity includes STS Upper Stages.

STS Operations

The Shuttle Operations phase is the major element of Space Flight Operations and starts with flight five (STS-5) scheduled for launch in late 1982. During FY 1983, the primary activities will include the production and acquisition of hardware for operational flights. Typical functions will be production engineering, manufacturing, sustaining engineering, anomaly resolution, logistics and contract management. Additional effort will be required to increase manufacturing/tooling capacity. Also included in Space Transportation System Operation is the Inertial Upper Stage flight hardware production for STS operational flights. This IUS activity is managed through the USAF to procure the required NASA IUS vehicles.

Spacelab

FY 1983 activities include continuation of program management; final deliveries of ESA provided hardware and software; initial deliveries of follow-on production hardware procured from the European consortium; integration of ESA and NASA provided hardware and software; and operational flow processing planning in preparation for the first Spacelab flight in FY 1983. Manufacturing and testing of the Spacelab transfer tunnel will also continue with delivery in FY 1983. The delivery of U.S. produced spares and additional European spares are also scheduled to be completed in FY 1983.

STS Upper Stages (Inertial Upper Stage - IUS)

The first NASA IUS launch (TDRS-A mission) is scheduled in 1983. A series of readiness reviews will be conducted to assure flight readiness of the IUS prior to launch. The second NASA IUS vehicle will be delivered in the second quarter. The readiness reviews will be conducted leading to a planned launch (TDRS-B) in the third quarter. The third NASA IUS vehicle is scheduled for delivery in late 1983. Planning and preparation will be completed for a second IUS follow-on production.

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 1983 advanced studies activities include: space platform, tethered satellite, fabrication of structural elements in space; studies of improved propulsion systems capable of using different propellants in the same system; concept studies of geostationary platforms and materials experimentation carriers/modules; and studies of advanced

manipulator systems, remote controls, visual aids and sensory systems to augment the ability of humans to function efficiently in space. In addition, the space platform will continue parallel alternative system design concept studies (phase B) which began in FY 1980. Emphasis will be placed on reducing program risk in phase C/D by performing payload accommodation analyses, flight operation analyses, end-to-end data, flow analyses and reassessing initial configuration, size and evolution options to minimize initial power module cost.

Permanent Positions
(Civil Service)

PHYSICS AND ASTRONOMY..... 693

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 orbit 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, for 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, and assembly and verification. In FY 1983, fabrication and assembly of the Scientific Instruments and Optical Telescope Assembly will be completed with the scientific instruments being delivered to GSFC for verification and acceptance for subsequent delivery to Lockheed Missiles and Space Corporation for integration into the ST. The Support Systems Module will be nearing completion of assembly and verification prior to start of assembly and verification of the ST in early FY 1984. ESA will deliver the solar arrays in late FY 1983 and the Faint Object Camera will be delivered in the first half of FY 1983.

Spacelab Payload Mission Management

MSFC is responsible for management and implementation of Spacelab Missions 1, 2, 3, as well as certain partial payloads including OAST-1, OSTA-2, Materials Experiment Assembly, and Monodisperse Latex Reactor. MSFC is also responsible for in-house development of selected experiments to be flown on these missions. Mission management responsibility begins with the definition of the payload complement and ends with the dissemination of the experiment data and materials resulting from the flight. During FY 1983, MSFC will continue to manage the mission planning activities and development of instruments and supporting hardware/software. Spacelab Mission 1 is now scheduled for launch in 1983 and Spacelab Mission 2 in 1984. Spacelab Mission 3 is also scheduled for launch in 1984. During FY 1983, interfaces will continue to be maintained with the appropriate NASA program offices, the principal investigators, and other appropriate groups to assure that the scientific objectives of the missions are achieved. MSFC will continue to participate in and manage the analysis of the requirements, objectives, and constraints of STS systems and payload components so as to develop requirements for all levels of integration to insure physical, functional, and operational compatibility for all assigned missions.

Supporting Research and Technology

The supporting research and technology activities at MSFC are oriented to develop new technologies required for future science missions. The principal science areas are the Astrophysics and Solar Physics. In 1983, definition study efforts for the Gravity Probe-B (GP-B) and an Advanced X-Ray Astrophysics Facility and technology support leading to planned development activities in subsequent years will continue.

Permanent Positions
(Civil Service)

SPACE APPLICATIONS.....

230

The MSFC activities for this line item 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 1983, the Materials Processing in Space program at the Marshall Space Flight Center will embody research and development activities in such areas as: (1) crystal growth and solidification, (2) containerless processing, (3) fluid and chemical processing, and (4) vacuum research. Continuing activities include ground base research, engineering and scientific analyses, advanced studies, and technical management of definition, design, development, and operation of material processing experiments, apparatus, and payloads.

Atmospheric Supporting Research

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

Permanent Positions
(Civil Service)

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 public sectors areas. MSFC civil service engineering and science personnel provide the primary source of technical skills necessary to accomplish the technology transfer to the public sectors.

AERONAUTICAL RESEARCH AND TECHNOLOGY.....

11

The Aeronautics Research and Technology effort is concerned with aircraft operational safety. The major activities in FY 1983 will be to continue studies of atmospheric conditions having adverse effects on aircraft operation and design, to perform gust correlations, to investigate the dissipation of fog, and to continue studies and technology related to clear air turbulence. Studies will be conducted on the application of infrared lasers for measuring atmospheric flow structure.

Permanent Positions
(Civil Service)

SPACE RESEARCH AND TECHNOLOGY..... 161

The major Space Research and Technology discipline efforts at Marshall are in chemical propulsion, materials, structures, dynamics, microelectronics, guidance and control, information systems, large solar array technology, and power systems technology. In FY 1983, these efforts will focus on developing technology for high performance propulsion power systems and large space systems for the future.

CENTER MANAGEMENT AND OPERATIONS SUPPORT..... 533

Center Management and Operations Support is support or services being provided to all Marshall 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 immediate staff, e.g., Comptroller, Legal, Patent Counsel, Equal Opportunity, Public Affairs, and Safety.

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 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

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
		(Thousands of Dollars)		
I. <u>PERSONNEL AND RELATED COSTS</u>.....	<u>131,156</u>	<u>133,256</u>	<u>132,760</u>	<u>132,529</u>
	<u>Basis of Fund Requirements</u>			
A. <u>Compensation and Benefits</u>				
1. <u>compensation</u>				
a. Permanent positions	115,850	116,899	116,426	115,787
b. Nonpermanent	1,464	2,004	1,868	1,967
c. Overtime and other compensation	<u>1,096</u>	<u>1,117</u>	<u>1,003</u>	<u>908</u>
Subtotal, Compensation	118,410	120,020	119,297	118,662
2. <u>Benefits</u>	<u>12,027</u>	<u>12,222</u>	<u>12,399</u>	<u>12,803</u>
Subtotal, Compensation and Benefits	<u>130,437</u>	<u>132,242</u>	<u>131,696</u>	<u>131,465</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel.....	244	488	451	451
2. Personnel training.....	<u>475</u>	<u>526</u>	<u>613</u>	<u>613</u>
Subtotal, Supporting Costs.....	<u>719</u>	<u>1,014</u>	<u>1,064</u>	<u>1,064</u>
Total, Personnel and Related Costs.. ..	<u>131,156</u>	<u>133,256</u>	<u>132,760</u>	<u>132,529</u>

Explanation of Fund Reuirements

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</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>130,437</u>	<u>132,242</u>	<u>131,696</u>	<u>131,465</u>
1. <u>Compensation</u>	<u>118,410</u>	<u>120,020</u>	<u>119,297</u>	<u>118,662</u>
a. <u>Permanent positions</u>	115,850	116,899	116,426	115,787

The current estimate for 1982 reflects a change from the 1982 budget estimate due to the recent pay increases, partially offset by a reduction in permanent positions.

Basis of Cost for Permanent Positions

In 1983, the cost of permanent workyears will be \$115,787,000. The decrease from 1982 results from the following:

Cost of permanent positions in 1982.....	116,426
Cost increases in 1983.....	+2,625
Within grade and career advanced:	
Full year effect of 1982 actions.....	+1,379
Partial year effect of 1982 actions.....	+782
Full year effect of 1982 pay increase.....	+464
Cost decreases in 1983.....	-3,264
Turnover savings and abolished positions:	
Full year effect of 1982 actions.....	-844
Effect of 1983 actions.....	-2,420
Cost of permanent positions in 1983.....	<u>115,787</u>

	<u>1981</u>	<u>1982</u>		<u>1983</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)		
b. Other than full-time permanent positions				
(1) cost.....	1,464	2,004	1,868	1,967
(2) Workyears	145	194	183	183

The distribution of 1983 workyears is as follows:

Distribution of Other Than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Cooperative training	67
Summer employment	21
Opportunity programs	56
Other temporary employment... ..	<u>39</u>
Total.....	<u>183</u>

The decrease from the 1982 budget estimate to the 1982 current estimate reflects a decrease in the length of summer employments and the realignment by skill mix of some of the temporary programs. The 1983 estimate is essentially level with 1982.

c. Overtime and Other Compensation	1,096	1,117	1,003	908
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The decrease from the 1982 budget estimate to the 1982 current estimate reflects a revised overtime plan slightly offset by the cost of the 1981 pay increases. The 1983 estimate reflects the Center's continuing effort to hold overtime to the minimum hours necessary to achieve the Center's mission.

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
2. <u>Benefits</u>	12,027	12,222	12,399	12,803

(Thousands of Dollars)

The following are the amounts of contribution by category:

Civil Service Retirement Fund.....	8,008	8,310	8,150	8,105
Employee life insurance.....	350	366	361	361
Employee health insurance.....	2,465	2,312	2,287	2,287
Workmen's compensation.....	1,138	1,188	1,518	2,003
FICA.....	57	46	47	47
Other benefits.....	9	---	36	---
Total.....	12,027	12,222	12,399	12,803

The increase in the 1982 current estimate from the 1982 budget estimate reflects the cost of the 1982 pay increase. The workmen's compensation estimates for 1982 and 1983 reflect estimates based on Department of Labor billings. The increase in the 1983 estimate is primarily due to the anticipated billings for workmen's compensation costs.

B. <u>Supporting Costs</u>	<u>719</u>	<u>1,014</u>	<u>1,064</u>	<u>1,064</u>
1. Transfer of personnel... ..	244	488	451	451

The estimated costs provide for certain relocation costs, such as the expenses of selling and buying a home and the movement of household goods. The decrease from the 1982 budget estimate to the 1982 current estimate reflects a lower level of new hires than previously planned.

	1981	1982		1983
	<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.....	475	526	613	613

The purpose of the MSFC training program is to continue the development of skills and knowledge of civil service employees in order to more efficiently support MSFC's roles and missions. 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; development of needed skills and knowledge required in MSFC mission activities; and extending MSFC work force capability and increasing productivity. The increase in the 1982 current estimate over the 1982 budget estimate reflects larger than anticipated rises in tuition costs. The 1983 estimate is level with 1982.

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
11. <u>TRAVEL</u>	<u>2,539</u>	<u>3,698</u>	<u>3,413</u>	<u>3,413</u>

Summary of Fund Requirements

A. Program Travel.....	2,312	3,369	3,150	3,150
B. Scientific and Technical Development Travel..	51	87	63	63
C. Management and Operations Travel.....	<u>176</u>	<u>242</u>	<u>200</u>	<u>200</u>
Total, Travel.....	<u>2,539</u>	<u>3,698</u>	<u>3,413</u>	<u>3,413</u>

Explanation of Fund Requirements

A. <u>Program Travel</u>	<u>2,312</u>	<u>3,369</u>	<u>3,150</u>	<u>3,150</u>
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Program travel is directly related to the accomplishment of the Center's mission and in 1983 is approximately 90 percent of the total MSFC travel. Travel requirements include those for ongoing programs such as the Space Shuttle Main Engine, External Tank and Solid Rocket Booster, STS Operations, Spacelab, Inertial Upper Stage, Space Telescope, space science and applications payloads and basic/supporting research and technology. Travel for Spacelab, Spacelab Payloads, and Space Telescope will require both domestic and European travel. The decrease in the 1982 current estimate from the budget estimate is due to the 1982 budget amendment. The 1983 estimate reflects decreased travel to offset expected travel cost increases.

B. <u>Scientific and Technical Development Travel</u>	<u>51</u>	<u>87</u>	<u>63</u>	<u>63</u>
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Scientific and technical development travel permits employees to participate in meetings and technical seminars with representatives of the aerospace community. This participation allows them to maintain technical currentness as they benefit from exposure to technological advances outside MSFC,

as well as to present both accomplishments and problems to their associates. These meetings are principally working panels convened to solve problems for the benefit of the Government. The decrease in the 1982 current estimate from the budget estimate is due to the 1982 budget amendment. The 1983 estimate reflects decreased travel to offset expected travel cost increases.

	<u>1981 Actual</u>	<u>1982</u>		<u>1983 Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
C. <u>Management and Operations Travel</u>	<u>176</u>	<u>242</u>	<u>200</u>	<u>200</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. The decrease in the 1982 current estimate from the budget estimate is due to the budget amendment. The 1983 estimate reflects decreased travel to offset expected increases in travel costs and commercial vehicle rentals.

III. <u>OPERATION OF INSTALLATION</u>.....	<u>31,290</u>	<u>34,196</u>	<u>34,667</u>	<u>41,762</u>
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Summary of Fund Requirements

A. Facilities Services.....	15,559	16,273	16,544	18,774
B. Technical Services.....	6,346	6,832	6,901	8,092
C. Management and Operations.	<u>9,385</u>	<u>11,091</u>	<u>11,222</u>	<u>14,896</u>
Total, Operation of Installation.....	<u>31,290</u>	<u>34,196</u>	<u>34,667</u>	<u>41,762</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 1982 budget to the 1982 current estimate is mainly due to projected support contractor wage rate increases and increased utility rates partially offset by reduced consumption. The 1983 budget estimate provides for projected increases in support contractor wage rates, supplies, materials and equipment along with anticipated utility rate increases.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
A. <u>FACILITIES SERVICES</u>	<u>15,559</u>	<u>16,273</u>	<u>16,544</u>	<u>18,774</u>

The Marshall Space Flight Center (MSFC) occupies 1,841 acres under Department of the Army permit in a complex of science and engineering laboratories and special development and test facilities. The complex encompasses 3,645,000 gross square feet of building space including 18 major buildings. Also included are 17 major technical facilities. This physical plant houses an average daily on-Center population of approximately 4,700 personnel.

Summary of Fund Requirements

1. <u>Maintenance and Related Services</u>	<u>4,438</u>	<u>3,536</u>	<u>3,809</u>	<u>4,377</u>
a. <u>Facilities</u>	3,845	2,930	3,069	3,655
b. <u>Equipment</u>	593	606	740	722
2. <u>Custodial Services</u>	<u>2,965</u>	<u>3,312</u>	<u>3,488</u>	<u>3,793</u>
3. <u>Utility Services</u>	<u>8,156</u>	<u>9,425</u>	<u>9,247</u>	<u>10,604</u>
Total, Facilities Services.....	<u>15,559</u>	<u>16,273</u>	<u>16,544</u>	<u>18,774</u>

Explanation of Fund Requirements

	<u>1981</u>	<u>1982</u>		<u>1983</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>Maintenance and Related Services</u>	<u>4,438</u>	<u>3,536</u>	<u>3,809</u>	<u>4,377</u>

This activity involves a total of 206 facilities (building, structures, and trailers) with 3.7 million square feet of floor area. Also involved are 1,841 acres of land area, one million square yards of surfaced area, and several special structures and systems. The 1982 budget to the current estimate reflects the purchase of additional equipment and a slight workyear increase in the base maintenance contract offset by a decrease in rates. This increase is required to provide a proper maintenance level. The increase from the 1982 current estimate to 1983 is due to projected increases in support contractor labor rates and supplies and materials plus facility repairs and painting which were deferred from previous years.

2. <u>Custodial Services</u>	<u>2,965</u>	<u>3,312</u>	<u>3,488</u>	<u>3,793</u>
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Custodial services include janitorial services, security services, fire protection, trash removal, sanitary landfill operations, pest control activities, and related supplies and materials. Janitorial service is provided to about 3 million square feet of facility space and trash removal for approximately 125 separate locations. Security and fire protection services include 24-hour coverage of MSFC property, law enforcement, and motor vehicle control and registration. The increase from the 1982 budget to the 1982 current estimate is due to rate increases based on 1981 experience. The 1982 current estimate to 1983 increase is also based on expected contractor rate increases.

3. <u>Utility Services</u>	<u>8,156</u>	<u>9,425</u>	<u>9,247</u>	<u>10,604</u>
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This function provides for the cost of electricity, steam, natural gas, water and sewage disposal service provided by the Army (Redstone Arsenal) on a reimbursable basis. It also provides for propane and burner fuel for generating steam for heating. The decrease in the 1982 current estimate from the budget estimate is due to lower than planned utility rates and reduced consumption. The increase in 1983 includes expected utility rate increases partially offset by reduced consumption.

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
B. <u>TECHNICAL SERVICES</u>	<u>6,346</u>	<u>6,832</u>	<u>6,901</u>	<u>8,092</u>

Summary of Fund Requirements

1. <u>Automatic Data Processing</u>	<u>4,187</u>	<u>4,384</u>	<u>4,475</u>	<u>5,413</u>
a. Equipment..	811	721	672	1,249
b. Operations.	3,376	3,663	3,803	4,164
2. <u>Scientific and Technical Information</u> ..	<u>882</u>	<u>983</u>	<u>1,016</u>	<u>1,082</u>
a. Library	830	858	880	942
b. Education and information.....	52	125	136	140
3. <u>Shop Support and Services</u>	<u>1,277</u>	<u>1,465</u>	<u>1,410</u>	<u>1,597</u>
Total, Technical Services.....	<u>6,346</u>	<u>6,832</u>	<u>6,901</u>	<u>8,092</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u>	<u>4,187</u>	<u>4,384</u>	<u>4,475</u>	<u>5,413</u>
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Provides centralized systems analysis, programming, operations, and related computational services to meet the management and administrative computing requirements. Also includes maintenance of ADP equipment and related supplies and materials. Maintenance is provided under separate contracts for central site computers and associated equipment. Equipment maintained includes Univac 1100/82 system, FR-80 microfiche system, systems software support, and a key-to-disc which collects, controls, organizes, and edits raw data for input in the Univac 1100/82 system.

This function also provides for the development and utilization of computer techniques and systems programming of all digital computers and associated equipment at MSFC. The computer systems include the Univac 1100/82 system, Univac 9300 Remote Job Entry terminals, and an FR-80 Model 8001 and auxilliary equipment. Also included is associated auxilliary support equipment such as film processors, xerox microfiche printers, xerox forms copiers, and punch card accounting machines. This activity includes the operations of two large magnetic tape libraries containing a combined total of 25,000 reels; receipt, control, and distribution of program and data processing products; and testing and cleaning of magnetic tapes.

The increase in the 1982 current estimate over the budget estimate is due to contractor rate increases. The increase from the 1982 current estimate to the 1983 estimate provides for additional anticipated rate increases and the one-time purchase of a computer micrographics printer for the Center's resource management information systems.

	1981	1982		1983
	<u>Actual</u>	Budget <u>Estimate</u>	Current <u>Estimate</u>	Budget <u>Estimate</u>
		(Thousands of Dollars)		
2. <u>Scientific and Technical Information..</u>	<u>882</u>	<u>983</u>	<u>1,016</u>	<u>1,082</u>

This activity provides for the cost sharing operation of the Redstone scientific information center library on Redstone Arsenal and other various scientific and technical information services.

Scientific information and library services are provided to MSFC employees and associated NASA contractor personnel through the Redstone Scientific Information Center (RSIC) operations. The RSIC contains a central collection of books and journals, periodicals, documents on micorfilm and technical papers. Operation of the RSIC by the Army is under direction of a joint MSFC/Army Redstone scientific information board with costs shared.

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 1982 current estimate increase over the 1982 budget estimate is due to increased cost in technical publication services and supplies and materials. The 1983 estimate provides for continuation of the same level of service.

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
3. <u>Shop Support and Services</u>	<u>1,277</u>	<u>1,465</u>	<u>1,410</u>	<u>1,597</u>

These funds provide the Center with support in the areas of graphics, photographic services, some instrumentation support and related supplies, materials, and equipment. The decrease between the 1982 current estimate and the budget estimate reflects 1981 experience. The increase from the 1982 current estimate to 1983 is due to expected increases in support contractor rates, and the replacement of some obsolete and wornout equipment no longer economical to repair.

C. <u>MANAGEMENT AND OPERATIONS</u>	<u>9,385</u>	<u>11,091</u>	<u>11,222</u>	<u>14,896</u>
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Summary of Fund Requirements

1. Administrative Communications.. ..	3,113	3,129	3,693	4,802
2. Printing and Reproduction	336	520	425	538
3. Transportation... ..	2,038	2,750	2,906	4,975
4. Installation Common Services.....	<u>3,898</u>	<u>4,692</u>	<u>4,198</u>	<u>4,581</u>
Total, Management and Operations... ..	<u>9,385</u>	<u>11,091</u>	<u>11,222</u>	<u>14,896</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u>	<u>3,113</u>	<u>3,129</u>	<u>3,693</u>	<u>4,802</u>
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Communications support for MSFC consists of local telephone service, long distance telephone service and various kinds of other nontelephone communications. The MSFC central exchange provides instruments and lines at the Center for local telephone service. Long distance telephone service (FTS) is provided by the GSA operated system billed to NASA. Cost results from a formula which is

based primarily on the number of calls made two years in the past and the number of circuits used by the Center. Included are such items as long distance commercial tolls and the autodin network for ordering supplies and materials. Also included are the costs of leased lines for the teleconferencing network. 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. Also provided are payments for entry into the GSA teletype system for government subscribers, entry into the Western Union teletype system for commercial subscribers, and overseas telegrams and cable system upkeep. The increase in the 1982 current estimate over the budget estimate is due to FTS rate increases. The 1983 estimate projects further rate increases in local services and FTS services as well as additional cost increases in other communication services.

	1981	1982		1983
	<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. <u>Printing and Reproduction</u>	<u>336</u>	<u>520</u>	<u>425</u>	<u>538</u>

A portion of MSFC's printing and reproduction requirements are met by an on-site reproduction plant operated by MSFC civil service personnel. In addition to the on-site reproduction plan, MSFC must also purchase reproduction services from the Government Printing Office (GPO), the Army, and private firms. This purchased printing is either an overflow requirement that cannot be handled within the on-site workload, or is of such a type that it cannot be handled with the limited capability of the on-site equipment. The decrease from the 1982 current estimate reflects reduced printing requirements. The increase from the 1982 current estimate to 1983 is due to rate increases plus an anticipated increase in GPO printing costs as well as more off loading of requirements from the on-site plant.

3. <u>Transportation</u>	<u>2,038</u>	<u>2,750</u>	<u>2,906</u>	<u>4,975</u>
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The transportation function at MSFC includes operation and maintenance of vehicles and aircraft, transportation of related supplies and materials, and purchase of transportation equipment. Included is the maintenance of general purpose vehicles, material handling equipment, general special purpose trailers and vehicles, equipment such as "A" frame cranes, "H" frame cranes, tractors, generators and welders; intermediate inspection at 6,000 miles or six months; and major inspections at 12,000 miles or 12 months. Freight charges for shipment of materials and equipment by

both surface and air transportation are also included. The increase from the 1982 budget estimate to the 1982 current estimate reflects support contractor and fuel rate increases offset by a slight reduction in contractor workyears. The increase in 1983 is due to the purchase of a replacement administrative aircraft and anticipated support contractor rate increases.

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
(Thousands of Dollars)				
4. <u>Installation Common Services</u>	<u>3,898</u>	<u>4,692</u>	<u>4,198</u>	<u>4,581</u>

This activity provides administrative support to Center management and staff activities, medical services, and various other installation support services.

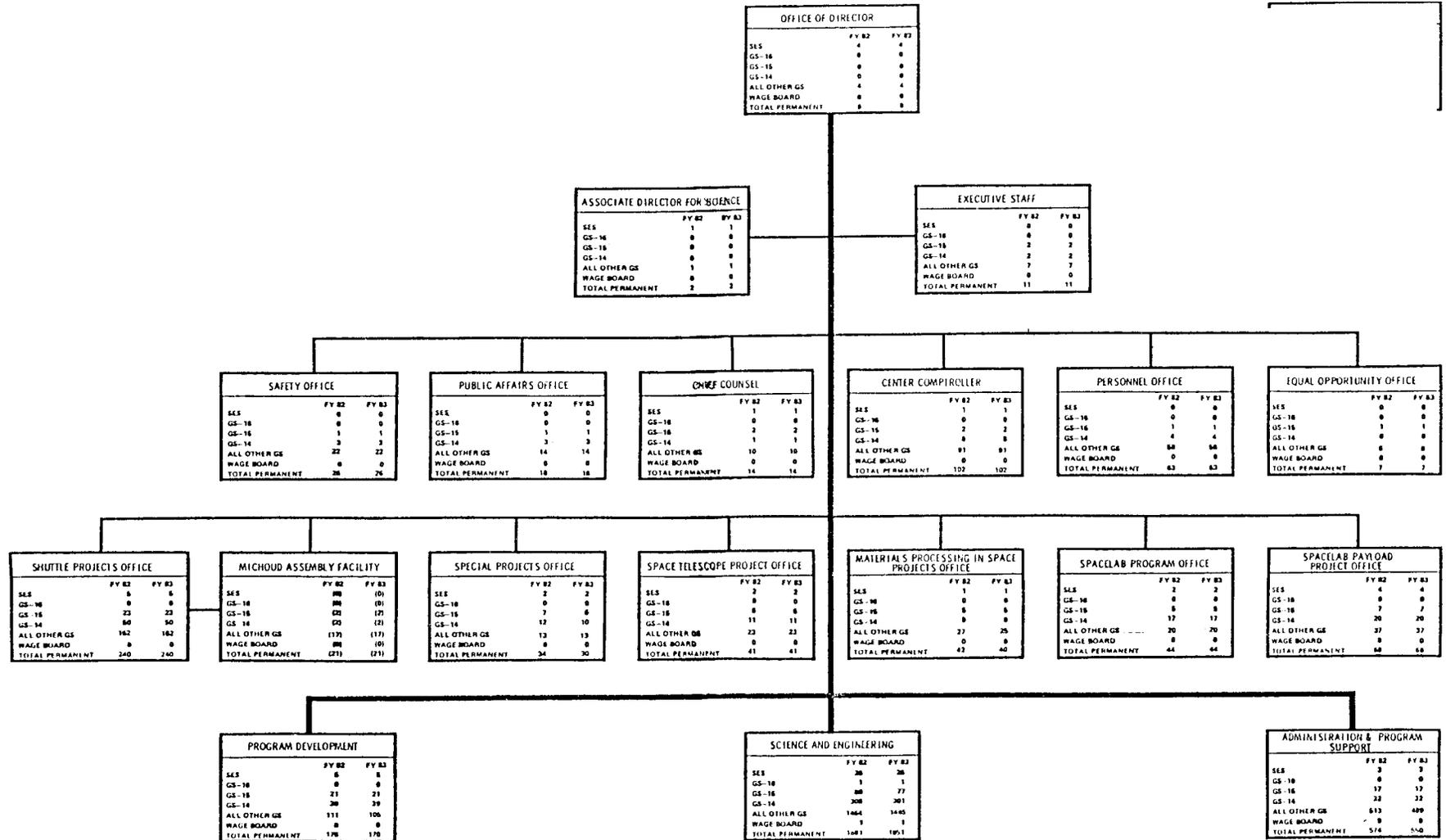
Center management and staff functions include patent counsel services, tort claims, and equal opportunity activities. Medical services provides occupational medicine and environmental health services for the maintenance and improvement of employee health at MSFC, with emphasis on prevention, diagnosis, treatment, and care of illnesses and injuries caused or aggravated by the work environment.

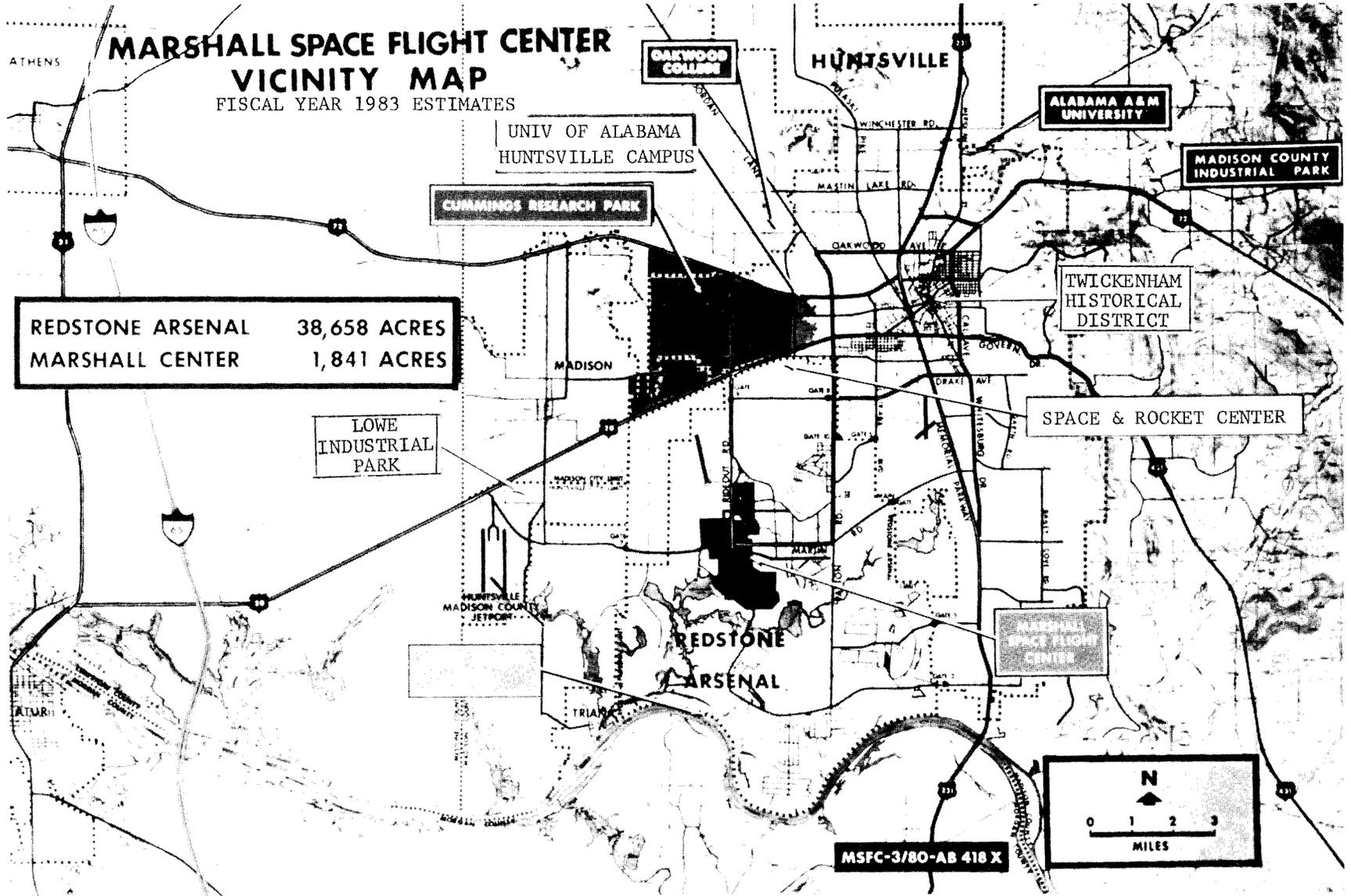
Installation support services include maintenance and repair of office equipment, equipment rental, acquisition of supplies and materials and other miscellaneous services such as: (1) receiving supplies, materials, and equipment; (2) distributing supplies, materials, equipment, and program-critical hardware; (3) preparing supplies, materials, and equipment for shipment to include packing and crating and constructing required shipping containers according to government-provided specifications; and (4) warehousing of raw materials.

Also provided are such services as the disposal of toxic wastes; inspection of hazardous cargo prior to entry to Restone Arsenal; receipt, storage, and issue services for hazardous compounds 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 1982 budget estimate to the 1982 current estimate reflects a deferral of services and drawing down supply inventories. The increase in 1983 is primarily for the replenishment of supplies and materials inventories to those levels that experience indicates are needed to efficiently support the institution.

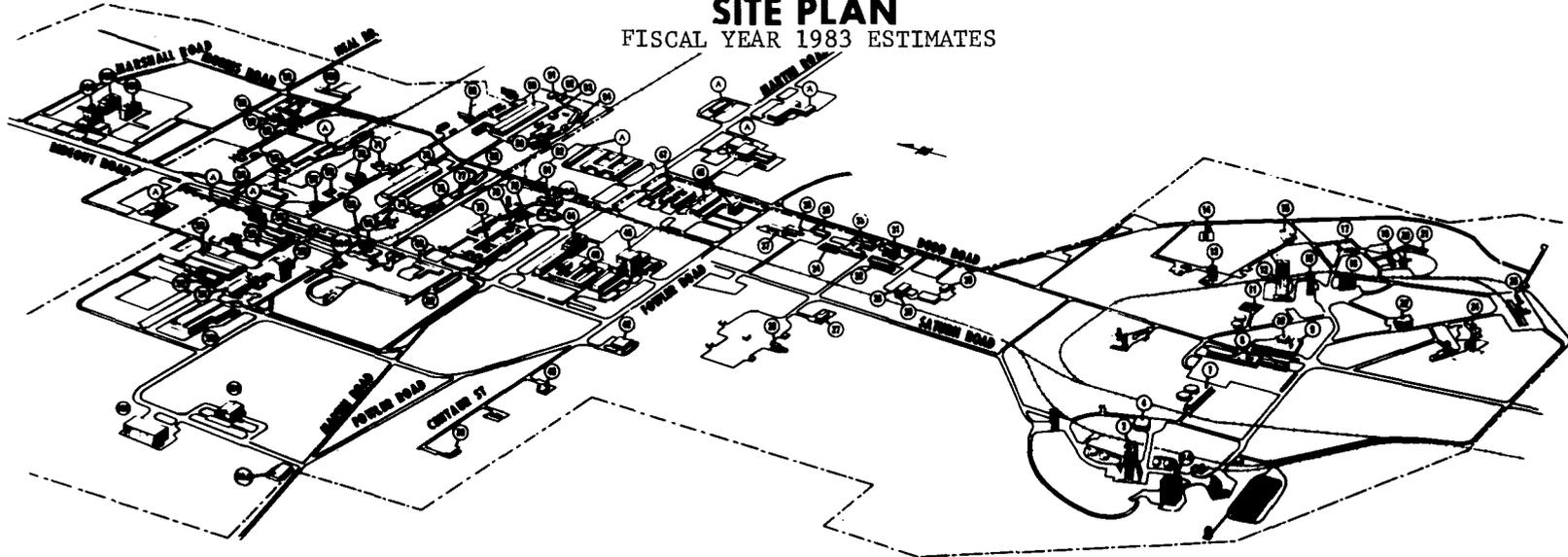
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION GEORGE C. MARSHALL SPACE FLIGHT CENTER





MARSHALL SPACE FLIGHT CENTER SITE PLAN

FISCAL YEAR 1983 ESTIMATES



HEADQUARTERS AREA

- 95 4207 COMMUNICATIONS FACILITY
- 96 4241 SHOP AND STORAGE BUILDING
- 97 S-4244 STORAGE BUILDING
- 23 S-4251 EQUIPMENT SHED
- 99 4250 OFFICE YARD SHOP BUILDING
- 100 4249 OFFICE BUILDING
- 101 4200 OFFICE BUILDING
- 102 4202 OFFICE BUILDING
- 103 4201 OFFICE BUILDING

LAB AND SUPPORT AREA

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

- 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 BISONIC WIND TUNNEL FACILITY
- 66 4733 IMPULSE BASE FLOW FACILITY
- 67 4306 OFFICE BUILDING
- 68 4312 OFFICE BUILDING
- 70 4313 SHOP BUILDING
- 71 4352 ENVIRONMENTAL TEST LABORATORY
- 73 4401 STORAGE AND OFFICE BUILDING
- 74 4405 OFFICE BUILDING
- 75 4491 OFFICE AND LABORATORY BUILDING
- 76 4407 LABORATORY AND OFFICE BUILDING
- 77 S-4409 STORAGE SHED
- 78 4406 ENVIRONMENTAL TEST FACILITY
- 79 S-4436 AUTOMATION CHECKOUT BUILDING
- 80 4402 ELECTRICAL SYSTEMS LABORATORY BUILDING
- 81 4405 HAZARDOUS OPERATIONS LABORATORY
- 82 4493 SHOP AND STORAGE BUILDING

- 83 4403 VEHICLE MAINTENANCE SHOP
- 86 4353 PHOTO LAB
- 90 4401 SPACE SCIENCES LABORATORY
- 91 S-4498 STORAGE BUILDING
- 92 S-4499 STORAGE BUILDING
- 93 4402 TRANSPORTATION SUPPORT BUILDING
- 94 4404 CENTER ACTIVITIES BUILDING
- 104 4752 MULTIPURPOSE HIGH BAY FACILITY
- 105 4755 HIGH BAY ASSEMBLY FACILITY

TEST AREA

WEST AREA

- 2 4470 PROPULSION & STRUCTURAL TEST FACILITY
- 4 4474 BLOCKHOUSE
- 7 4467 PUMP HOUSE
- 8 4466 OFFICE BUILDING
- 8A 4499 STRUCTURAL TEST FACILITY

EAST AREA

- 1 S-44 DOCUMENTATION REPOSITORY
- 32 S-44 PUMP AND BOILER HOUSE
- 11 S-44 DEIONIZED WATER PLANT

- 12 4350 STRUCTURAL TEST FACILITY
- 13 4322 PROPULSION SYSTEMS COMPONENT TEST STAND
- 14 4330 PROPULSION SYSTEMS COMPONENT TEST STAND
- 17 4361 SHOP AND LABORATORY BUILDING
- 16 4357 STRUCTURAL TEST FACILITY
- 17 4363 TEST AND DATA RECORDING FACILITY
- 18 4348 PROPULSION SYSTEMS COMPONENT TEST FACILITY
- 19 S-4359 TEST STAND SUPPORT BUILDING
- 20 4340 MODEL PROPULSION SYSTEMS TEST STAND (ACOUSTIC)
- 21 4341 TEST STAND CONTROL BUILDING
- 22 4370 BLOCKHOUSE AND CABLE TUNNELS
- 24 4334 PROPULSION SYSTEMS TEST STAND
- 23 4372 PROPULSION AND STRUCTURAL TEST FACILITY

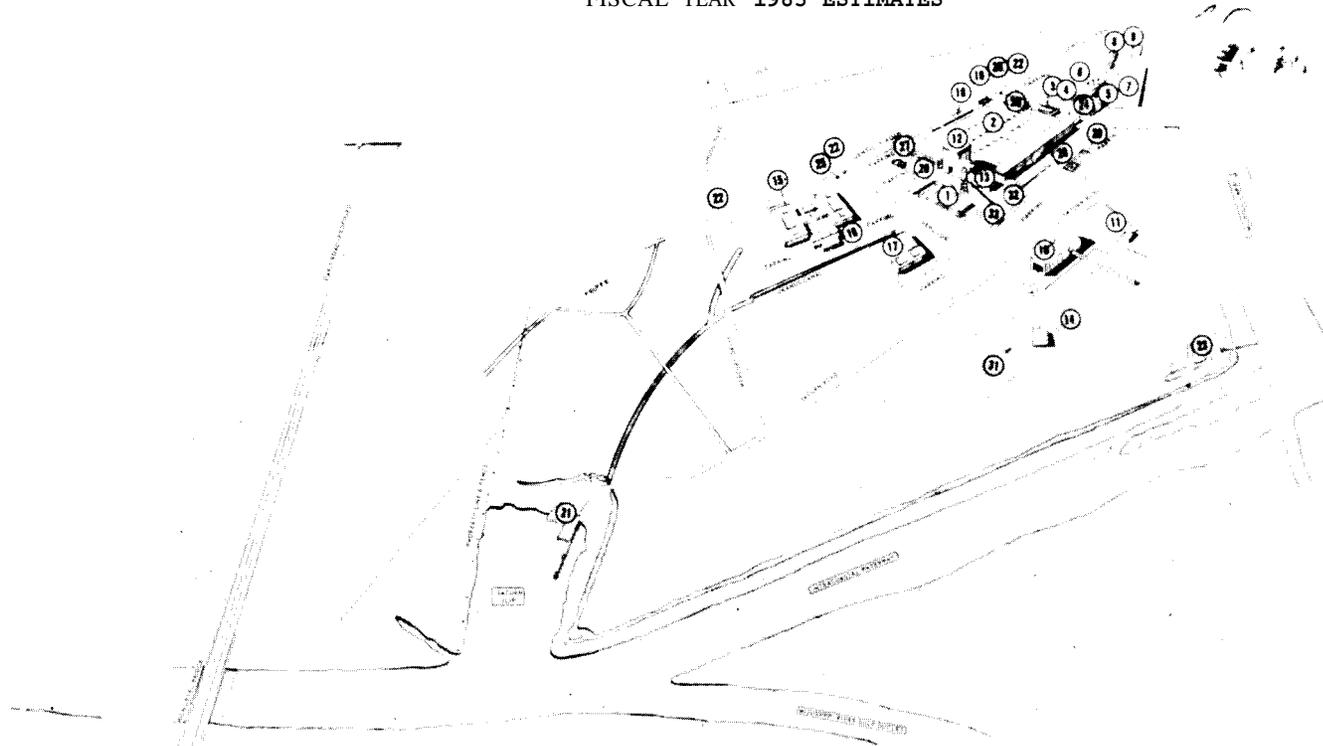
TEST SUPPORT AREA

- 26 4446 OFFICE BUILDING
- 27 4448 HIGH PRESSURE TEST FACILITY
- 28 S-4459 HP O₂ FACILITY
- 29 S-4460 BOILER PLANT
- 30 S-4447 COMPRESSOR BUILDING
- 31 S-4455 MULTIPURPOSE HIGH BAY FACILITY
- 32 S-4456 HYDRAULIC EQUIPMENT DEVELOPMENT FACILITY
- 33 S-4453 COMPONENT'S SERVICE BUILDING
- 34 4478 OFFICE AND STORAGE BUILDING
- 35 S-4454 OFFICE BUILDING
- 36 S-4451 SHOP WELDING
- 37 4449 MULTIPURPOSE HIGH BAY FACILITY

MICHLOUD ASSEMBLY FACILITY

SITE PLAN

FISCAL YEAR 1983 ESTIMATES



MANUFACTURING AND ASSEMBLY

- 1 | 303 HANGAR
- 2 | 103 MANUFACTURING
- 3 | 111 LABORATORY
- 4 | 104 BATTERY CHARGING & STORAGE
- 5 | 207 BOILER HOUSE
- 6 | 202 COOLING TOWER
- 7 | 220 COMPONENT SUPPLY
- 8 | 203 MAINTENANCE SUPPLY
- 9 | 221 HAZARDOUS MATERIAL STORAGE

TEST FACILITIES

- 10 | 420 TEST & CHECKOUT FACILITY
- 11 | 404 HIGH PRESSURE TEST FACILITY
- 12 | 110 VERTICAL ASSEMBLY & HYDROSTATIC TEST

- 13 | 130 SYSTEMS ENGINEERING
- 14 | 451 PNEUMATIC TEST FACILITY

ENGINEERING & ADMINISTRATION

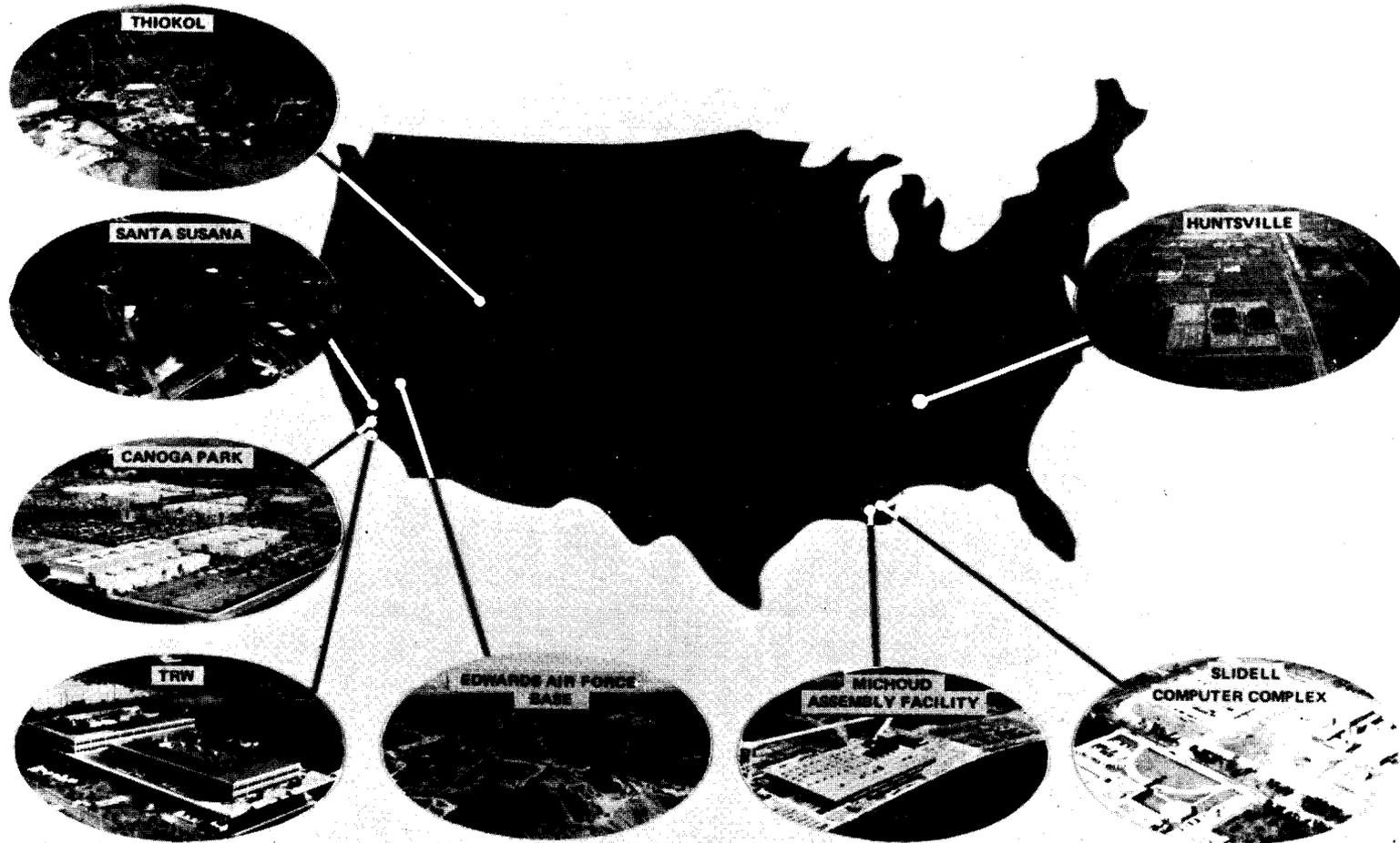
- 15 | 350 OFFICE AND ENGINEERING BUILDING
- 16 | 351 CAFETERIA
- 17 | 320 CONTRACTOR SERVICES BUILDING
- 18 | 101 ADMINISTRATION
- 19 | 102 ENGINEERING
- 20 | 301 MAINTENANCE SHOP

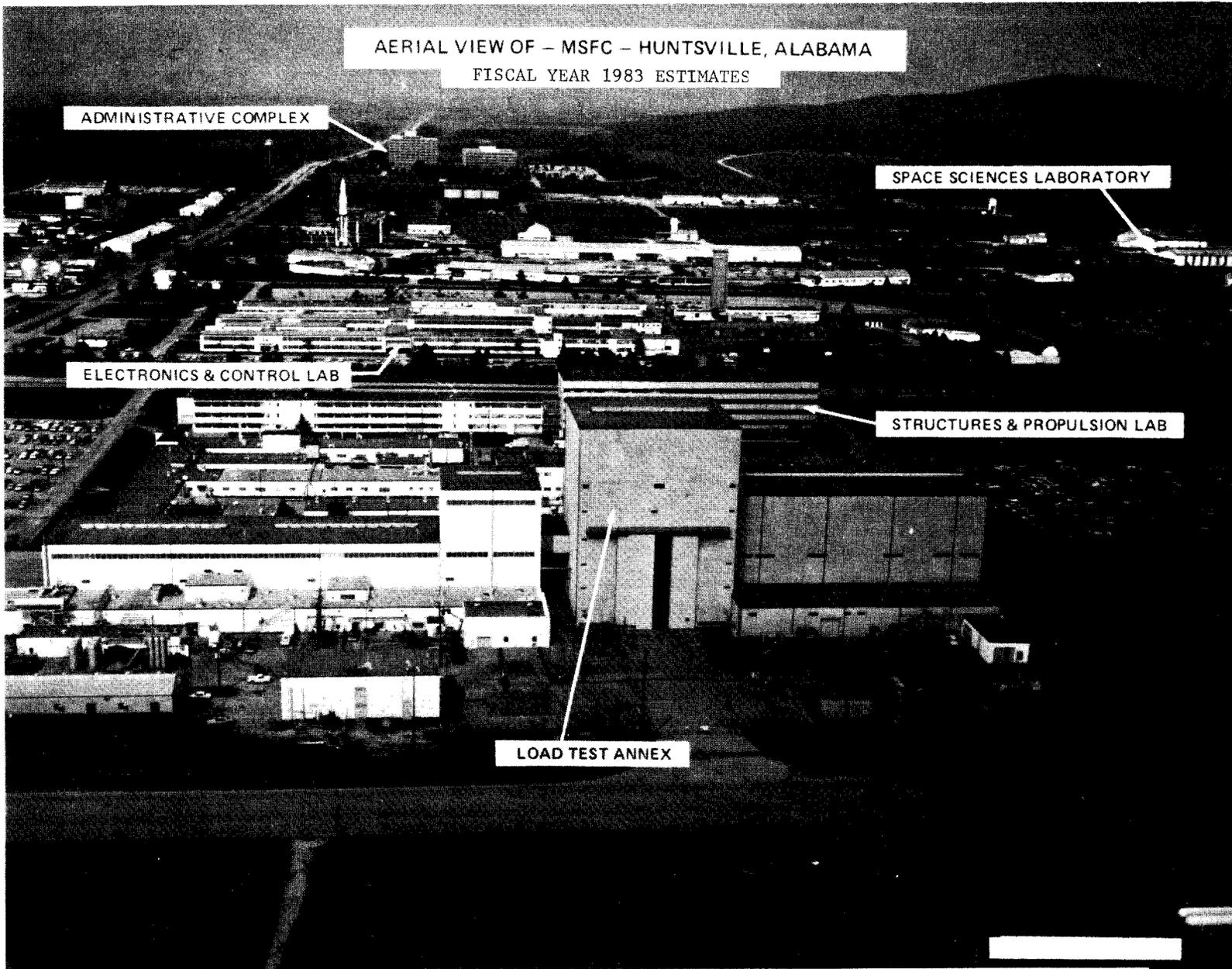
TRANSPORTATION, UTILITIES & MISC

- 21 | 480 BARGE DOCK
- 22 | GUARD HOUSE
- 23 | 450 MAIN PUMP STATION

- 24 | 201 PUMP STATION NO 1
- 25 | 304 PUMP STATION NO 3
- 26 | 143 PUMP STATION NO 4
- 27 | 308 WEST MASTER SUBSTATION
- 28 | 121 MAIN SUBSTATION
- 29 | 170 CHEMICAL WASTE LAGOON
- 30 | 119 PAINT SHOP
- 31 | 403 SALVAGE YARD
- 32 | 105 TRANSPORTATION
- 33 | 302 ELEVATED WATER TOWER

MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1983 ESTIMATES
PROGRAM FACILITIES





AERIAL VIEW OF - MSFC - HUNTSVILLE, ALABAMA
FISCAL YEAR 1983 ESTIMATES

ADMINISTRATIVE COMPLEX

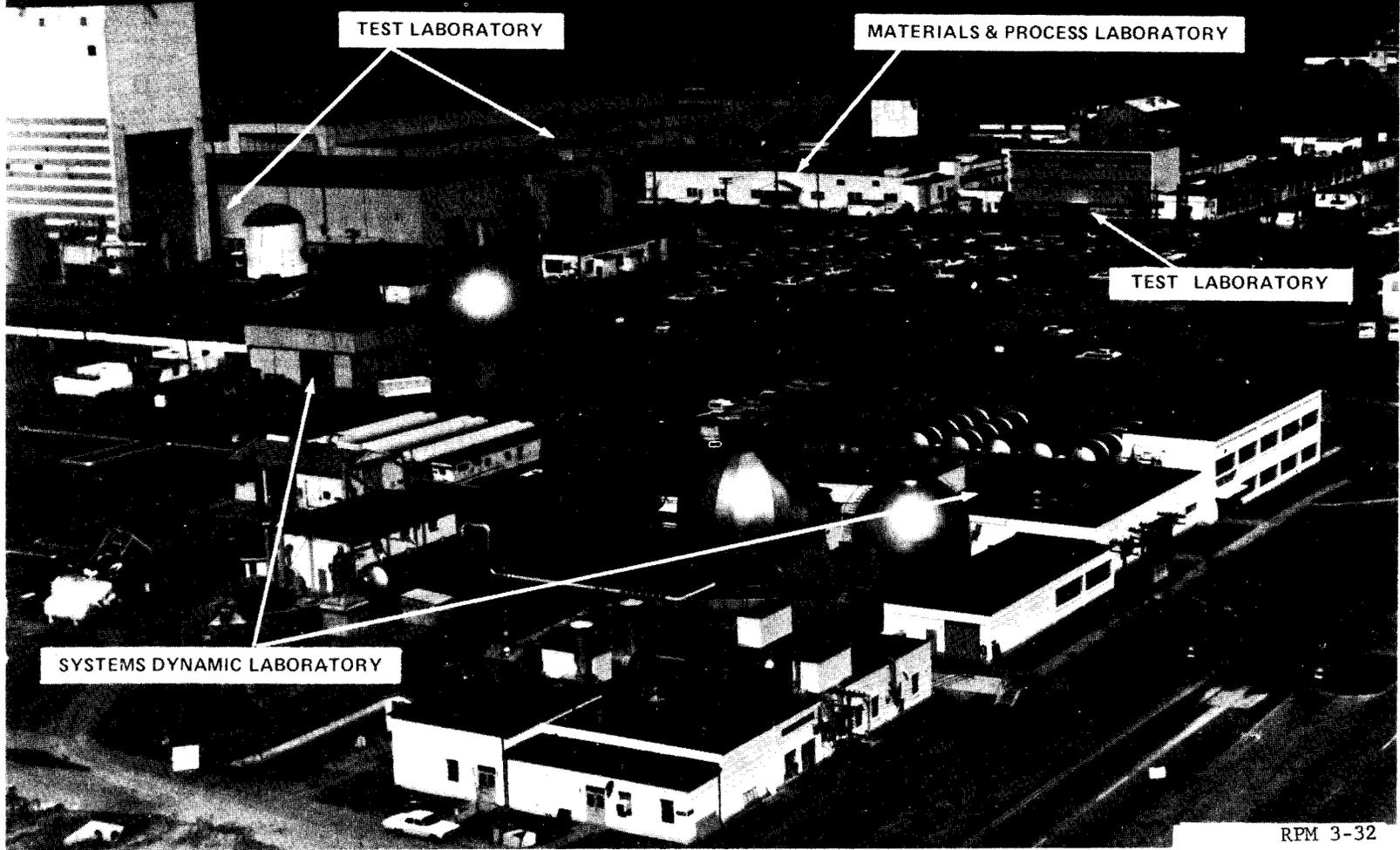
SPACE SCIENCES LABORATORY

ELECTRONICS & CONTROL LAB

STRUCTURES & PROPULSION LAB

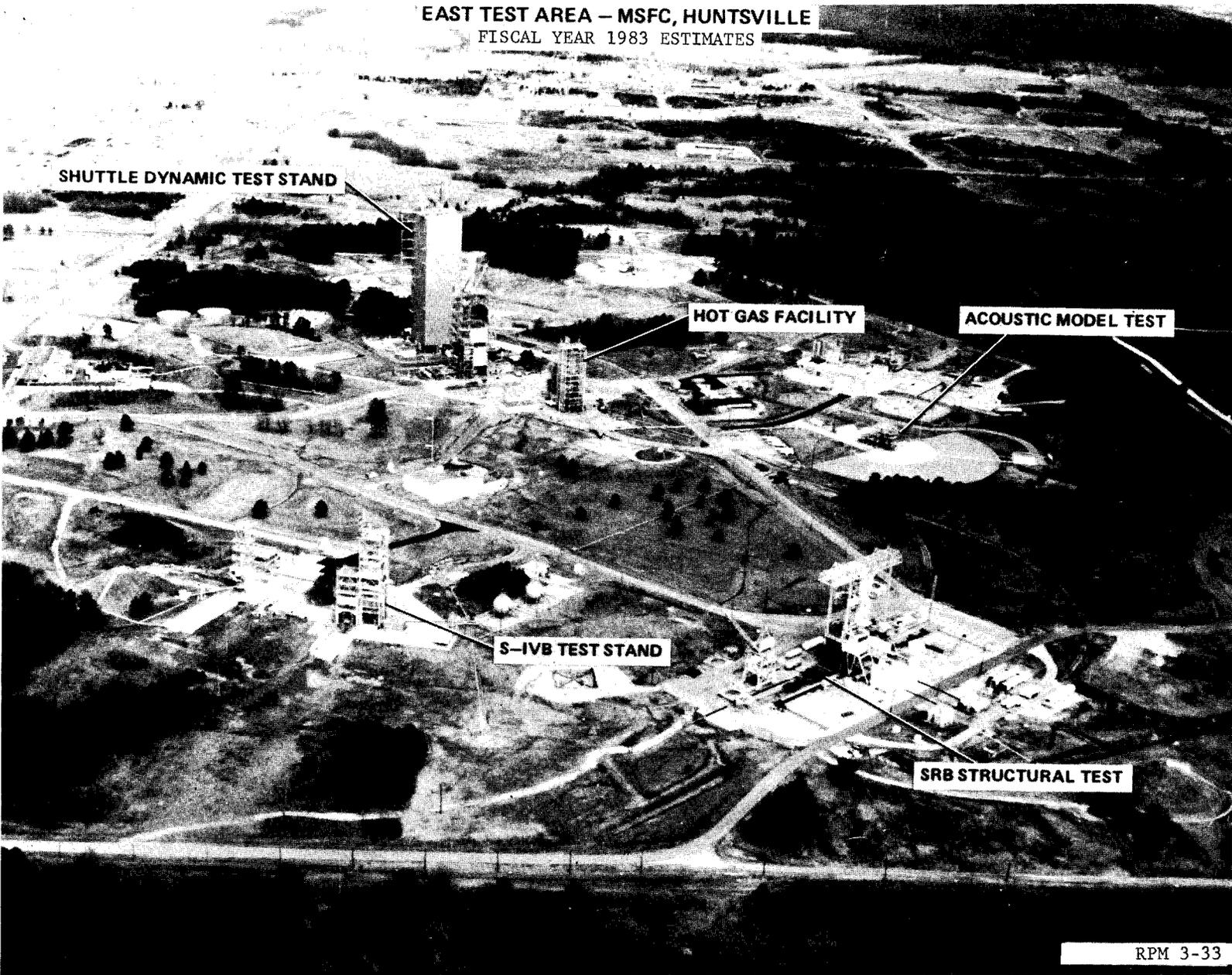
LOAD TEST ANNEX

SCIENCE & ENGINEERING AREA - MSFC, HUNTSVILLE
FISCAL YEAR 1983 ESTIMATES

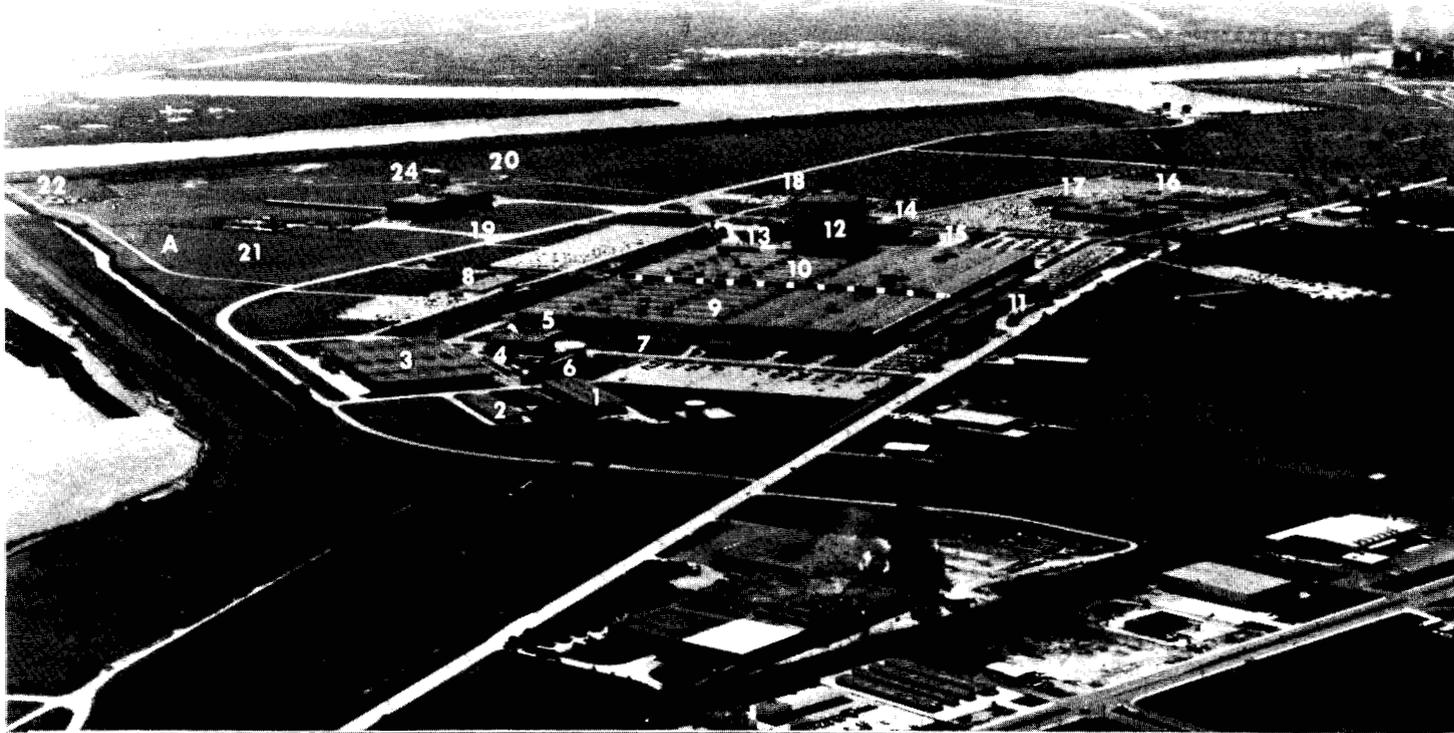


EAST TEST AREA – MSFC, HUNTSVILLE

FISCAL YEAR 1983 ESTIMATES



MICHOUD ASSEMBLY FACILITY
FISCAL YEAR 1983 ESTIMATES



- | | | |
|------------------------------|----------------------------------|---------------------------------|
| 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 |

NATIONAL SPACE
TECHNOLOGY
LABORATORIES



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1983 ESTIMATES

NATIONAL SPACE TECHNOLOGY LABORATORIES

DESCRIPTION

The National Space Technology Laboratories are located in southwest Mississippi, approximately 50 miles northeast of New Orleans, Louisiana. Total land area is 138,807 acres of which 13,480 acres 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 Intercoastal Waterway. Capital investment for the National Space Technology Laboratories, as of September 30, 1981, was \$307,029,000.

CENTER ROLES AND MISSIONS

The National Space Technology Laboratories (NSTL), formerly the Mississippi Test Facility (MTF), was constructed and operated during the 1960's for acceptance testing of the booster stages of the Saturn V rocket system. NSTL 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 efforts.

NSTL 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. NSTL manages the installation and, through interagency agreements, provides support and maintains full utilization of all facilities by NASA and collocated elements of other executive agencies. These agencies are engaged in compatible research, development, and operational activities. They include the Department of Interior, the Department of Commerce, the Environmental Protection Agency, the Department of Transportation, the Department of Defense, the State of Mississippi, and the State of Louisiana. The principal roles are:

Space Shuttle - NSTL provides, maintains and manages the facilities and the related capabilities required for the continued development and the acceptance testing of the Space Shuttle Main Engines,

the development testing of the Shuttle's Main Propulsion Test Article which consists of a cluster of three main engines, an external tank and an orbiter aft-fuselage structure. Also, cryogenic loading tests of the external tanks for the orbital flight tests are performed at NSTL.

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

	1981 Actual	1982		1983
		Budget Estimate	Current Estimate	Budget Estimate
(Thousands of Dollars)				
I. Personnel and Related Costs.....	3,769	3,749	3,933	4,020
11. Travel.....	118	382	147	147
111. Operation of Installation.....	1,619	1,493	2,006	2,085
A. Facilities Services.....	(517)	(611)	(568)	(643)
B. Technical Services.....	(107)	(140)	(145)	(160)
C. Management and Operations	<u>(995)</u>	<u>(742)</u>	<u>(1,293)</u>	<u>(1,282)</u>
Total, fund requirements.....	<u>5,506</u>	<u>5,624</u>	<u>6,086</u>	<u>6,252</u>

Distribution of Permanent Positions by Program

	<u>1981</u>	<u>1982</u>	<u>1983</u>	
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems and Operations</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>
Space shuttle.....	5	5	5	5
<u>Space Science and Applications</u>	<u>40</u>	40	40	40
Space applications	40	<u>40</u>	<u>40</u>	<u>40</u>
Subtotal, direct positions... ..	45	45	45	<u>45</u>
<u>Center Management and Operations Support Positions</u> .. .	<u>60</u>	<u>58</u>	59	59
Total, permanent positions	<u>105</u>	<u>103</u>	<u>104</u>	<u>104</u>

PROGRAM DESCRIPTION

Permanent Positions
(Civil Service)

SPACE SHUTTLE.....

5

In 1983, 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.

SPACE APPLICATIONS.....

4.0

In 1983, the National Space Technology Laboratories' 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 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 applicable disciplinary requirements.
- Promote the effective transfer of applications technology as well as to reduce systems costs, and improve compatibility with other information sources and products.
- Conduct research and develop applications in non-remote sensing applications primarily in such areas as data collection systems, environmental system development, and closed ecosystems development .

CENTER MANAGEMENT AND OPERATIONS SUPPORT.....

59

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

Manager and Staff - The Installation Manager, Deputy Manager, and immediate staff, e.g., Legal, Patent 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 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

	<u>1981</u>	<u>1982</u>		<u>1983</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)		
I. <u>PERSONNEL AND RELATED COSTS</u>.....	<u>3,769</u>	<u>3,749</u>	<u>3,933</u>	<u>4,020</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions	3,289	3,243	3,387	3,456
b. Other than full-time permanent positions..	142	147	169	178
c. Overtime and other compensation.. ..	<u>7</u>	<u>16</u>	<u>6</u>	<u>8</u>
Subtotal, Compensation.	3,438	3,406	3,562	3,642
2. <u>Benefits</u>	<u>316</u>	<u>309</u>	<u>338</u>	<u>345</u>
Subtotal, Compensation and Benefits.....	<u>3,754</u>	<u>3,715</u>	<u>3,900</u>	<u>3,987</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel.	---	17	15	15
2. Personnel training.....	<u>15</u>	<u>17</u>	<u>18</u>	<u>18</u>
Subtotal, Supporting Costs.....	<u>15</u>	<u>34</u>	<u>33</u>	<u>33</u>
Total, Personnel and Related Costs.....	<u>3,769</u>	<u>3,749</u>	<u>3,933</u>	<u>4,020</u>

Explanation of Fund Requirements

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands)	<u>Current Estimate</u> (Dollars)	
A. <u>Compensation and Benefits</u>	<u>3,754</u>	<u>3,715</u>	<u>3,900</u>	<u>3,987</u>
1. <u>Compensation</u>	<u>3,438</u>	<u>3,406</u>	<u>3,562</u>	<u>3,642</u>
a. Permanent positions	<u>3,289</u>	<u>3,243</u>	<u>3,387</u>	<u>3,456</u>

The current estimate for 1982 reflects a change from the 1982 budget estimate due to the recent pay increases partially offset by a reduction in permanent positions in 1982.

Basis of Cost for Permanent Positions

In 1983, the cost of permanent positions will be \$3,456,000. The increase from 1982 results from the following:

Cost of permanent positions in 1982.....	3,387
Cost increases in 1983.....	+113
Within grade and career advances:	
Full year effect of 1982 actions.....	+57
Partial year effect of 1983 actions.....	+43
Full year effect of 1982 pay increases.....	+13
Cost decreases in 1983.....	-44
Turnover savings and abolished positions:	
Full year effect of 1982 actions.....	-27
Effect of 1983 actions.....	-17
Cost of permanent positions in 1983.....	<u>3,456</u>

	<u>1981</u>	<u>1982</u>		<u>1983</u>
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>		<u>Estimate</u>
		(Thousands of Dollars)		
b. Other than full-time permanent positions				
1. Cost.....	142	147	169	178
2. Workyears.....	14	13	18	18

The distribution of 1983 workyears is as follows:

Distribution of Other than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Cooperativetraining..	5
Opportunityprograms.....	1
Other temporary employment	<u>12</u>
Total.....	<u><u>18</u></u>

The increase from the 1982 budget estimate to the 1982 current estimate is a result of the 1981 pay increases as well as the increased utilization of part-time permanent positions. The 1983 estimate reflects the same level of employment as in 1982 with continued emphasis on the utilization of the part-time permanent program.

c. Overtime and other compensation.....	7	16	6	8
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The overtime levels included are necessary to meet management and administrative requirements in such areas as procurement and financial management. The 1982 current estimate and the 1983 estimate reflect an overtime schedule consistent with 1981 experience.

	1981	1982		1983
	<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. <u>Benefits</u>,.....	<u>316</u>	<u>309</u>	<u>338</u>	<u>345</u>

The following are the amounts of contribution by category:

Civil Service Retirement Fund.. .. .	221	228	242	249
Employee life insurance.....	10	9	11	11
Employee health insurance.....	80	62	80	80
FICA.....	5	4	5	5
Other benefits.....	<u>---</u>	<u>6</u>	<u>---</u>	<u>---</u>
Total.....	<u>316</u>	<u>309</u>	<u>338</u>	<u>345</u>

The increase from the 1982 budget estimate to the 1982 current estimate and the increase in 1983 is a result of the October 1981 pay increase.

B. <u>Supporting Costs</u>	<u>15</u>	<u>34</u>	<u>23</u>	<u>33</u>
1. Transfer of personnel	<u>---</u>	17	15	15

The decrease from the 1982 budget estimate to the 1982 current estimate reflects a revised number of personnel transfers. The 1983 estimate is level with 1982.

2. Personnel training.	15	17	18	18
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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 for "Upward Mobility" training for women and minorities, and Equal Employment Opportunity. The increase from the 1982 budget estimate to the 1982 current estimate is due to greater than anticipated rise in tuition costs. The 1983 estimate is level with the 1982 plan.

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
II. <u>TRAVEL</u>	<u>118</u>	<u>382</u>	<u>147</u>	<u>147</u>

Summary of Fund Requirements

A. Program Travel.....	63	76	88	88
B. Scientific and Technical Development Travel.....	3	3	3	3
C. Management and Operations Travel.....	<u>52</u>	<u>303</u>	<u>56</u>	<u>56</u>
Total, Travel.....	<u>118</u>	<u>382</u>	<u>147</u>	<u>147</u>

Explanation of Fund Requirements

A. <u>Program Travel</u>	<u>63</u>	<u>76</u>	<u>88</u>	<u>94</u>
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Program travel requirements are directly related to the accomplishment of the Laboratories' mission, and will be in support of Space Science and Applications programs. Program travel will account for approximately 60 percent of total travel in 1983. The increase in the 1982 current estimate over the 1982 budget estimate is due to increased program related travel in the earth resources area. The 1983 budget estimate reflects reduced travel to offset expected transportation rate increases.

B. <u>Scientific and Technical Development Travel</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</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 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.

	<u>1981 Actual</u>	<u>1982</u>		<u>1983</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
C. <u>Management and Operations Travel</u>	<u>52</u>	<u>303</u>	<u>56</u>	<u>56</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 Laboratories' top management to NASA Headquarters and other NASA centers and local transportation. The decrease from the 1982 budget estimate to the 1982 current estimate is due to the realignment of local transportation costs into the Transportation subfunction in Operation of Installation. The 1983 estimate reflects decreased travel to offset expected rate increases.

111. <u>OPERATION OF INSTALLATION</u>	<u>1,619</u>	<u>1,493</u>	<u>2,006</u>	<u>2,085</u>
	<u>Summary of Fund Requirements</u>			
A. Facilities Services.....	517	611	568	643
B. Technical Services.. ..	107	140	145	160
C. Management and Operations	<u>995</u>	<u>742</u>	<u>1,293</u>	<u>1,282</u>
Total ■ Operation of Installation.. ..	<u>1,619</u>	<u>1,493</u>	<u>2,006</u>	<u>2,085</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.

Increased funding from 1981 to the 1982 current estimate and in 1983 are for projected increases in the cost of services throughout the majority of institutional support areas, utility rate increases, and the upgrading of the Visitor Information Center during 1982 and 1983. The increase in 1982 from the budget to the current estimate reflects a one-time purchase of equipment necessary to upgrade the NSTL on-site communications systems and the realignment of local transportation costs from the Travel function to the Operation of Installation budget.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
A. <u>FACILITIES SERVICES</u>	<u>517</u>	<u>611</u>	<u>568</u>	<u>643</u>

The NSTL 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 1,220,982 gross square feet of building space including seven main buildings. Also included are five major technical facilities. This physical plant supports an average daily on-site population of 3,000 to 3,500 personnel. Many of the test facilities are utilized on schedules involving more than one shift operation and/or operations during off-peak hours.

Summary of Fund Requirements

1. Maintenance and Related Services.....	120	136	136	150
2. Custodial Services.....	101	113	113	125
3. Utility Services.....	<u>296</u>	<u>362</u>	<u>319</u>	<u>368</u>
Total ■ Facilities Services.. ..	<u>517</u>	<u>611</u>	<u>568</u>	<u>643</u>

Explanation of Fund Requirements

	<u>1981</u>	<u>1982</u>		<u>1983</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>Maintenance and Related Services</u>	<u>120</u>	<u>136</u>	<u>136</u>	<u>150</u>

This activity provides for the modifications and alterations of facilities and movements of personnel and equipment of the Earth Resources Laboratory (ERL), and equipment purchases for the ERL and the Visitor Information Center. The increase from 1982 to 1983 reflect continued cost increases for these services.

2. <u>Custodial Services</u>	<u>101</u>	<u>113</u>	<u>113</u>	<u>125</u>
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Provides for NASA's share of security guard services, janitorial services and fire protection services by the National Space Technology Laboratories institutional support contractor. The 1983 budget estimate is for the same level of service as in 1982, including an increase for negotiated contractor rates.

3. <u>Utility Services</u>	<u>296</u>	<u>362</u>	<u>319</u>	<u>368</u>
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Provides for the purchase of the two utility commodities; electricity from the Mississippi Power Company and natural gas from the United Gas Pipe Line Company. Natural gas is the primary heating fuel used at NSTL. Also provided is NASA's share of the operation of the utility distribution and control systems, water wells and sewage systems.

The decrease from the 1982 budget estimate to the 1982 current estimate is based on utility usage experienced in 1981. Beginning in 1981, many of our facilities were separately metered so as to more equitably share utility cost with the other resident agencies. The increase from the 1982 current estimate to the 1983 budget estimate is due to anticipated rate increases.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</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)	
B. <u>TECHNICAL SERVICES</u>	<u>107</u>	<u>140</u>	<u>145</u>	<u>160</u>

Summary of Fund Requirements

1. <u>Automatic Data Processing</u>				
a. Operations....	<u>2</u>	<u>39</u>	<u>3</u>	<u>4</u>
2. <u>Scientific and Technical Information</u>	<u>37</u>	<u>73</u>	<u>66</u>	<u>70</u>
a. Library	2	7	3	3
b. Education and information.....	35	66	63	67
3. <u>Shop Support and Services</u>	<u>68</u>	<u>28</u>	<u>76</u>	<u>86</u>
Total, Technical Services	<u>107</u>	<u>140</u>	<u>145</u>	<u>160</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u>	<u>2</u>	<u>39</u>	<u>3</u>	<u>4</u>
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Provides for the supplies and materials in support of the Earth Resources Laboratory's ADP requirements. The decrease from the 1982 budget estimate to the current estimates reflects the realignment of general operational support to ERL's data processing efforts to the Shop Support and Services category.

2. <u>Scientific and Technical Information</u>	<u>37</u>	<u>73</u>	<u>66</u>	<u>70</u>
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Provides for the books, periodicals and other technical reports required by the Earth Resources Laboratory, and NASA's share of upgrading and operating the Visitor Information Center. The

upgrading is a comprehensive three-phase program initiated in 1982 and is to be completed in 1983 in time for the 1984 New Orleans World Fair.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
3. <u>Shop Support and Services</u>	<u>68</u>	<u>28</u>	<u>76</u>	<u>86</u>

Provides for NASA's share of such technical services as reliability and quality assurance, safety, photography and graphics. The increase from the 1982 budget estimate to the current estimate is due to realignment of general operational support to ERL's data processing efforts from the automatic data processing category. The 1983 budget estimate provides for the same level of service and includes expected cost increases.

C. <u>MANAGEMENT AND OPERATIONS</u>	<u>995</u>	<u>742</u>	<u>1,293</u>	<u>1,282</u>
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Summary of Fund Requirements

1. Administrative Communications.....	465	445	644	551
2. Printing and Reproduction.....	29	45	40	45
3. Transportation... ..	441	152	509	576
4. Installation Common Services.....	<u>60</u>	<u>100</u>	<u>100</u>	<u>110</u>
Total, Management and Operations.....	<u>995</u>	<u>742</u>	<u>1,293</u>	<u>1,282</u>

Explanation of Fund Requirements

	<u>1981</u>	<u>1982</u>		<u>1983</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>465</u>	<u>445</u>	<u>644</u>	<u>551</u>
<p>Provides for NASA's share of the local telephone service, FTS, long distance, and operation and maintenance of the on-site communications equipment and switchboard. The increase in 1982 from the budget estimate is due to the one-time purchase of equipment necessary to upgrade the NSTL on-site communications systems. The FY 1983 budget provides for an improved level of service including expected rate increases.</p>				
2. <u>Printing and Reproduction</u>	<u>29</u>	<u>45</u>	<u>40</u>	<u>45</u>
<p>Provides for printing and reproduction services in support of the Earth Resources Laboratory and the local house organ. The decrease from the 1982 budget estimate to the current estimate reflects prior year experience. The increase in 1983 reflects expected increased rates for these services.</p>				
3. <u>Transportation</u>	<u>441</u>	<u>152</u>	<u>509</u>	<u>576</u>
<p>This estimate includes local transportation, as well as freight costs, government bills of lading, air freight, other general shipments and related transportation costs. The 1982 current estimate reflects the realignment of local transportation costs, including rental of vehicles, from the Travel function. The 1983 estimate reflects expected rate increases for vehicle rentals.</p>				
4. <u>Installation Common Services</u>	<u>60</u>	<u>100</u>	<u>100</u>	<u>110</u>
<p>Provides supplies, materials and equipment for the Earth Resources Laboratory. The increase from the 1982 current estimate to the 1983 estimate reflects expected rate increases for the same level of service.</p>				

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
 NATIONAL SPACE TECHNOLOGY LABORATORIES

NSTL SUMMARY STAFFING		
	<u>FY82</u>	<u>FY83</u>
SES	3	3
GS-15	4	4
GS-14	11	12
All other GS	<u>86</u>	<u>85</u>
TOTAL PERMANENT	104	104

OFFICE OF THE MANAGER		
	<u>FY82</u>	<u>FY8</u>
SES	2	2
All other GS	<u>3</u>	<u>3</u>
TOTAL PERMANENT	5	5

CHIEF COUNSEL		
	<u>FY82</u>	<u>FY83</u>
GS-15	1	1
All other GS	<u>1</u>	<u>1</u>
TOTAL PERMANENT	2	2

EXECUTIVE STAFF		
	<u>FY82</u>	<u>FY83</u>
411 other GS	<u>4</u>	<u>4</u>
TOTAL PERMANENT	4	4

RESOURCES & FINANCIAL MANAGEMENT OFFICE		
	<u>FY82</u>	<u>FY83</u>
411 other GS	16 1	17 1
TOTAL PERMANENT	17	18

PROCUREMENT & CONTRACTS OFFICE		
	<u>FY82</u>	<u>FY8</u>
GS-14	1	1
All other GS	<u>13</u>	<u>12</u>
TOTAL PERMANENT	14	13

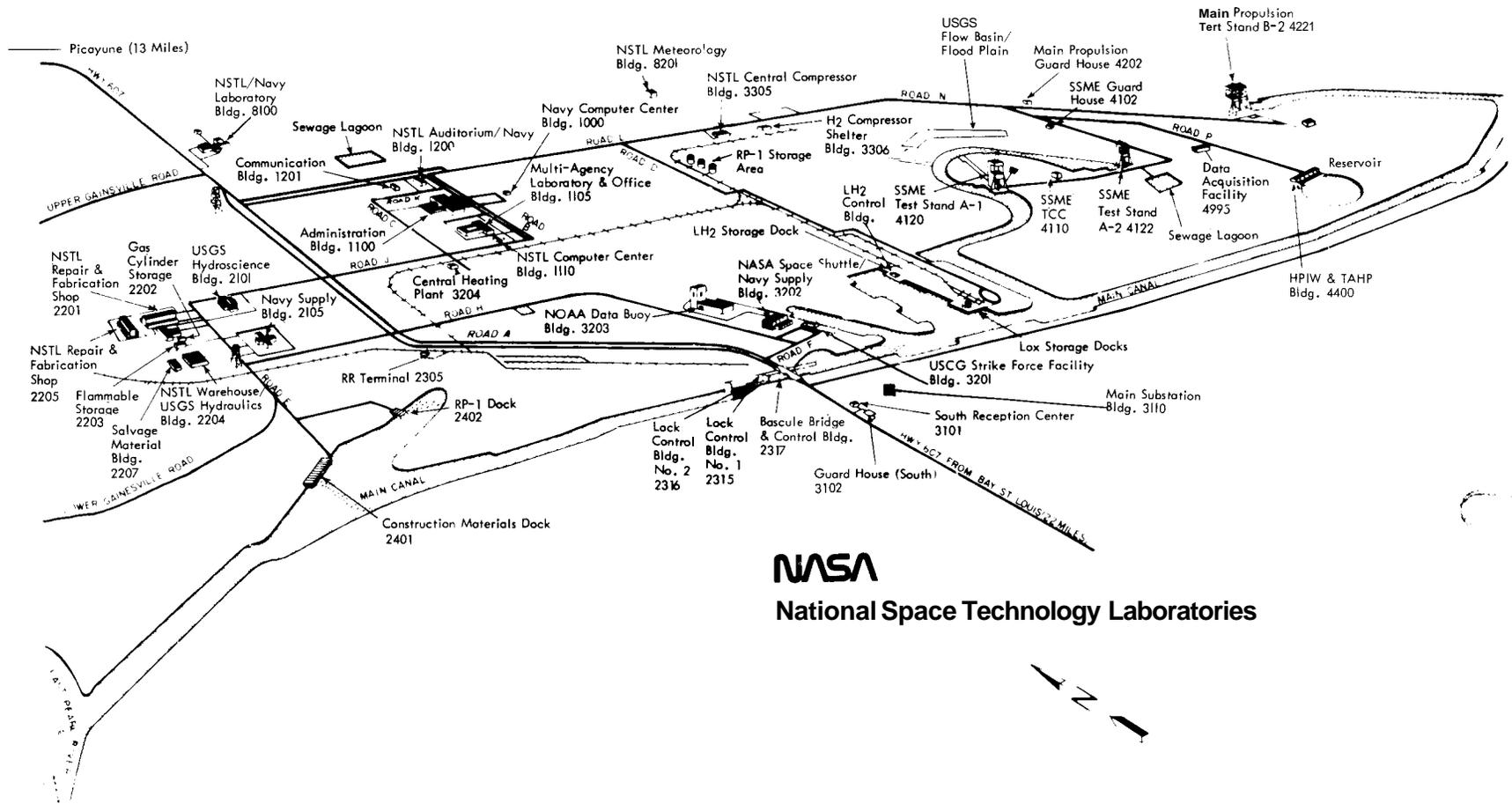
FACILITIES ENGINEERING OFFICE		
	<u>FY82</u>	<u>FY8</u>
GS-14	1	1
All other GS	<u>8</u>	<u>8</u>
TOTAL PERMANENT	9	9

INSTALLATIONS OPERATIONS OFFICE		
	<u>FY82</u>	<u>FY83</u>
GS-14	4	4
411 other GS	<u>12</u>	<u>12</u>
TOTAL PERMANENT	16	16

EARTH RESOURCES LABORATORY		
	<u>FY82</u>	<u>FY83</u>
SES	1	1
GS-15	3	3
GS-14	4	5
All other GS	20 28	<u>28</u>
TOTAL PERMANENT	37	37

NSTL LOCATION PLAN

FISCAL YEAR 1983 ESTIMATES



NATIONAL SPACE TECHNOLOGY LABORATORIES - AERIAL VIEW

FISCAL YEAR 1983 ESTIMATES



ARMY AMMUNITION PLANT CONSTRUCTION

NSTL INSTRUMENTATION LAB

ENGINEERING AND ADMINISTRATION AREA

INDUSTRIAL AREA

HIGH PRESSURE GAS FACILITY

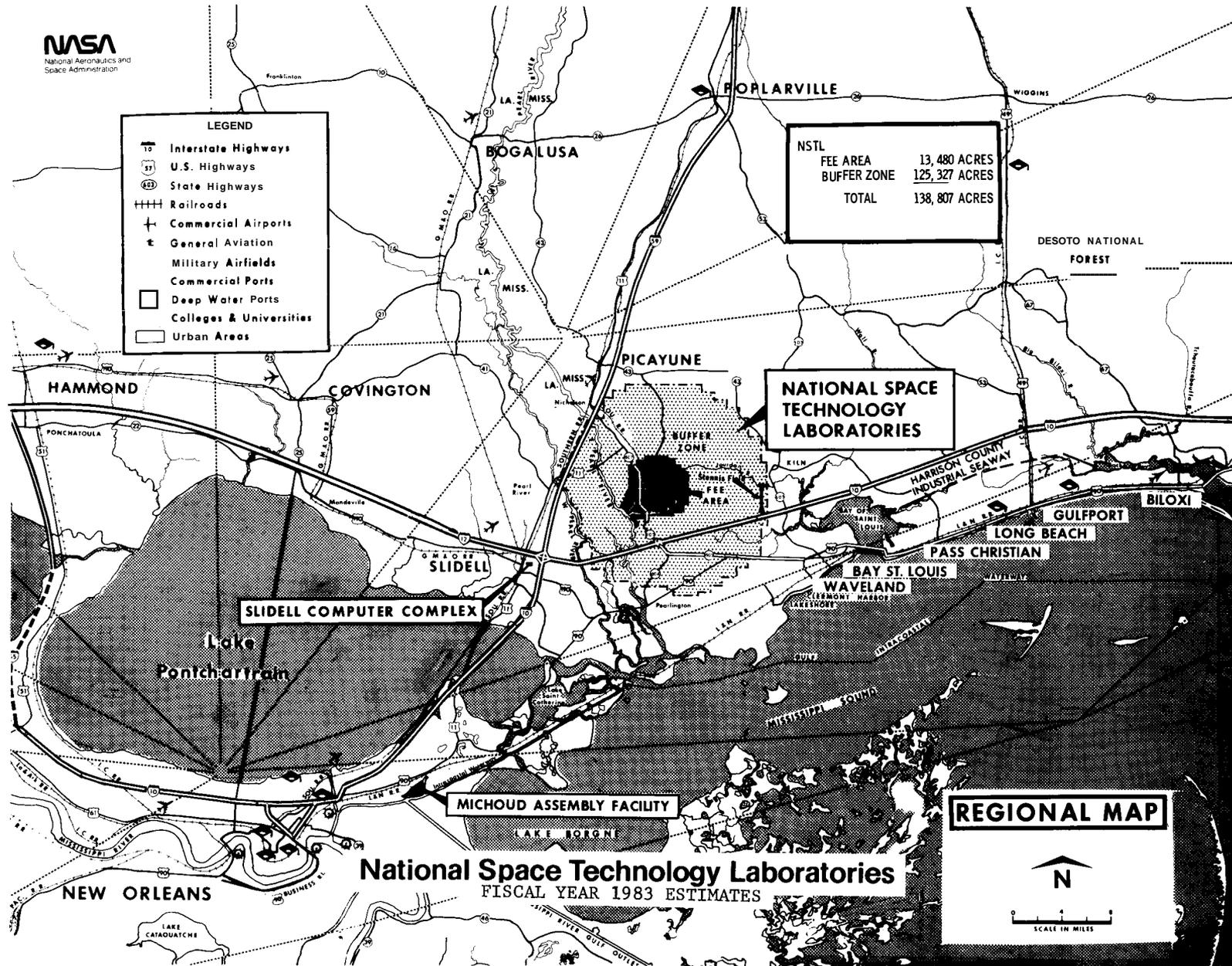
RIVER COMPLEX

LOX STORAGE DOCKS

SHUTTLE TEST AREA

LOCK AND BASCULE BRIDGE

DEEP WATER CANAL ACCESS



GODDARD SPACE
FLIGHT CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1983 ESTIMATES

GODDARD SPACE FLIGHT CENTER

DESCRIPTION

The Goddard Space Flight Center, located 15 miles northeast of Washington, D.C., at Greenbelt, Maryland is situated on a 552-acre main site. Three additional nearby plots of 601 acres comprise the remote site area and contain the Goddard Antenna Test Range, the Goddard Optical Facility, the Propulsion Research Facility, the Laser Facility, the Magnetic Fields Component Test Facility, the Attitude Control Test Facility, and the Network Training and Test Facility. The Center also utilizes an additional 6,176 acres at the Wallops facility located on the Atlantic Coast of Virginia's eastern shore. The Wallops facility consists of 1,833 acres on the main base, 3,095 acres on Wallops Island launching site, 108 acres on the mainland tracking site, and 1,140 acres of marshland. The total capital investment for the Goddard Space Flight Center, including tracking stations, contractor-held facilities at various locations, and the Wallops facility, as of September 30, 1981, was approximately \$864,971,000.

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

CENTER ROLES AND MISSIONS

The Goddard Space Flight Center (GSFC), 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 satellite tracking networks, data acquisition and analysis; and scientific research to include both theoretical studies and the development of many significant scientific experiments flown on satellites. Wallops operates a research airport in support of NASA's aeronautics research programs. The principal and supporting roles are:

PRINCIPAL

Earth Orbital Spacecraft Development and Flight Operations - including 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 - planning, developing and implementing the tracking network, data processing and analysis, communications, and mission control systems and facilities; planning and conducting support of Earth orbital spacecraft, aeronautical research and sounding rockets, which includes flight control, tracking, data acquisition, communications, and information processing and analysis; and network planning and implementation support for Shuttle. (Tracking and data acquisition responsibilities include deep space and orbital phase acquisition of all mission types and the implementation of the Tracking and Data Relay Satellite System.)

Launch Range and Research Airport Management and Operations - Planning and operating the launch range, associated aircraft, and a research airport in support of NASA aerospace programs as well as those of the Department of Defense, other government agencies, and the academic and international community. Includes launch support for the expendable Scout launch vehicles launched at the Wallops Flight Center.

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 Applications - Developing the technical discipline base, developing and calibrating spaceborne sensors, ground data processing and analysis systems, and implementing applications experiments for Environmental Observations and Resources Observations.

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

Balloon Program - Managing, monitoring, scheduling, and technical oversight of balloon activities conducted for NASA and other agencies providing multidiscipline payload development support.

Spacelab Payload Development and Mission Management - developing, analytically integrating and processing data for Spacelab payloads in astrophysics, solar terrestrial physics, astronomy, and applications.

Special Payloads Activities - Involves the management of such Shuttle payload activities as Detached Shuttle Payloads, Get-Away Special, etc., and of balloon and aircraft projects. Develops and operates diverse mechanical, electrical, aerodynamic, propulsion, control, thermal, and combined systems.

SUPPORTING

Planetary Science - developing and applying techniques for the analysis of planetary atmospheres.

Environmental Observations - Contributing to the technical discipline base, developing spaceborne sensors and implementing experiments.

Aerospace Flight Test Support - Planning and conducting 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>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</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>
I. Personnel and Related Costs.....	132,444	135,602	136,553	135,950
11. Travel	2,572	3,789	3,684	3,684
III. Operations of Installation.....	27,432	32,628	29,829	34,004
A. Facilities Services.....	(13,631)	(19,183)	(16,317)	(18,498)
B. Technical Services.....	(3,849)	(4,071)	(4,165)	(4,161)
C. Management Operations	<u>(9,952)</u>	<u>(9,374)</u>	<u>(9,347)</u>	<u>(11,345)</u>
Total, fund requirements	<u>162,448</u>	<u>172,019</u>	<u>170,066</u>	<u>173,638</u>

Distribution of Permanent Positions by Program

	<u>1981</u>	<u>1982</u>		<u>1983</u>
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems and Operations</u>	173	145	175	158
Space shuttle	37	23	34	32
Space flight operations	65	42	70	54
Expendable launch vehicles	71	80	71	72
<u>Space Science and Applications</u>	<u>1.902</u>	<u>2.033</u>	<u>1.895</u>	<u>1.891</u>
Physics and astronomy	893	985	947	1.008
Planetary exploration	89	72	77	63
Life sciences	1	---	---	---
Space applications	906	952	864	813
Technology utilization	13	24	7	7
<u>Aeronautics and Space Technology</u>	144	171	149	139
Space research and technology	121	147	125	120
Aeronautical research and technology	23	24	24	19
<u>Space Tracking and Data Systems</u>	660	655	706	709
Tracking and data acquisition	660	655	706	709
Subtotal. direct positions	2.879	3.004	2,925	2.897
<u>Center Management and Operations Support Positions</u> ...	<u>820</u>	<u>835</u>	<u>736</u>	<u>726</u>
Total. permanent positions	<u>3.699</u>	<u>3.839</u>	<u>3.661</u>	<u>3.623</u>

PROGRAM DESCRIPTION

Permanent Positions
(Civil Service)

SPACE SHUTTLE.....

32

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.

SPACE FLIGHT OPERATIONS.....

54

The GSFC activities in this area is to manage and coordinate 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 Shuttle. Tasks include ensuring that experiments meet flight and safety specifications and securing the experiments into containers for Shuttle flight. Individual experimenters are responsible for the performance of their instruments/experiments.

Activities also include the management, development and operation of a reliable and cost effective Spinning Solid Upper Stage and a Flight Support System to support Multimission Modular Spacecraft for Shuttle flight. The Spinning Solid Upper Stage is designed to insert shuttle-borne payloads into orbits not attainable by the orbiter, and can also be used with expendable launch vehicles.

The Flight Support System is the electromechanical interface between the orbiter and Multimission Modular Spacecraft. It will be utilized for the ascent, retrieval, repair and descent phases of Shuttle flights carrying Multimission Modular Spacecraft payloads.

EXPENDABLE LAUNCH VEHICLES.....

72

The GSFC is the management center for the Delta launch vehicle. The Delta vehicle is NASA's only medium class standard launch vehicle and has the capability 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 NASA missions, for a wide range of reimbursable missions for other Government agencies, domestic commercial users, and international users. The Delta program provides for production of the launch vehicles required for approved missions, provides the necessary operations support, production capability for projected missions and solid propellant upper stages and apogee booster motors. The

Delta project provides engineering, quality, and configuration control services to maintain operational capability with high reliability. In addition, a Scout launch capability is maintained by the Wallops facility.

Permanent Positions
(Civil Service)

PHYSICS AND ASTRONOMY.....

1008

Physics and Astronomy is comprised of research in two major areas: Astrophysics and Solar Terrestrial Research.

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, and particle astrophysics, solar physics, interplanetary physics, planetary magnetospheres, and astrochemistry.

During 1983, GSFC investigators will actively be involved in development, assembly, and test of instruments for the Space Telescope, Gamma Ray Observatory, Cosmic Background Explorer, Shuttle Payloads and Integrated Rocket Experiments, and data analysis of several major Physics and Astronomy missions including the High Energy Astronomy Observatory, the Dynamics Explorer, the Solar Maximum Mission, the Interplanetary Monitoring Probes, and the International Sun-Earth Explorers.

In 1983, 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. Additionally, it is expected that the International Sun-Earth Explorer series will provide unusual opportunities to study the dynamic interactions of solar wind and the Earth's magnetosphere from various points in space.

In 1983, efforts will continue in the development of Active Magnetospheric Particle Tracer and Cosmic Background Explorer. The Active Magnetospheric Particle Tracer Explorer, an international cooperative project with the Federal Republic of Germany utilizes an American spacecraft within the

Earth's magnetosphere to measure ionized particles released from the Federal Republic of Germany's spacecraft. In addition, GSFC will be involved in preparation for the Solar Maximum Mission Retrieval/Repair planned for 1983.

The Center will provide the management and support of NASA domestic and international Sounding Rocket programs. The project involvement extends from the conception through launch and data analysis in support of research within Galactic Astronomy, High Energy Astrophysics, Solar Physics, Plasma Physics, Upper Atmospheric and Interdisciplinary Research, and the space applications of materials processing science. During 1983, we plan to continue using sounding rocket technology for the Shuttle via detached special payloads. This is a cost-effective approach which allows the experimenter to obtain scientific data from an instrument designed to fly on a sounding rocket or the Shuttle.

In 1983, GSFC will manage the scientific balloon program providing for launch and tracking support, flight hardware support, and technical support including new systems development. Also in 1983, it is planned that Goddard will assume responsibility for the National Scientific Balloon facility at Palestine, Texas which is currently sponsored by the National Science Foundation if an agreement can be reached with NSF during FY 1982.

Permanent Positions
(Civil Service)

PLANETARY EXPLORATION.....

63

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

During 1983, GSFC investigators will continue to be actively involved in the development of two instruments, the Neutral Mass Spectrometer and the Photopolarimeter Radiometer for the Galileo Project. These instruments will measure chemical composition and the physical properties of clouds in the atmosphere of Jupiter. GSFC will also be involved in the data analysis activity of various instruments on Voyager and Pioneer Venus.



SPACE APPLICATIONS.....

813

The Space and Terrestrial Applications program for 1983 spans this Center's broad roles and missions mandate. Included for 1983 are activities in the discipline areas of Resource Observations and Environmental Observations.

GSFC is engaged in three major types of activities in these areas: A) research and technology; B) flight projects; and C) application data analysis. These activities may be characterized as follows:

A. The research and technology effort in general is directed toward solving major problems in the above mentioned disciplines. It stresses continuity of research and development from the assessment of these problems to conceptual instrument design and testing, mission payload studies, concepts of flight missions, and their final analyses and evaluation after launch. It includes the design and construction of mathematical models to study:

1. The global circulation of this planet's atmosphere for better weather and climate predictions;
2. The dynamics of the Earth to provide improved understanding of geodynamics and earthquake processes, and gravity fields;
3. The processes of the oceans such as surface winds, waves, temperature, currents, and circulation to support our weather and climate effort as well as our ocean research program;
4. The Earth's renewable and nonrenewable resources for better monitoring, assessment, and management; and
5. The environment of the Earth's atmosphere and hydrosphere.

Other examples of efforts of more specific nature include: new instrument development for measuring temperature and pressure profiles in the atmosphere which are essential input parameters for our weather and climate models; user active and passive microwave systems for measuring sea surface

temperatures and winds, as well as soil moisture essential for water resources modeling and agriculture yield predictions; new instruments for ocean color measurements important for ocean studies, and pollution determination; new high precision laser electronic ranging systems to support our Earth and ocean dynamics efforts; new low cost data collection platforms; and low cost global positioning system terminals for civilian application.

B. Application's flight project responsibilities for 1982 and 1983 include:

1. Operational weather satellite missions for the National Oceanic and Atmospheric Administration (NOAA), including launch of NOAA-D and E, and GOES F.
2. Currently aloft Landsat and Nimbus satellites will continue to provide remotely sensed resources observations and environmental observations to a worldwide applications research science community.
3. Landsat-D--Scheduled for launch during 1982.
4. Earth Radiation Budget Experiment--During 1983, the ERBE Project will complete fabrication of the ERBS spacecraft and integration and testing of ERBS instruments.
5. Correlation measurements are required from balloons, sounding rockets, aircraft, and ground installations.

C. Applications demonstration activities involve the formulation, analysis, and distribution of applications data received from satellites for which GSFC has management responsibility. Such demonstrations concern the use of data from Nimbus-7 spacecraft for the solution of problems concerning pollution, ocean resources and dynamics, and weather and climate. The Heat Capacity Mapping Mission will evaluate the utility of thermal measurements from satellites for determining such parameters as soil moisture and rock types inferred from surface temperatures and thermal inertia. Similar activities will take place using the data from Landsat-3 spacecraft. This information will be of use to investigators in the agricultural, forestry, geology, land use, cartography, hydrology, ecology, and oceanography disciplines.

TECHNOLOGY UTILIZATION.....

7

Technology Utilization activities are directed toward the application of space technology to public and private sector needs. Foremost among the technology applications projects in 1982 are the implantable defibrillator and implantable medication system. Other activities include:

- A. New technology identification, evaluation, and publication,
- B. Dissemination methods and techniques, and
- C. Public sector technology applications projects.

SPACE RESEARCH AND TECHNOLOGY.....

120

The Space Research and Technology program activities provide results appropriate to space mission capability. Past efforts have produced many worthwhile advances in space system capability, reliability, and effectiveness. During 1983, areas of continuing attention include advanced sensors and instruments; advanced technology encompassing thermal energy management, data processing and information extraction, cryogenic cooling for sensors, and fundamental electronics; power system management, and Large Space Structure Technology.

Activities in such areas as machine intelligence, computer system sciences, earth orbiting spacecraft systems, communications, and detectors will continue.

Research and technology will be directed primarily to applications and future astronomical, astrophysical and atmospheric missions.

AERONAUTICAL RESEARCH AND TECHNOLOGY.....

19

In 1983, the Wallops airport will be used in conducting 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 the effect of runway grooving as a means of controlling aircraft hydroplaning on wet or slush-covered runways. Studies of automotive hydroplaning have also been conducted using this runway. The data required from the aircraft and automotive tests will ultimately assist in the development of safer, more flexible transportation systems. Wallops will also continue to support general aviation stall/spin research, single-pilot IFR flight tests, agricultural aerial applications research, aircraft noise research, and support safety research for general aviation.

Permanent Positions
(Civil Service)

TRACKING AND DATA ACQUISITION.....

709

The Tracking and Data Acquisition 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 implementation of 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).

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 for which NASA has responsibility.

In support of the aeronautics and sounding rockets program, GSFC provides tracking, data acquisition, communication and control. Support of balloons, sounding rockets, reentry vehicles, satellites launched from Wallops Island and other offsite range locations, and other aeronautical and research programs are conducted at Wallops.



During 1983, the Tracking and Data Relay Satellite System (TDRSS) will become operational with two satellites in geosynchronous orbit and the White Sands Ground Terminal providing telemetry, tracking, and command support. The Tracking and Data Relay Satellite System will provide the satellite relay of Earth orbiting spacecraft data to a single ground station located at White Sands, New Mexico. The system will employ 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 in 1984/1985 to provide high-earth orbit support not available from TDRSS.

During 1983, the Space Tracking and Data Network is projecting support for planned missions including: Space Transportation System flights, Fleet Satellite Communications-4, International Sun-Earth Explorers, International Ultraviolet Explorer, Landsat, Solar Maximum Mission, and Stratospheric Aerosol and Gas Experiment.

Support is provided to flight missions in the categories of mission control, operational computing, and sensor data processing. This includes mission and systems analysis, systems design and implementation, and the operation and maintenance of multimission and dedicated technical facilities to support both Goddard and non-Goddard missions.

During 1983, emphasis will continue to be placed on defining concepts for spacecraft and data autonomy in order to modify designs of flight and ground systems to improve the response, capacity, and effectiveness of the end-to-end data system, as well as the development of system concepts and techniques to provide data to multiple users from multiple data sources.

In the area of mission control, work will continue on the first Payload Operations Control Center Network cluster to allow the reuse of standard components and designs in order to share expensive resources among a large number of missions.

For operational computing, major efforts will be continued to size the computational requirements for the Shuttle era and provide a new computing capability for flight dynamics, including attitude computations, and command management.

Emphasis will be placed on end-to-end data concepts and, in addition, a major effort will be required to develop and implement new capabilities to process and distribute Spacelab payload data, and to provide command and control capabilities for the Space Telescope project.

Permanent Positions
(Civil Service)

CENTER MANAGEMENT AND OPERATIONS SUPPORT.....

726

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 immediate staff, staff organizations, e.g., Comptroller, Counsel, Patent Counsel, Equal Opportunity, Planning and Analysis, Public Affairs, and Safety.

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 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

	1981	1982		1983
	<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. <u>PERSONNEL AND RELATED COSTS</u>	<u>132,444</u>	<u>135,602</u>	<u>136,553</u>	<u>135,950</u>
	<u>Summary of Fund Requirements</u>			
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions.....	117,708	120,478	121,005	120,734
b. Other than full-time permanent positions...	1,382	1,585	1,512	1,684
c. Overtime and other compensation	<u>1,311</u>	<u>1,155</u>	<u>1,234</u>	<u>958</u>
Subtotal, Compensation	120,401	123,218	123,751	123,376
2. <u>Benefits</u>	<u>10,933</u>	<u>10,935</u>	<u>11,549</u>	<u>11,321</u>
Subtotal, Compensation and Benefits.....	<u>131,334</u>	<u>134,153</u>	<u>135,300</u>	<u>134,697</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel	174	392	164	164
2. Personnel training.. ..	<u>936</u>	<u>1,057</u>	<u>1,089</u>	<u>1,089</u>
Subtotal, Supporting Costs.....	<u>1,110</u>	<u>1,449</u>	<u>1,253</u>	<u>1,253</u>
Total, Personnel and Related Costs.. ..	<u>132,444</u>	<u>135,602</u>	<u>136,553</u>	<u>135,950</u>

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
A. <u>Compensation and Benefits</u>	131,334	134,153	135,300	134,697
1. <u>Compensation</u>	120,401	123,218	123,751	123,376
a. Permanent positions.....	117,708	120,478	121,005	120,734

The current estimate for 1982 reflects a change from the 1982 budget estimate due to the recent pay increases, partially offset by a reduction in permanent positions in 1982.

Basis of Cost for Permanent Positions

In 1983, the cost of permanent positions will be \$120,734,000. The decrease from 1982 results from the following:

Cost of permanent positions in 1982.....	\$121,005
Cost increases in 1983.....	+2,228
Within grade and career advances:	
Full year effect of 1982 actions.....	+1,065
Partial year effect of 1983 actions.....	+479
Full year effect of 1982 pay increases.....	+684
Cost decreases in 1983.....	-2,499
Turnover savings and abolished positions:	
Full year effect of 1983 actions.....	-633
Effect of 1983 actions.....	-1,683
Change in reimbursable estimate.....	-183
Cost of permanent positions in 1983.....	<u>\$120,734</u>

	<u>1981</u> Actual	<u>1982</u>		<u>1983</u>
		<u>Budget</u> Estimate	<u>Current</u> Estimate	<u>Budget</u> Estimate
		(Thousands of Dollars)		
b. Other than full-time permanent positions				
1. cost.....	1,382	1,585	1,512	1,684
2. Workyears.....	122	146	159	159

The distribution of 1983 workyears is as follows:

Distribution of Other than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Cooperative training.....	61
Summer employment.....	10
Opportunity programs.....	39
Other temporary employment.....	<u>49</u>
Total.....	<u>159</u>

The increase from the 1982 budget estimate to the 1982 current estimate reflects increased emphasis on the youth opportunity and cooperative training programs. The 1983 estimate reflects skill mix changes resulting in increased costs.

c. Overtime and other compensation.....	1,311	1,155	1,234	958
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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 1982 budget estimate to the 1982 current estimate reflects the October 1981 pay increase. The decrease from 1982 to 1983 reflects the center's current estimate of requirements.

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
2. <u>Benefits</u>	<u>10,933</u>	<u>10,935</u>	<u>11,549</u>	<u>11,321</u>

The following are the amounts of contribution by category:

Civil Service Retirement Fund.. .. .	7,935	8,439	8,215	8,216
Employee life insurance.....	317	285	330	316
Employee health insurance.....	2,388	1,843	2,545	2,264
Workmen's compensation.....	164	173	304	374
FICA.....	30	26	155	151
Other benefits.....	<u>99</u>	<u>169</u>	<u>---</u>	<u>---</u>
Total.....	<u>10,993</u>	<u>10,935</u>	<u>11,549</u>	<u>11,321</u>

The increase from the 1982 budget estimate to the 1982 current estimate is due to recent pay increases, partially offset by the reduction in permanent workyears. The workmen's compensation for 1982 and 1983 reflects estimates based on Department of Labor billings.

B. <u>Supporting Costs</u>	<u>1,046</u>	<u>1,449</u>	<u>1,253</u>	<u>1,253</u>
1. Transfer of personnel.....	174	392	164	164

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 decrease from the 1982 budget estimate to the 1982 current estimate reflects a revised number of transfers.

2. Personnel training.....	936	1,057	1,089	1,089
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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 1982 budget estimate to the 1982 current estimate reflects a rise in tuition costs.

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
11. <u>TRAVEL</u>	<u>2,572</u>	<u>3,789</u>	<u>3,684</u>	<u>3,684</u>

Summary of Fund Reuirements

A. Program Travel.....	2,242	3,295	3,261	3,338
B. Scientific and Technical Development Travel.. ..	142.	298	210	108
C. Management and Operations Travel.....	<u>188</u>	<u>196</u>	<u>213</u>	<u>238</u>
Total, Travel.....	<u>2,572</u>	<u>3,789</u>	<u>3,684</u>	<u>3,684</u>

Explanation of Fund Requirements

A. <u>Program Travel</u>	<u>2,242</u>	<u>3,295</u>	<u>3,261</u>	<u>3,338</u>
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Program travel, which accounts for approximately 90 percent of total travel in 1983, is essential to the accomplishment of the Center's mission, particularly with regard to the Physics and Astronomy, Space Applications, Tracking and Data Acquisition, and Space Transportation Systems 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 1982 budget estimate and the 1982 current estimate reflects the amended 1982 reduced travel budget. The increase in the 1983 estimate over the 1982 current estimate is due to increased requirements associated with such programs as TDRSS, AMPTE, UARSE, ERBE, Landsat D, and STS; and anticipated travel increases.

B. <u>Scientific and Technical Development Travel</u>	<u>142</u>	<u>298</u>	<u>210</u>	<u>108</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. The decrease from the 1982 budget estimate to the 1982 current estimate reflects the amended 1982 travel budget. The 1983 estimate reflects a reduction in travel due to requirements in the other travel categories.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</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>188</u>	<u>196</u>	<u>213</u>	<u>238</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, and travel of the Center's top management to other NASA Centers. The increase from the 1982 budget estimate to the 1982 current estimate is due to an increase in the local travel because of the consolidation of GSFC and WFC. The 1983 estimate reflects the same level of travel activity as in 1982 with expected increases in travel costs.

III. <u>OPERATION OF INSTALLATION</u>	<u>27,432</u>	<u>32,628</u>	<u>29,829</u>	<u>34,004</u>
	<u>Summary of Fund Reuirements</u>			
A. Facilities Services.....	13,631	19,183	16,317	18,498
B. Technical Services.....	3,849	4,071	4,165	4,161
C. Management and Operations	<u>9,952</u>	<u>9,374</u>	<u>9,347</u>	<u>11,345</u>
Total, Operation of Installation.. ..	<u>27,432</u>	<u>32,628</u>	<u>29,829</u>	<u>34,004</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 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.

The decrease from the 1982 budget estimate to the 1982 current estimate reflects necessary deferrals and reductions in services and activities as well as revised utility usage projections based on continued energy conservation. The 1983 budget estimate provides for projected increases in support contractor rates, supplies, materials, and equipment along with anticipated utility rate increases.

	1981	<u>1982</u>		1983
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
A. <u>FACILITIES SERVICES</u>	<u>13,631</u>	<u>19,183</u>	<u>16,317</u>	<u>18,498</u>

The Greenbelt facility is located on a 552-acre main site, and on a 601-acre remote site area with a complex of laboratory and office-type buildings as well as test facilities. This complex encompasses 2,517,500 gross square feet of building space including 34 buildings. This physical plant supports an average daily on-Center population of 5,800 to 6,100 personnel. Many of the test facilities are utilized on schedules involving more than one shift and during off-peak hours.

The Wallops facility involves 6,176 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 onsite population of 900 to 1,000 Personnel.

Summary of Fund Requirements

	1981	1982		1983
	<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>	<u>816</u>	<u>725</u>	<u>640</u>	48 1
2. <u>Maintenance and Related Services</u>	<u>2,291</u>	<u>2,846</u>	<u>2,548</u>	<u>3,060</u>
a. Facilities.....	2,291	2,830	2,548	3,060
b. Equipment.....	--	16	--	--
3. <u>Custodial Services</u>	<u>2,210</u>	<u>3,306</u>	<u>3,397</u>	<u>3,706</u>
4. <u>Utility Services</u>	<u>8,3 14</u>	<u>12,306</u>	<u>9,7 32</u>	<u>11,251</u>
Total, Facilities Services.....	<u>13,631</u>	<u>19,183</u>	<u>16,317</u>	<u>18,498</u>

Explanation of Fund Requirements

1. <u>Rental of Real Property</u>	<u>816</u>	<u>725</u>	<u>640</u>	<u>48 1</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 1982 budget estimate to the 1982 current estimate and the further decrease in the 1983 budget estimate is due to vacating a portion of the leased space.

2. <u>Maintenance and Related Services</u>	<u>2,291</u>	<u>2,846</u>	<u>2,5 48</u>	<u>3,060</u>
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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 decrease from the 1982 budget estimate to the 1982 current

estimate reflects necessary deferrals such as maintenance, painting and equipment upgrading. The increase in 1983 provides for longdeferred items which need to be completed, such as upgrading power plant operations for energy conservation.

	1981	<u>1982</u>		1983
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		(Thousands of Dollars)		<u>Estimate</u>
		<u>Estimate</u>	<u>Estimate</u>	
3. <u>Custodial Services</u>	<u>2,210</u>	<u>3,306</u>	<u>3,397</u>	<u>3,706</u>

The estimate provides for support service contractor effort 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 protection of all Government facilities and equipment including the GISS in New York City, and firefighting and ambulance service at Wallops. The 1982 current estimate provides for anticipated rate increases, purchase of security items deferred from 1981, and a slight increase in support contractor effort.

4. <u>Utility Services</u>	8,314	<u>12,306</u>	<u>9,732</u>	<u>11,251</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 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 1982 budget estimate to the 1982 current estimate is due to revised usage projections based on continued energy conservation as well as the deferral of the central power plant conversion. The increase in 1983 provides for anticipated utility rate increases while reducing consumption as part of continued conservation efforts.

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
B. <u>TECHNICAL SERVICES</u>	<u>3,849</u>	<u>4,071</u>	<u>4,165</u>	<u>4,161</u>

(Thousands of Dollars)

Summary of Fund Requirements

1. <u>Automatic Data Processing</u>	<u>2,571</u>	<u>2,561</u>	<u>2,566</u>	<u>2,387</u>
a. <u>Equipment</u>	1,221	775	762	531
b. <u>Operations</u>	1,350	1,786	1,804	1,856
2. <u>Scientific and Technical Information</u>	<u>910</u>	<u>1,018</u>	<u>1,176</u>	<u>1,159</u>
a. <u>Library</u>	652	699	752	801
b. <u>Education and Information</u>	258	319	424	358
3. <u>Shop Support and Services</u>	<u>368</u>	<u>492</u>	<u>423</u>	<u>615</u>
Total, Technical Services.....	<u>3,849</u>	<u>4,071</u>	<u>4,165</u>	<u>4,161</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u>	<u>2,571</u>	<u>2,561</u>	<u>2,566</u>	<u>2,387</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 a Xerox 1200 printer, various terminals, and other peripheral equipment. The systems supported include institutional management, finance and accounting, procurement and personnel management. The 1983 estimate reflects operations costs after replacement of the Wallops Honeywell Computer.

	<u>1981</u>	<u>1982</u>		<u>1983</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)		
2. <u>Scientific and Technical Information.. .. .</u>	<u>910</u>	<u>1,018</u>	<u>1,176</u>	<u>1,159</u>

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 increase in 1982 is required for completion of the Visitor Information Center at Wallops as well as anticipated contractor rate increases.

3. <u>Shop Support and Services.....</u>	<u>368</u>	<u>492</u>	<u>423</u>	<u>615</u>
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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 increase from the 1982 current estimate to the 1983 estimate reflects increased requirements for photo and graphic services and expected contractor rate escalation.

	<u>1981</u>	<u>1982</u>		<u>1983</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)		
C. <u>MANAGEMENT AND OPERATIONS</u>	<u>9,952</u>	<u>9,374</u>	<u>9,347</u>	<u>11,345</u>
<u>Summary of Fund Requirements</u>				
1. Administrative Communications.....	2,891	2,655	3,543	4,547
2. Printing and Reproduction.....	175	390	301	348
3. Transportation.....	4,033	2,721	2,470	2,462
4. Installation Common Services.....	<u>2,853</u>	<u>3,608</u>	<u>3,033</u>	<u>3,988</u>
Total, Management and Operations.....	<u>9,952</u>	<u>9,374</u>	<u>9,347</u>	<u>11,345</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u>	<u>2,891</u>	<u>2,655</u>	<u>3,543</u>	<u>4,547</u>
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The estimate provides for local telephone service, long distance telephone service, and other nontelephone communications. Local telephone services covers 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 1982 current estimate and 1983 reflects the same level of service with an increase in FTS costs.

2. <u>Printing and Reproduction</u>	<u>175</u>	<u>390</u>	<u>301</u>	<u>348</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 decrease from the 1982 budget estimate to the 1982 current estimate is a reduction in the level of printing activity and reflects 1981 experience. The 1983 estimate reflects planned increases in off-site contractor printing requirements and negotiated support contractor wage increases.

	<u>1981</u>	<u>1982</u>		<u>1983</u>
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		(Thousands of Dollars)		<u>Estimate</u>
		<u>Estimate</u>	<u>Estimate</u>	
3. <u>Transportation</u>	4,033	2,721	2,470	2,462

This estimate covers a support contractor who 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 decrease from the 1982 budget estimate to the 1982 current estimate reflects decreased support contractor rates as a result of negotiating a new contract. The 1983 estimate reflects 1982 experience.

4. <u>Installation Common Services</u>	2,853	3,608	3,033	3,988
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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 3,623 employees at the Center. The necessary supplies, materials, and equipment for operation of the health unit are included. The decrease in 1982 from the budget

estimate to the current estimate is due to necessary deferrals into 1983. The 1983 estimate provides for rate increases and replacement of vehicles.

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

DIRECTOR		
DEPUTY DIRECTOR		
ASSISTANT DIRECTOR FOR SPECIAL PROJECTS		
	82	83
SES	3	3
EXCEPTED	0	0
GS 16	0	0
GS 15	3	3
GS 14	0	0
OTHER GS	5	5
WAGE GRADE	0	0
TOTAL	11	11

NASA INSPECTOR GENERAL
 REGIONAL OFFICE

TOTAL		
	82	83
SES	53	53
EXCEPTED	3	3
GS 16	1	1
GS 15	310	210
GS 14	555	555
OTHERGS	2596	2558
WAGE GRADE	143	143
TOTAL	3661	3623

COMPTROLLER		
	82	83
SES	2	2
EXCEPTED	0	0
GS 16	0	0
GS 15	3	3
GS 14	6	6
OTHERGS	98	98
WAGE GRADE	0	0
TOTAL	109	109

DIRECTOR OF FLIGHT ASSURANCE		
	82	83
EXCEPTED	1	1
GS 16PTD	0	0
GS 15	16	16
GS 14	0	0
OTHERGS	29	29
OTHERGS	67	67
WAGE GRADE	0	0
TOTAL	113	113

CHIEF COUNSEL		
	82	83
SES	1	1
EXCEPTED	0	0
GS 16	0	0
GS 15	2	2
GS 14	5	5
OTHER GS	3	3
WAGE GRADE	0	0
TOTAL	11	11

EQUAL OPPORTUNITY PROGRAMS OFFICE		
	82	83
SES	0	0
EXCEPTED	0	0
GS 16	0	0
GS 15	0	0
GS 14	1	1
OTHER GS	3	3
WAGE GRADE	0	0
TOTAL	4	4

PROGRAM AND INSTITUTIONAL PLANNING OFFICE		
	82	83
SES	2	2
EXCEPTED	0	0
GS 16	0	0
GS 15	2	2
GS 14	3	3
OTHER GS	3	3
WAGE GRADE	0	0
TOTAL	10	10

DIRECTOR OF MANAGEMENT OPERATIONS		
	82	83
SES	3	3
EXCEPTED	1	1
GS 16	0	0
GS 15	14	14
GS 14	38	38
OTHERGS	491	485
WAGE GRADE	141	141
TOTAL	688	682

DIRECTOR OF FLIGHT PROJECTS		
	82	83
SES	10	10
EXCEPTED	0	0
GS 16	0	0
GS 15	68	68
GS 14	97	97
OTHERGS	151	151
WAGE GRADE	0	0
TOTAL	326	326

DIRECTOR OF MISSIONS AND DATA OPERATIONS		
	82	83
SES	3	3
EXCEPTED	0	0
GS 16	0	0
GS 15	17	17
GS 14	38	38
OTHERGS	161	161
WAGE GRADE	0	0
TOTAL	219	219

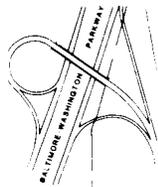
DIRECTOR OF SCIENCES		
	82	83
SES	6	6
EXCEPTED	0	0
GS 16	1	1
GS 15	39	39
GS 14	51	51
OTHER GS	213	213
WAGE GRADE	0	0
TOTAL	310	310

DIRECTOR OF ENGINEERING		
	82	83
SES	4	4
EXCEPTED	0	0
GS 16	0	0
GS 15	48	48
GS 14	119	119
OTHER GS	541	535
WAGE GRADE	0	0
TOTAL	712	706

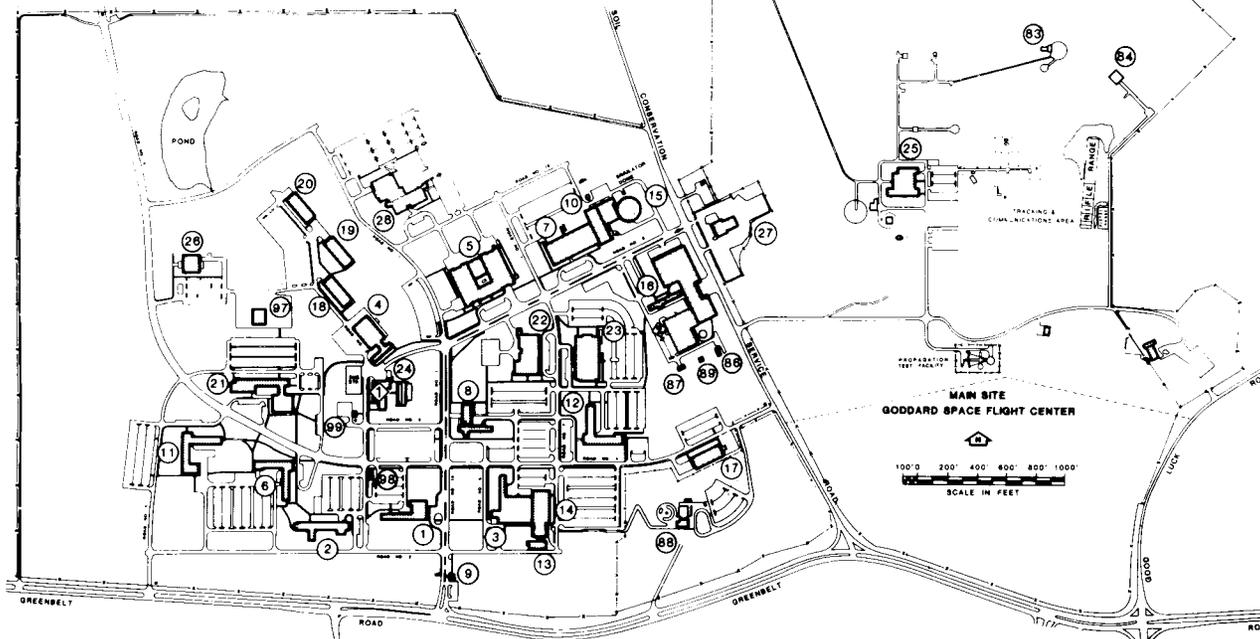
DIRECTOR OF NETWORKS		
	82	83
SES	3	3
EXCEPTED	0	0
GS 16	0	0
GS 15	38	38
GS 14	63	63
OTHER GS	321	321
WAGE GRADE	0	0
TOTAL	425	425

DIRECTOR OF APPLICATIONS		
	82	83
SES	11	11
EXCEPTED	2	2
GS 16	0	0
GS 15	50	50
GS 14	79	79
OTHERGS	335	309
WAGE GRADE	0	0
TOTAL	477	451

DIRECTOR OF SUBORBITAL PROJECTS AND OPERATIONS		
	82	83
SES	4	4
EXCEPTED	0	0
GS 16	0	0
GS 15	10	10
GS 14	26	26
OTHERGS	204	204
WAGE GRADE	2	2
TOTAL	246	246



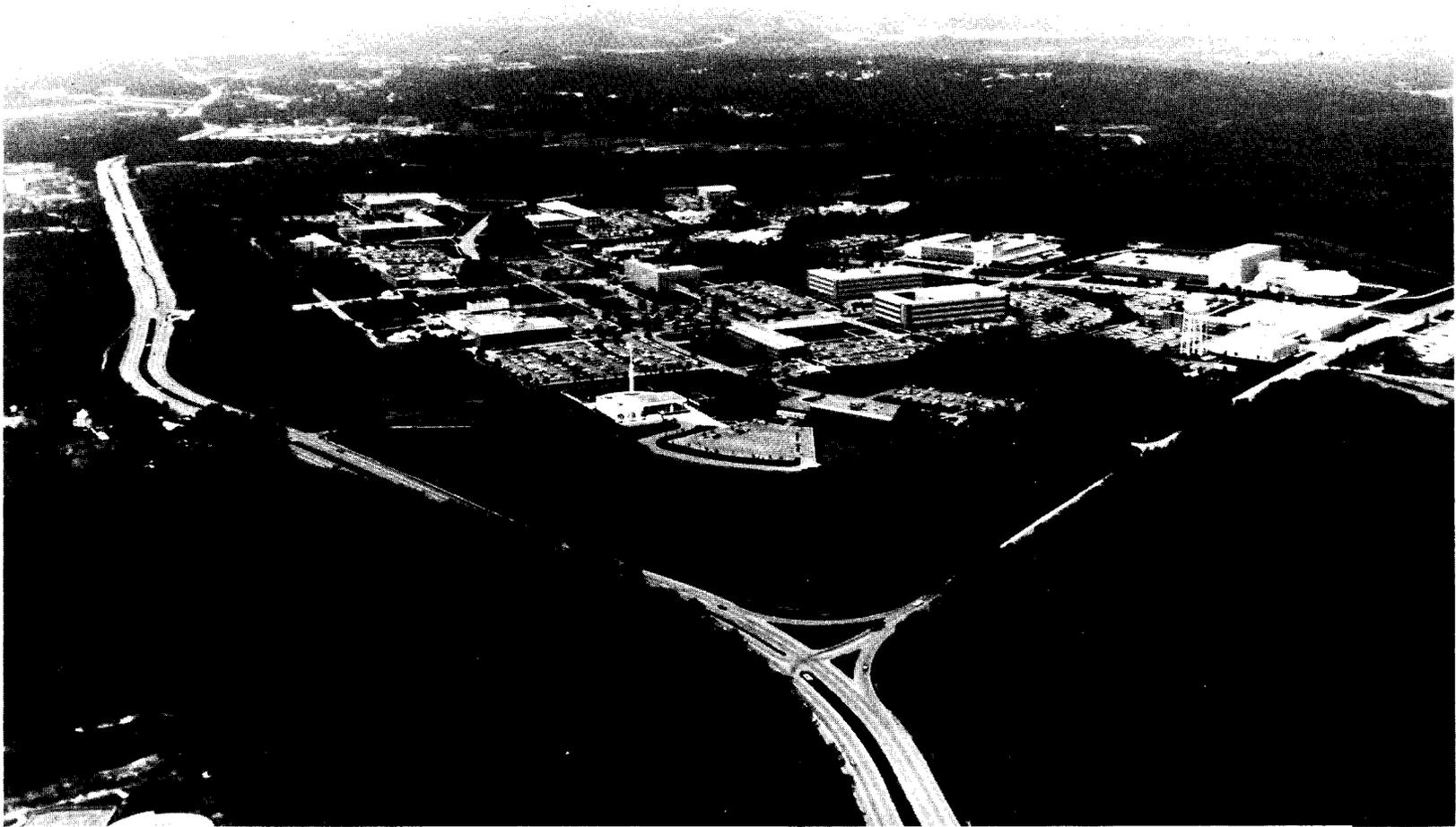
**GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1983 ESTIMATES
LOCATION PLAN**



GSFC MAIN SITE BUILDINGS

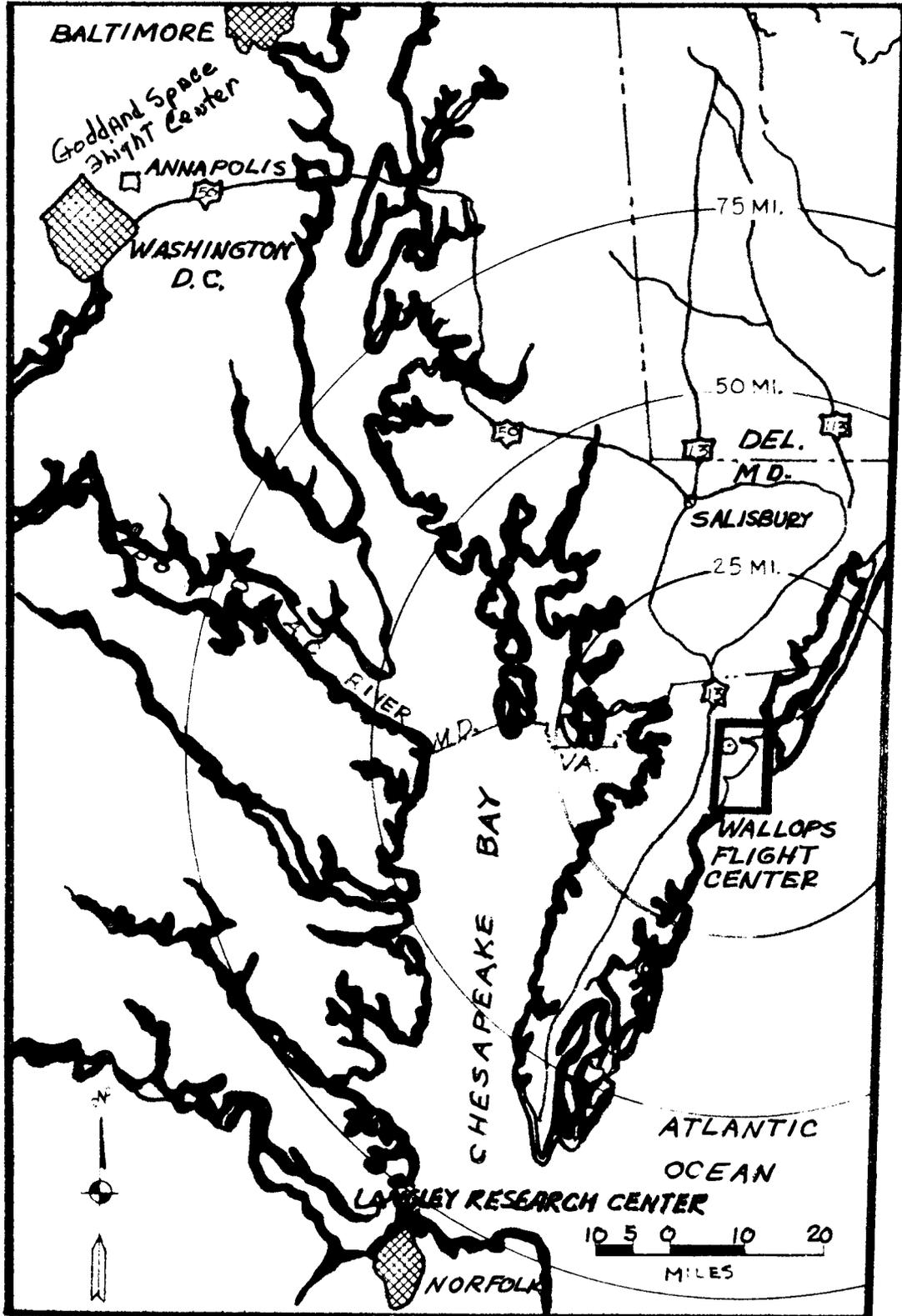
- Bldg. 1 - Space Projects Building
- Bldg. 2 - Research Projects Laboratory
- Bldg. 3 - Central Flight Control Et Range Operations Building
- Bldg. 4 - Plant Operations Building
- Bldg. 5 - Instrument Construction Et Installation Laboratory
- Bldg. 6 - Space Sciences Laboratory
- Bldg. 7 - Payload Testing Facility
- Bldg. 8 - Administration Building
- Bldg. 9 - Main Gate House
- Bldg. 10 - Environmental Testing Laboratory
- Bldg. 11 - Applied Sciences Laboratory
- Bldg. 12 - Tracking Et Telemetry Laboratory
- Bldg. 13 - Network Control Center Facility
- Bldg. 14 - Spacecraft Operations Facility
- Bldg. 15 - Launch Phase Simulator
- Bldg. 16 - Logistic Et Supply Facility
- Bldg. 16W - Logistic Et Supply Facility
- Bldg. 17 - Administrative Support Building
- Bldg. 18 - Administrative Support Building
- Bldg. 19 - Technical Support Building
- Bldg. 20 - Technical Support Building
- Bldg. 21 - Meteorological Systems Development Laboratory
- Bldg. 22 - Space Et Terrestrial Applications Facility
- Bldg. 23 - Data Interpretation Laboratory
- Bldg. 24 - Central Heating Et Refrigeration Plant
- Bldg. 25 - NTF and Hydromechanical Laboratory
- Bldg. 26 - NASA Space Science Data Center
- Bldg. 27 - Mobile Equipment Support Facility
- Bldg. 28 - Technical Processing Facility
- Bldg. 83 - Satan Transmitting Facility
- Bldg. 84 - Frequency Standard Et Test Facility
- Bldg. 86 - Day Care Center
- Bldg. 87 - Gas Cylinder Storage Building
- Bldg. 88 - Visitor Center
- Bldg. 89 - Ordinance Building
- Bldg. 97 - Plant Maintenance Support Facility
- Bldg. 98 - GEWA Store
- Bldg. 99 - Director's Special Project Building

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1983 ESTIMATES
AERIAL VIEW



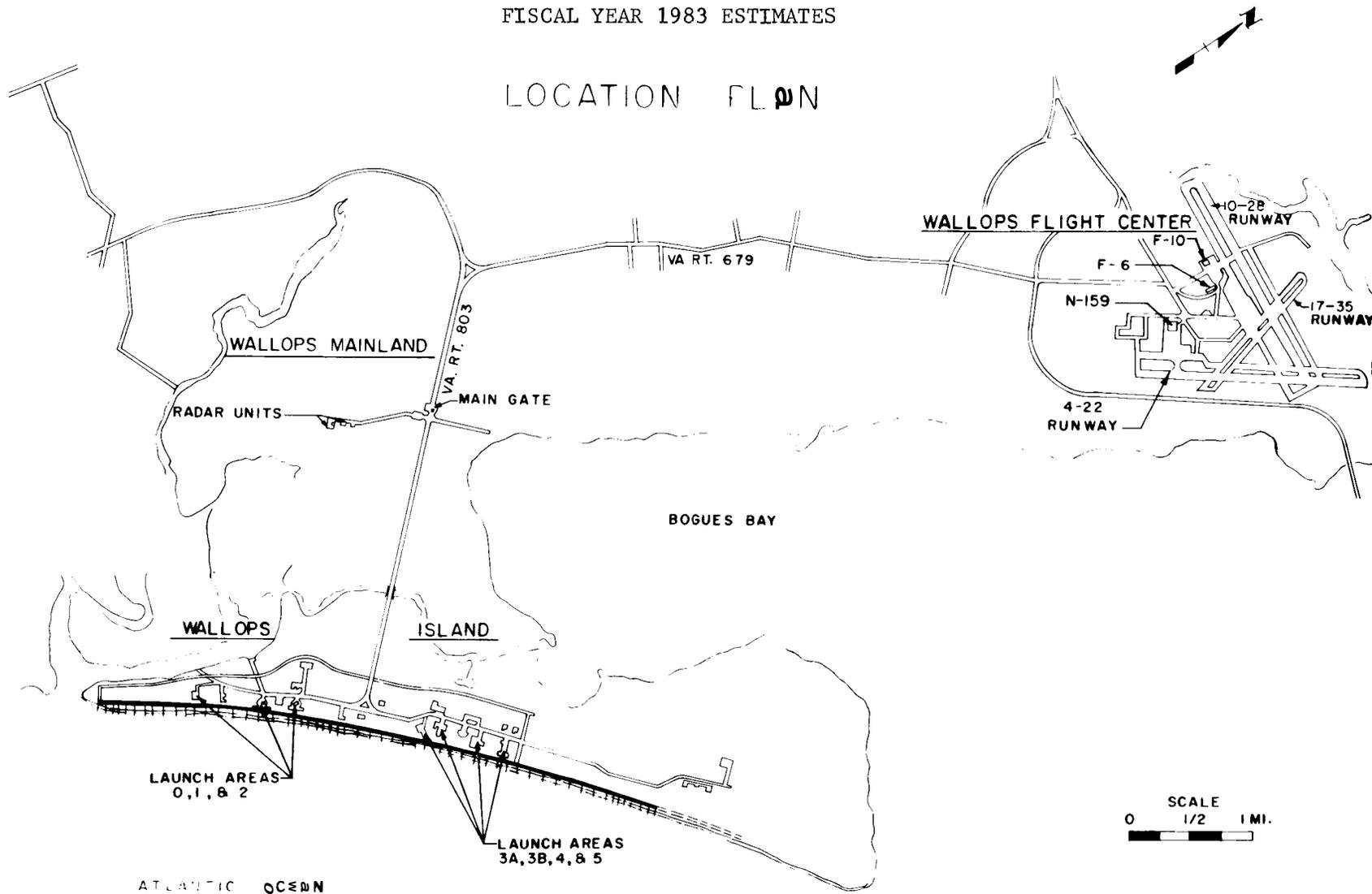
WALLOPS FLIGHT CENTER
FISCAL YEAR 1983 ESTIMATES
AERIAL MAP

RPM 5-33



WALLOPS FLIGHT CENTER
FISCAL YEAR 1983 ESTIMATES

LOCATION PLAN



WALLOPS FLIGHT CENTER
FISCAL YEAR 1983 ESTIMATES
AERIAL VIEW



WALLOPS FLIGHT CENTER
FISCAL YEAR 1983 ESTIMATES
AERIAL VIEW



WALLOPS FLIGHT CENTER
FISCAL YEAR 1983 ESTIMATES
AERIAL VIEW



AMES
RESEARCH CENTER



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1983 ESTIMATES

AMES RESEARCH CENTER

DESCRIPTION

Ames Research Center (ARC) operates in two locations. The Ames Research Center proper is located on 421 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 ARC, Moffett Field, is the U.S. Army Research and Technology Laboratory. Personnel from this Laboratory work closely with ARC personnel on research of mutual interest. The capital investment of ARC, Moffett Field, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1981, was \$606,737,000.

The Ames-Hugh L. Dryden Flight Research Facility (DFRF) is 65 air miles northeast of Los Angeles. DFRF is located at the north end of Edwards Air Force Base on 521 acres of land under a permit from the Air Force. The Air Force encompasses 300,722 acres. DFRF is adjacent to Rogers Dry Lake, a 55-square mile area with a complex of runways varying in length from five to eleven miles. The total capital investment of the Dryden Flight Research Facility, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1981, was \$90,517,000.

CENTER ROLES AND MISSIONS

The programs at ARC involve research and development in the fields of aeronautics, space science, life sciences, and space technology, as well as applications to 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 aerodynamics, rotorcraft technology, high performance aircraft technology, flight simulation, flight testing, computational fluid dynamics, aerothermodynamics, space sciences, airborne sciences and applications, aeronautical human factors, exobiology 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 - advancing the general state of the art, both theoretical and experimental.

Rotorcraft Technology - developing a technology base for improving efficiency, safety, performance and environmental acceptability.

Low Speed Vehicle Systems - conducting research in the Vertical Take-off and Landing (VTOL) area with emphasis on rotorcraft technology and systems.

Computational Fluid Dynamics - furthering the state-of-the-art through the definition of new systems, both hardware and software, and application to aeronautical and other related areas.

Aeronautical Flight Research - conducting flight research using aircraft as test facilities and conducting flight research programs of advanced aerospace vehicle concepts.

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

Flight Instrumentation Development - directing cooperative efforts in the development of new methods and equipment for flight measurements.

Guidance and Control - conducting theoretical investigations, 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 - furthering 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 - conducting flight research on advanced military configurations and demonstrating the potential for improved aircraft performance through the integration of aircraft systems.

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

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

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

Airborne Research and Applications - operating instrumented jet aircraft for the purpose of conducting airborne research and applications experiments.

Aerothermodynamics - developing 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 - completing mission operations and data analysis support for the currently approved Pioneer series of missions.

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

Life Sciences:

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

Biological Experiments - developing, managing and operating experiments for determining effects of space flight on living organisms (non-human) and for providing information applicable to solving space medicine problems.

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

SUPPORTING

Space Transportation Passenger Selection Criteria - developing and evaluating the medical criteria for non-crew passenger selection.

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

Vertical/Short Take-Off and Landing (V/STOL) Technology - developing a technology base for military V/STOL in support of Department of Defense missions.

Shuttle Orbiter - providing landing and recovery capability during Orbital Flight Test (OFT) missions and contingency recovery capability for subsequent operational flights.

SUMMARY OF RESOURCES REQUIREMENTS

Funding Plan by Function

	<u>1981</u>	<u>1982</u>		<u>1983</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)	
I. Personnel and Related Costs	75,312	76,852	78,330	78,391
11. Travel.....	1,558	2,260	2,109	2,109
111. Operation of Installation.....	17,973	22,576	22,250	24,393
A. Facilities Services.. ..	(9,765)	(14,113)	(12,264)	(14,411)
B. Technical Services.....	(2,667)	(2,466)	(3,109)	(2,610)
C. Management and Operations.. ..	(5,541)	(5,997)	(6,877)	(7,372)
Total, fund requirements.	<u>94,843</u>	<u>101,688</u>	<u>102,689</u>	<u>104,893</u>

Distribution of Permanent Positions by Program

	<u>1981</u>	<u>1982</u>		<u>1983</u>
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems and Operations</u>	43	<u>47</u>	<u>47</u>	32
Space shuttle.....	43	47	47	---
Space flight operations..	---	---	---	32
<u>Space Science and Applications</u>	372	<u>409</u>	<u>364</u>	<u>361</u>
Physics and astronomy.....	69	95	75	79
Planetary exploration.....	83	74	80	74
Life sciences.....	124	131	122	122
Space applications.....	92	101	83	83
Technology utilization.....	4	8	4	3
<u>Aeronautics and Space Technology</u>	<u>1,125</u>	<u>1,116</u>	<u>1,129</u>	<u>1,137</u>
Aeronautical research and technology.....	972	958	982	991
Space research and technology..	153	158	147	146
<u>Space Tracking and Data Systems</u>	<u>29</u>	<u>29</u>	29	29
Tracking and data acquisition.....	<u>29</u>	<u>29</u>	<u>29</u>	<u>29</u>
Subtotal, direct positions.....	<u>1,569</u>	<u>1,601</u>	<u>1,569</u>	<u>1,559</u>
<u>Center Management and Operations Support Positions</u> ..	<u>489</u>	<u>518</u>	<u>468</u>	<u>462</u>
Total, permanent positions.....	<u>2,058</u>	<u>2,119</u>	<u>2,037</u>	<u>2,021</u>

PROGRAM DESCRIPTION

Permanent Positions
(Civil Service)

SPACE FLIGHT OPERATIONS.....

32

The Edwards Air Force Base was the primary landing site for the first four Space Shuttle missions and is the secondary landing site for subsequent missions. After landing, the Shuttle Orbiter is returned to Kennedy Space Center by shuttle carrier aircraft. DFRF will provide operational aircraft to test the Microwave Scanning Beam Landing System (MSBLS), provide Orbiter Convoy operations support, and maintain the Shuttle/Carrier Aircraft facility.

PHYSICS AND ASTRONOMY.....

79

In 1983, the civil service personnel will provide support for the airborne astronomy program which includes a C-141 aircraft--The Kuiper Airborne Observatory (KAO), as well as a Lear Jet aircraft, which are operated by Ames 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 its in-house capability to operate research aircraft.

Infrared astronomy observation from space platforms avoid obscuration caused by the Earth's atmosphere. Ames has the responsibility for instruments to accomplish these observations including development of the telescope portion of the Infrared Astronomical Satellite (IRAS); definition of an advanced instrument for use on Spacelab missions; the Shuttle Infrared Telescope Facility (SIRTF); and studies of instruments that may eventually be used as free-flyers in space.

PLANETARY EXPLORATION.....

74

A continuing series of project management activities, backed by the scientific expertise of principal investigators from Ames, other NASA Centers and the university community are required in 1983 to accomplish the ongoing programs in support of Agency goals 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 1983, the civil service personnel will continue to provide project management and scientific support for: (1) Pioneers 6 thru 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; (2) Pioneers 10 and 11, two spacecraft that 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 (these spacecraft were then retargeted by being swung in the Jovian gravity field to explore other regions of the solar system--Pioneer 11 made the first close reconnaissance of Saturn in 1979, and Pioneer 10 has now crossed the orbit of Uranus on its way out of the solar system); (3) Pioneer Venus, launched in 1978, with its orbiter now in place around Venus; and (4) the Galileo project, a natural outgrowth of the Pioneer Venus atmospheric probes, and development of the Galileo Probe.

Ames researchers are playing a key role in these missions. Ames 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. Ames researchers 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.

Ames 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 Positions
(Civil Service)

LIFE SCIENCES.....

122

In 1983, 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 systems; and understanding the origin, evolution, and distribution of life and life-related chemicals on Earth and elsewhere in the universe.

Space flight simulation studies will continue with testing of 40 to 50 year old humans to observe cumulative physiological change that may occur upon varying recovery periods. Findings will provide a basis for flight schedule and rotation for future Shuttle crew members. Ames investigators will be involved in the development phase of both animal and human experiments for the first dedicated Life Sciences Spacelab. Research will continue to determine whether the use of learned autonomic control (biofeedback training) to suppress the symptoms of motion or space sickness will affect the performance of complex cognitive or motor tasks.

The first units of the Research Animal Holding Facility, configured to hold squirrel monkeys and rats, will be integrated into flight configuration and subjected to verification testing in 1983 at Ames prior to the flight on Spacelab 3. Development will be initiated on experiments selected for flight on Spacelab 4, the first dedicated STS Life Sciences mission.

Studies will be continued using closed chambers for investigations of controlled ecology life support systems for space flight.

Research in 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 deoxyribonucleic acid (DNA) segments.

Permanent Positions
(Civil Service)

SPACE APPLICATIONS.....

83

A highly diversified group of scientifically capable people is required to support programs in Resource and Environmental Observations including space, atmospheric, and stratospheric programs; to provide skilled personnel and specialized airborne platforms in support of the Agency's applications satellite programs; to interpret and process both spaceborne and airborne remotely sensed data; to interact with and disseminate data and associated processing techniques to the user community.

The Ames stratospheric research program is an integrated activity that blends the expertise of the Center 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 at Ames to understand the unperturbed stratosphere and

predict the effects on the stratosphere of various pollutants, such as aircraft emissions and fluorocarbons, and of natural events such as the solar cycle and solar storms. A similar program is under way focusing on the climatic effects of aerosols in the Earth's atmosphere through models of aerosols and their radiative effects, and measurements of aerosol properties from Ames aircraft.

Further, the Center's space applications role is fulfilled by: (1) conducting an active and continuing broad program of applied research and development to enhance the use of remote and in situ sensing technology for Earth resources applications; and (2) defining, developing, and evaluating potential satellite sensors, data acquisition and processing techniques, and associated communications technology. 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.

In addition, this diversified scientific group provides management support to the Office of Space Science and Applications for the integrated airborne instrumentation research program at the Center.

Permanent Positions
(Civil Service)

TECHNOLOGY UTILIZATION.....

3

The technology utilization program at Ames is a community undertaking of scientists and engineers in many disciplines and Center organizations working under the leadership and coordination of a full-time Technology Utilization Office staff to move knowledge developed from the NASA programs into industry for effective use in the marketplace.

AERONAUTICAL RESEARCH AND TECHNOLOGY.....

991

In 1983, the content of the Ames program in aeronautics is characterized in terms of three elements: Generic Research and Technology, Vehicle Specific Technology (i.e., Rotorcraft) and aeronautical support to other Government agencies and to industry. These three elements form a coherent and interdependent program to meet the Vertical/Short Take-Off and Landing (V/STOL) and rotorcraft objectives of improved aerodynamic and operational performance, to improve terminal area safety and efficiency, and to reduce aircraft noise and vibrations.

Generic Research and Technology:

The generic research and technology program at Ames is principally focused in the areas of computational and experimental aerodynamics, test instrumentation and techniques, and safety. The program is concentrated in the disciplines of aerodynamics, 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 our ability to compute the theoretical behavior of aerodynamic flow and to measure experimental aircraft configuration parameters. Continued efforts will be directed toward providing advances in computational capability supporting aeronautical research. *Also* fundamental aerodynamic research will be continued to develop design methodologies for designing advanced aircraft. In guidance and control, advanced control technology will be explored and developed for reliable flight critical control systems for advanced aircraft; effort will continue to evaluate and improve digital flight control system verification and validation tools, techniques, methodology and criteria; work in optimal control theory in conjunction with dynamic modeling of aircraft and ground-based guidance aids will provide new insights into the definition of air traffic control system interfaces; and flight tests of digital fly-by-wire experiments will continue to support the development of advanced flight systems technology.

In **1983**, the human factors program will include: continuation of development of a baseline generic display of air traffic information for potential use in an aircraft cockpit; development of helicopter display and control integration to reduce pilot workload; study of advanced flight display formats for improving information presentation to aircrews; and, more complete understanding of human fatigue and circadian desynchronization effects on aircraft pilots.

Vehicle Specific Technology:

The vehicle specific technology at Ames is focused on rotorcraft and V/STOL aircraft. These aircraft have unique characteristics including: a dependence on propulsive lift (in addition to aerodynamic lift); greater capability for versatile operations in the terminal area; and a greater degree of integration of man and machine. The vehicle technology emphasis at Ames relates to, and depends on, the basic capabilities and the aeronautical research disciplines described previously. The **1983** research program will include small-scale and largescale wind tunnel testing and ground-based simulation, and flight research utilizing both rotorcraft and V/STOL aircraft. This class of aircraft is dependent on high lift technology and low cost guidance and control systems, both of which are part of the ongoing program at Ames. In rotorcraft aerodynamics, research will be conducted to

improve the understanding of rotor aerodynamics, rotor/fuselage interaction and rotorcraft noise. In guidance, work will be pursued to improve the all-weather rotorcraft operational capability for both remote site and high density terminal area. In the controls area, flying qualities design criteria will be developed to improve control system concepts for better performance and mission capabilities for rotorcraft.

Other Support:

The Ames Research Center 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. The Navy and NASA have agreed to a comprehensive technical support program for the Navy V/STOL aircraft technology development. The U.S. Army Research and Technology Laboratories of the Army Aviation Research and Development Command (AVRADCOM) is located at Ames. The Aeromechanics Laboratory, the primary investigator of Army rotorcraft flight dynamics and controls, is also located at Ames, working both on independent R&D projects and with a staff integrated into the NASA organization on projects of joint interest. Extensive use is made of Ames aeronautical research facilities in these efforts. There are also a large number of joint programs with the Air Force Systems Command, the Naval Air Systems Command, and the Federal Aviation Administration. Examples of these joint efforts include V/STOL Fighter Studies, Tilt Rotor concept evaluation and an AV-8B flight test program with the Navy; participation in the joint NASA/DARPA Forward Swept Wing demonstration program; continued participation in the joint NASA/USAF AFTI/F-111 program for research and development of a Mission Adaptive Wing to obtain in-flight smooth contour changes to the wing aerodynamic shape to achieve improved aerodynamic efficiency; 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 work on digital flight control system verification and validation with the FAA.

Permanent Positions
(Civil Service)

SPACE RESEARCH AND TECHNOLOGY..... 146

In 1983, 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 Experiment Program (OEX), the Infrared Astronomy Program, and the Galileo Probe.

The entry technology research will provide the 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 laser techniques to the development of flow diagnostic tools to remotely probe gas dynamic flows to define and verify turbulence models. Research efforts in the materials area will provide 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 1983, the 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. Ames Research Center is supporting two Space Shuttle Orbiter experiments. The first is an OEX experiment for Infrared Imaging of Shuttle (IRIS) to obtain measurements of surface temperatures of the lower and side surfaces of the orbiter by remote imagery from the C-141 Kuiper Airborne Observatory (KAO). The second is to conduct OEX thermal protection experiments to study advanced materials and evaluate possible cost and weight reduction for the thermal protection system for Shuttle and advanced Space Transportation Systems.

The work in this area at DFRF is 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; evaluation of the performance of the Shuttle Entry Air Data System (SEADS); 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 system, 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 size 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 technique and analytical methods.

Permanent Positions
(Civil Service)

TRACKING AND DATA ACQUISITION..... 29

In 1983, DFRF will maintain and operate the NASA Aerodynamic Test Range (ATR), which provides direct operational support for a wide variety of aerodynamic and aerospace programs. During mission support operations, the various functional elements such as radar, tracking and data processing, communications, video telemetry acquisition, and telemetry data processing all function in a coordinated manner to provide real time control and monitoring capabilities.

CENTER MANAGEMENT AND OPERATIONS SUPPORT..... 462

Center Management and Operations Support is support or services being provided to all Ames Research 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, Planning and Analysis, Public Affairs, Resources and Budget Management, Energy Management, and Safety.

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 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

	<u>1981</u>	<u>1982</u>		<u>1983</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)		
I. <u>PERSONNEL AND RELATED COSTS</u>.....	<u>75,312</u>	<u>76,852</u>	<u>78,330</u>	<u>78,391</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions.....	65,210	66,232	67,392	67,298
b. Other than full-time permanent positions..	1,799	2,208	2,082	2,177
c. Reimbursable detailees.....	96	221	186	272
d. Overtime and other compensation.....	<u>891</u>	<u>836</u>	<u>809</u>	<u>722</u>
Subtotal, Compensation.....	67,996	69,497	70,469	70,469
2. <u>Benefits</u>.....	<u>6,546</u>	<u>6,663</u>	<u>6,945</u>	<u>7,029</u>
Subtotal, Compensation and Benefits.....	<u>74,542</u>	<u>76,160</u>	<u>77,414</u>	<u>77,498</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel.....	167	124	171	148
2. Personnel training.....	<u>603</u>	<u>568</u>	<u>745</u>	745
Subtotal, Supporting Costs.....	<u>770</u>	<u>692</u>	<u>916</u>	<u>893</u>
Total, Personnel and Related Costs..	<u>75,312</u>	<u>76,852</u>	<u>78,330</u>	<u>78,391</u>

Explanation of Fund Reauirements

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
A. <u>Compensation and Benefits</u>	<u>74,542</u>	<u>76,160</u>	<u>77,414</u>	<u>77,498</u>
1. <u>Compensation</u>	<u>67,996</u>	<u>69,497</u>	<u>70,469</u>	<u>70,469</u>
a. Permanent positions.....	65,210	66,232	67,392	67,298

The current estimate for 1982 reflects a change from the 1982 budget estimate due to the recent pay increases, partially offset by a reduction in permanent positions in 1982.

Basis of Cost for Permanent Positions

In 1983, the cost of permanent positions will be \$67,298,000. The decrease from 1982 results from the following:

Cost of permanent positions in 1982.....	67,392
Cost increases in 1983.....	+1,031
Within grade and career advances:	
Full year effect of 1982 actions.....	+446
Partial year effect of 1983 actions.....	+263
Full year effect of 1982 pay increases.....	+322
Cost decreases in 1983.....	-1,125
Turnover savings and abolished positions:	
Full year effect of 1982 actions.....	-377
Effect of 1983 actions.....	-748
Cost of permanent positions in 1983.....	<u>67,298</u>

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of	<u>Current</u> <u>Estimate</u> Dollars)	
b. Other than full-time permanent positions				
1. Cost.....	1,799	2,208	2,082	2,177
2. Workyears	153	176	192	192

The distribution of 1983 workyears is as follows:

Distribution of Other than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Cooperative training.....	65
Summer employment	13
Opportunity programs	59
Other temporary employment	<u>55</u>
 Total.....	 <u>192</u>

The increase in workyears from the 1982 budget estimate to the 1982 current estimate reflects increased emphasis on youth opportunity and cooperative training programs, resulting in a lower compensation level in 1982. The 1983 workyears are level with 1982.

c. Reimbursable detailees	96	221	186	272
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The military personnel detailed to the ~~Amc~~ Research Center on a reimbursable basis are individuals experienced in aeronautics, rotorcraft technology, veterinary medicine, and related fields. The decrease from the 1982 budget estimate to the 1982 current estimate is due to the inability of the military to provide the full support anticipated. The increase in 1983 is due to the full-year cost of two additional detailees to support the rotorcraft and life sciences programs.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
d. Overtime and other compensation.....	891	836	809	722

Overtime and night differential are used primarily for off-shift operation of major facilities such as the Unitary Plan Wind Tunnel System, the 40-by-80 Foot Subsonic Wind Tunnel, the 6-by-6 Foot Supersonic Wind Tunnel, preparation for test flights and Space Shuttle testing. The 1982 current estimate is essentially level with the 1982 budget estimate. The decrease in the 1983 estimate reflects a lower level of overtime activity as Shuttle becomes operational in 1983.

2. <u>Benefits</u>	6,546	6,663	6,945	7,029
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The following are the amounts of contribution by category:

Civil Service Retirement Fund.....	4,558	4,775	4,711	4,769
Employee life insurance.....	180	178	182	197
Employee health insurance.....	1,351	1,307	1,400	1,400
Workmen's compensation.....	320	353	498	613
FICA.....	42	45	45	45
Other benefits.....	95	5	109	5
<u>Total</u>	<u>6,546</u>	<u>6,663</u>	<u>6,945</u>	<u>7,029</u>

The increase from the 1982 budget estimate to the 1982 current estimate is primarily due to the reduction of workyears that is more than offset by the 1981 pay increases. The workmen's compensation estimates for 1982 and 1983 reflect estimates based on Department of Labor billings. The increase in the 1983 estimate is primarily due to the anticipated increase in workmen's compensation.

B. <u>Supporting Costs</u>	770	692	916	893
1. Transfer of personnel	167	124	171	148

The increase from the 1982 budget estimate to the 1982 current estimate reflects continuation of increased cost levels experienced in 1981. The 1983 estimate reflects a decrease in the number of transfers over 1982.

	<u>1981</u>	<u>1982</u>		<u>1983</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)		
2. Personnel training.....	603	568	745	745

The increase from the 1982 budget estimate to the 1982 current estimate and the 1983 estimate is due to the rise in tuition and short course costs. The 1982 current estimate assumes approximately the same level of effort as 1982 budget level at increased tuition rates. The 1983 estimate is level with 1982.

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
II. <u>TRAVEL</u>.....	<u>1,558</u>	<u>2,260</u>	<u>2,109</u>	<u>2,109</u>

Summary of Fund Requirements

A. Program Travel.....	996	1,679	1,421	1,421
B. Scientific and Technical Development Travel..	258	177	303	303
C. Management and Operations Travel.....	<u>304</u>	<u>404</u>	<u>385</u>	<u>385</u>
Total, Travel.....	<u>1,558</u>	<u>2,260</u>	<u>2,109</u>	<u>2,109</u>

Explanation of Fund Requirements

A. <u>Program Travel</u>	<u>996</u>	<u>1,679</u>	<u>1,421</u>	<u>1,421</u>
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Program travel is required for the accomplishment of the Center's missions and is the largest part of the ~~Ames~~ travel budget, accounting for approximately 68 percent of travel costs in 1983. At ~~Ames~~ Research Center, 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 1983 estimate reflects a decreased level of travel offset by expected increases in travel costs.

B. <u>Scientific and Technical Development Travel</u>	<u>258</u>	<u>177</u>	<u>303</u>	<u>303</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 1982 current estimate provides for presentation of technical papers to the scientific community at approximately the same level as experienced in 1981. The 1983 estimate reflects a decreased level of travel offset by expected increases in travel costs.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
C. <u>Management and Operations Travel</u>	<u>304</u>	<u>404</u>	<u>385</u>	<u>385</u>

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; and travel of the Center's top management to NASA Headquarters, other NASA Centers, and contractor plants; and local transportation. The 1983 estimate allows for approximately the same level of travel as in 1982 in addition to expected increases in travel costs.

III. <u>OPERATION OF INSTALLATION</u>	<u>17,973</u>	<u>22,576</u>	<u>22,250</u>	<u>24,393</u>
<u>Summary of Fund Requirements</u>				
A. Facilities Services.....	9,765	14,113	12,264	14,411
B. Technical Services.....	2,667	2,466	3,109	2,610
C. Management and Operations.....	<u>5,541</u>	<u>5,997</u>	<u>6,877</u>	<u>7,372</u>
Total, Operation of Installation..	<u>17,973</u>	<u>22,576</u>	<u>22,250</u>	<u>24,393</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 1982 budget estimate to the 1982 current estimate is due to a decrease in electricity usage as well as a less than expected increase in electricity rates. This decrease is partially offset by the acquisition in 1982 of several one-time ADP procurements, a slight increase in support service contractor effort primarily in the ADP and property management areas, and a rate increase in communications. The 1983 estimate provides for rate increases for support contractors and utilities, and some increase in energy consumption for the modified 40 x 80-foot and the 80 x 120-foot wind tunnels, which become operational in March 1982.

	1981	1982		1983
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
A. <u>FACILITIES SERVICES</u>	<u>9,765</u>	<u>14,113</u>	<u>12,264</u>	<u>14,411</u>

~~Ames~~ Research Center, Moffett Field, is located on 421 acres in a complex of facilities made up of laboratory and office-type buildings as well as research wind tunnels. This complex encompasses 2,101,754 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.

The Dryden Flight Research Facility (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 501,578 gross square feet of office building space including 8 major technical facilities. This physical plant houses an average daily onsite population of 900 to 1,200 personnel. Many of the test facilities are utilized on schedules involving more than one shift.

Summary of Fund Requirements

	<u>1981 Actual</u>	<u>1982</u>		<u>1983</u>
		<u>Budget Estimate</u> (Thousands)	<u>Current Estimate</u> of Dollars)	<u>Budget Estimate</u>
1. <u>Rental of Real Property</u>	<u>47</u>	<u>98</u>	<u>106</u>	<u>117</u>
2. <u>Maintenance and Related Services</u>	<u>2,043</u>	<u>2,309</u>	<u>2,204</u>	<u>2,504</u>
a. <u>Facilities</u>	2,003	2,271	2,164	2,443
b. <u>Equipment</u>	40	38	40	61
3. <u>Custodial Services</u>	<u>2,724</u>	<u>3,185</u>	<u>3,188</u>	<u>3,524</u>
4. <u>Utility Services</u>	<u>4,951</u>	<u>8,521</u>	<u>6,766</u>	<u>8,266</u>
Total, Facilities Services.....	<u>9,765</u>	<u>14,113</u>	<u>12,264</u>	<u>14,411</u>

Explanation of Fund Requirements

1. <u>Rental of Real Property</u>	<u>47</u>	<u>98</u>	<u>106</u>	<u>117</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 1982 current estimate is increased from the 1982 budget estimate due to higher than anticipated contract rental rates and a one-time only tear-down fee. The increase in 1983 reflects the same level of rentals as in 1982.

2. <u>Maintenance and Related Services</u>	<u>2,043</u>	<u>2,309</u>	<u>2,204</u>	<u>2,504</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 1982 current estimate provides a continuation of the 1981 level of maintenance and repair effort. The 1983 estimate reflects cost increases in purchased goods and services, increased support contractor rates at DFRF, and the maintenance costs of additional equipment acquired in 1981 which is scheduled for servicing.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
3. <u>Custodial Services</u>	<u>2,724</u>	<u>3,185</u>	<u>3,188</u>	<u>3,524</u>

Janitorial and building cleaning services are associated with approximately two million square feet of various types of space located in 131 buildings, and 72 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 are included, such as pest control services, refuse collection, laundry and custodial supplies.

This activity involves support contractor efforts which provide janitorial and security services, fire protection provided by the Navy at ARC and other miscellaneous custodial services and supplies. The increase in 1983 is due to negotiated support contractor rate escalation.

4. <u>Utility Services</u>	<u>4,951</u>	<u>8,521</u>	<u>6,766</u>	<u>8,266</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 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 40-by-80 foot wind tunnel, the 14 foot transonic wind tunnel, and the operation of simulators and smaller wind tunnels. Approximately 55 percent of the natural gas is used in research facilities; the other part is used for heating and ventilation of institutional buildings. 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 decrease between the 1982 budget estimate and the 1982 current estimate is primarily in consumption of electricity. The 1983 estimated usage allows for the greater energy requirements of the repowered motors of the 40-by-80 foot and 80-by-120 foot wind tunnels which will start operating in calendar year 1982.

	<u>1981</u> <u>Actual</u>	<u>1982</u> Budget Current <u>Estimate</u> <u>Estimate</u>		<u>1983</u> Budget <u>Estimate</u>
		(Thousands of Dollars)		
B. <u>TECHNICAL SERVICES</u>	<u>2,667</u>	<u>2,466</u>	<u>3,109</u>	<u>2,610</u>
	<u>Summary of Fund Requirements</u>			
1. <u>Automatic Data Processing</u>	<u>1,640</u>	<u>1,886</u>	<u>2,359</u>	<u>1,878</u>
a. Equipment.....	601	580	454	251
b. Operations.....	1,039	1,306	1,905	1,627
2. <u>Scientific and Technical Information</u>	<u>800</u>	<u>367</u>	<u>517</u>	<u>524</u>
a. Library.....	20	21	21	23
b. Education and information.....	780	346	496	501

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
3. <u>Shop Support and Services</u>	<u>227</u>	<u>213</u>	<u>233</u>	<u>208</u>
Total, Technical Services.....	<u>2,667</u>	<u>2,466</u>	<u>3,109</u>	<u>2,610</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u>	<u>1,640</u>	<u>1,886</u>	<u>2,359</u>	<u>1,878</u>
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This category includes the central ADP facility operating costs which are incurred by administrative organizations. These costs are incurred through a system whereby user organizations are charged for actual usage of the ADP central facility's equipment and services. The charges include the organizations' proportionate share of support service contracts, leases and maintenance of computer hardware.

The increase from the 1982 budget estimate to the current estimate provides for increased contractor systems analysis support and two one-time ADP procurements. The 1983 estimate provides for the recurring costs of administrative computer operations less the two one-time acquisitions in 1982. In addition, the 1983 estimate provides for the acquisition of additional 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 ARC administrative ADP data systems between the main ARC site and the DFRF.

2. <u>Scientific and Technical Information</u>	<u>800</u>	<u>367</u>	<u>517</u>	<u>524</u>
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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. Public information services supporting the Shuttle Orbital Flight Test (OFT) activities at DFRF are decreasing from 1981 to 1982, but not as much as originally planned due to Shuttle requirement changes. The 1983 estimate maintains the same level of effort as in 1982.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
3. <u>Shop Support and Services</u>	<u>227</u>	<u>213</u>	<u>233</u>	<u>208</u>

This category includes administrative shop, photo and graphics, and audio visual services primarily supporting the public affairs activity. The increase from 1982 budget estimate to 1982 current estimate reflects an increase in support contractor effort in support of the Shuttle OFT requirements. The decrease in 1983 reflects a reduction in support contractor efforts due to a reduction of Shuttle activities at DFRF.

C. <u>MANAGEMENT AND OPERATIONS</u>	<u>5,541</u>	<u>5,997</u>	<u>6,877</u>	<u>7,372</u>
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Summary of Fund Reauirements

1. <u>Administrative Communications</u>	1,606	1,731	2,150	2,329
2. <u>Printing and Reproduction</u>	318	221	264	293
3. <u>Transportation</u>	734	675	838	907
4. <u>Installation Common Services</u>	<u>2,883</u>	<u>3,3 70</u>	<u>3,625</u>	<u>3,843</u>
<u>Total, Management and Operations</u>	<u>5,541</u>	<u>5,997</u>	<u>6,877</u>	<u>7,372</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u>	<u>1,606</u>	<u>1,731</u>	<u>2,150</u>	<u>2,329</u>
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Communications services are provided by the General Services Administration (GSA) for the Federal Telecommunications Service (FIS), 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 1982 budget estimate to the current estimate was due to an increase in communications rates and the one-time acquisition cost of a direct-dial switchboard. The 1983 estimate will maintain the same level of services as 1982.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
2. <u>Printing and Reproduction</u>	<u>318</u>	<u>221</u>	<u>264</u>	<u>293</u>

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, blue printing and microfilming are included. The 1982 current estimate reflects the higher than anticipated cost for supplies and duplicating equipment maintenance. The 1983 budget estimate reflects approximately the same level of activity as in 1982.

3. <u>Transportation</u>	<u>734</u>	<u>675</u>	<u>838</u>	<u>907</u>
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The estimates include motor pool operation costs including GSA vehicle rentals, freight costs, Government bills of lading, air freight and other general shipments. The increase in the 1982 current estimate is due to additional Shuttle OFT local transportation support at DFRF and the planned acquisition of fork lifts. The 1983 budget estimate reflects expected support contractor rate escalation.

4. <u>Installation Common Services</u>	<u>2,883</u>	<u>3,370</u>	<u>3,625</u>	<u>3,843</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 increase from the 1982 budget estimate to the 1982 current

estimate reflects increased support contractor effort in the health unit contract and in the supply/mail/property management operation support contract, and the addition of word processing services at DFRF. The 1983 estimate maintains the same level of effort as in 1982.

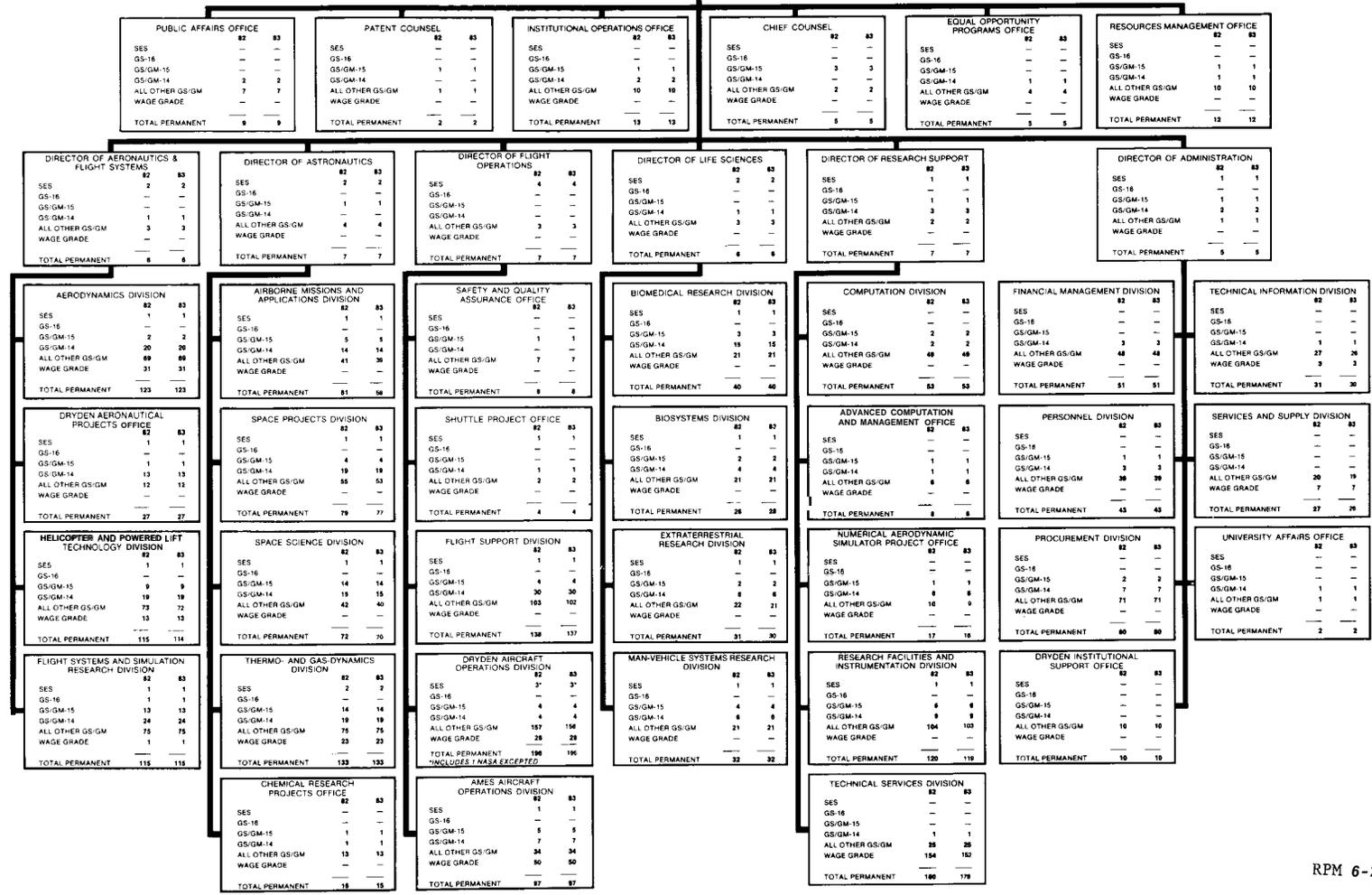
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART

AMES RESEARCH CENTER

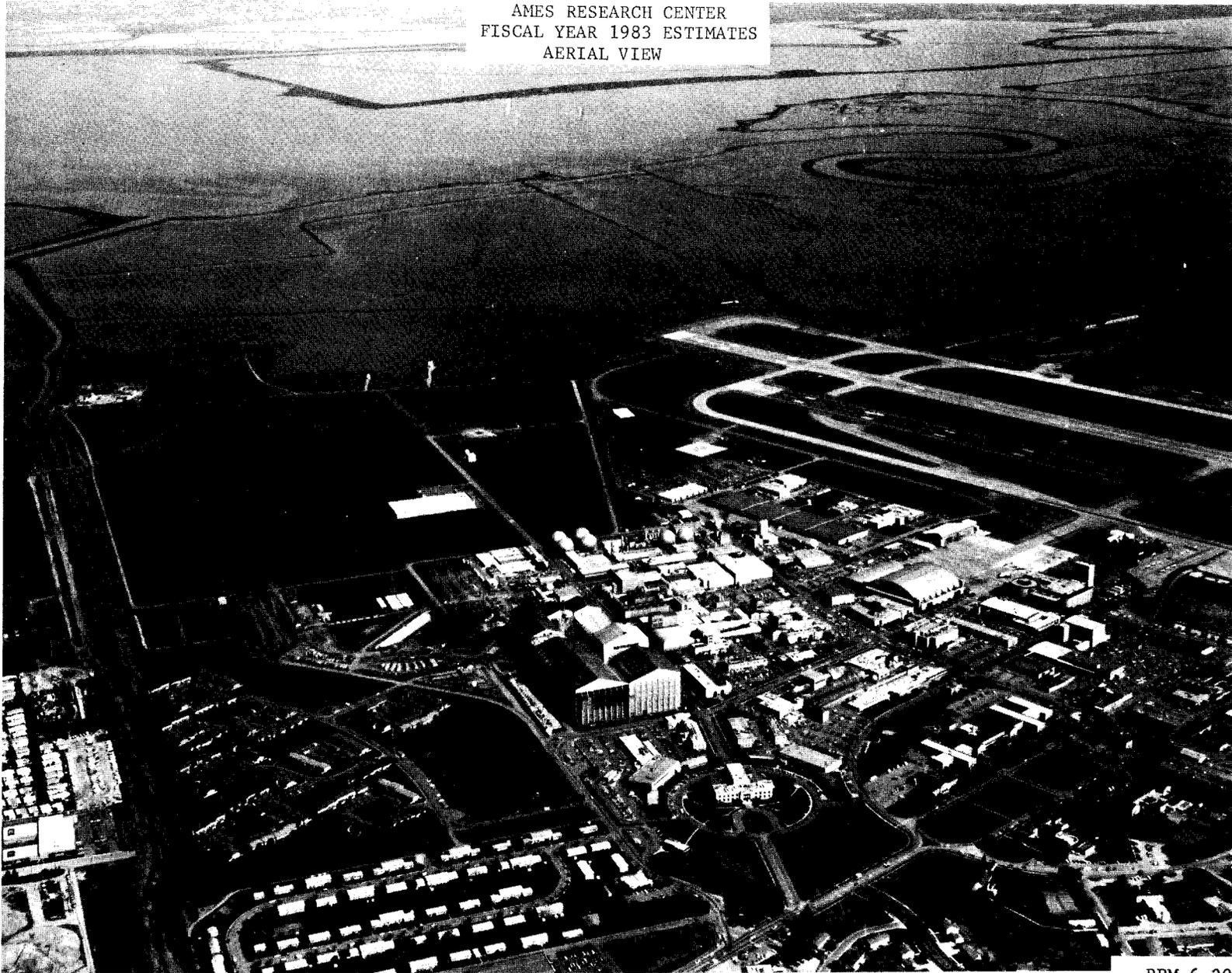
CENTER TOTAL	
SES	82 83
GS-16	30* 30*
GS-15	1 1
GS/GM-15	111 111
GS/GM-14	269 269
ALL OTHER GS/GM	1213 1208
WAGE GRADE	310 306
TOTAL PERMANENT	2067 2061

*INCLUDES 1 NASA EXCEPTED

DIRECTOR	
SES	4 4
GS-16	— —
GS/GM-15	1 1
GS/GM-14	2 2
ALL OTHER GS/GM	10 10
WAGE GRADE	— —
TOTAL PERMANENT	17 17

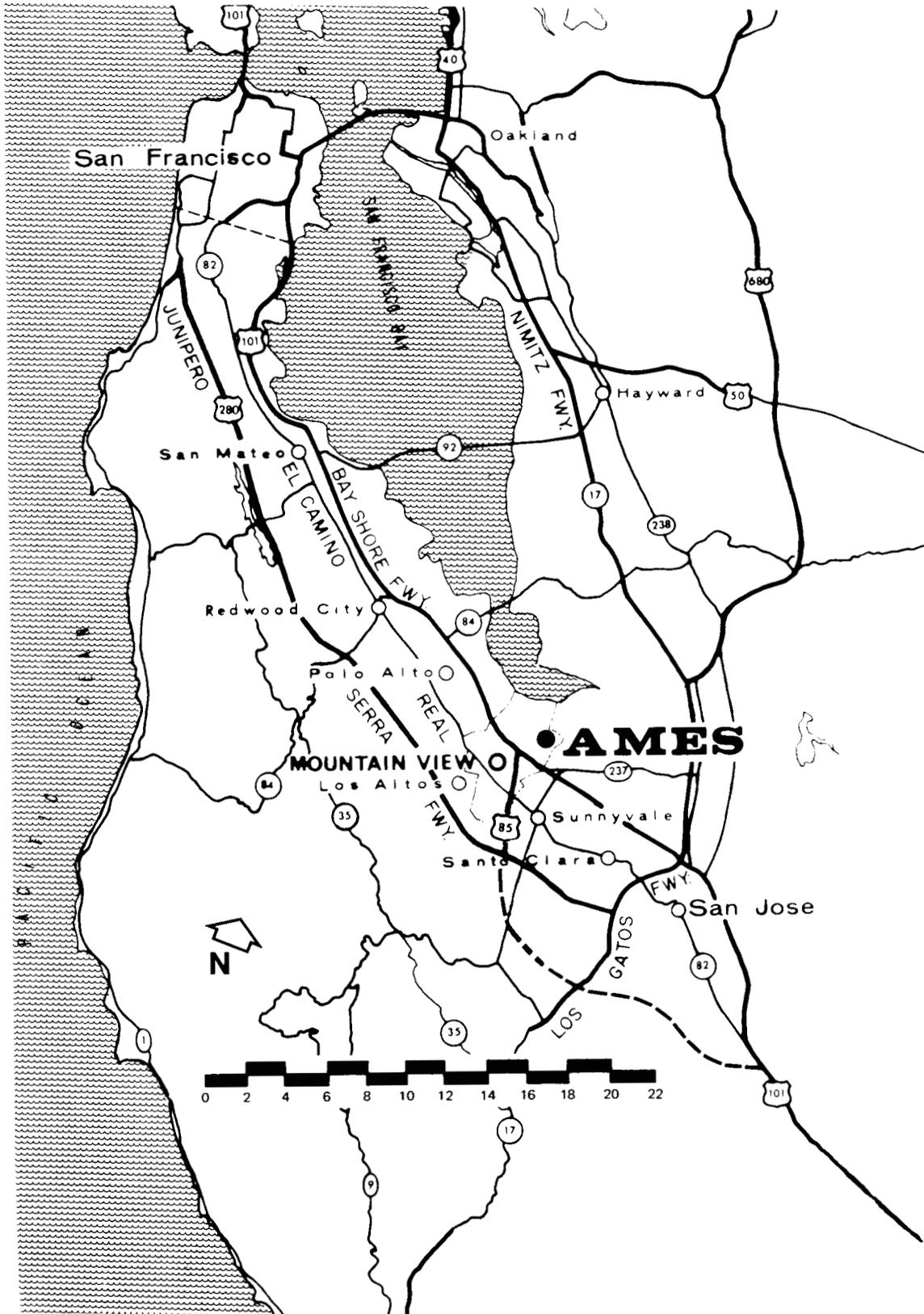


AMES RESEARCH CENTER
FISCAL YEAR 1983 ESTIMATES
AERIAL VIEW



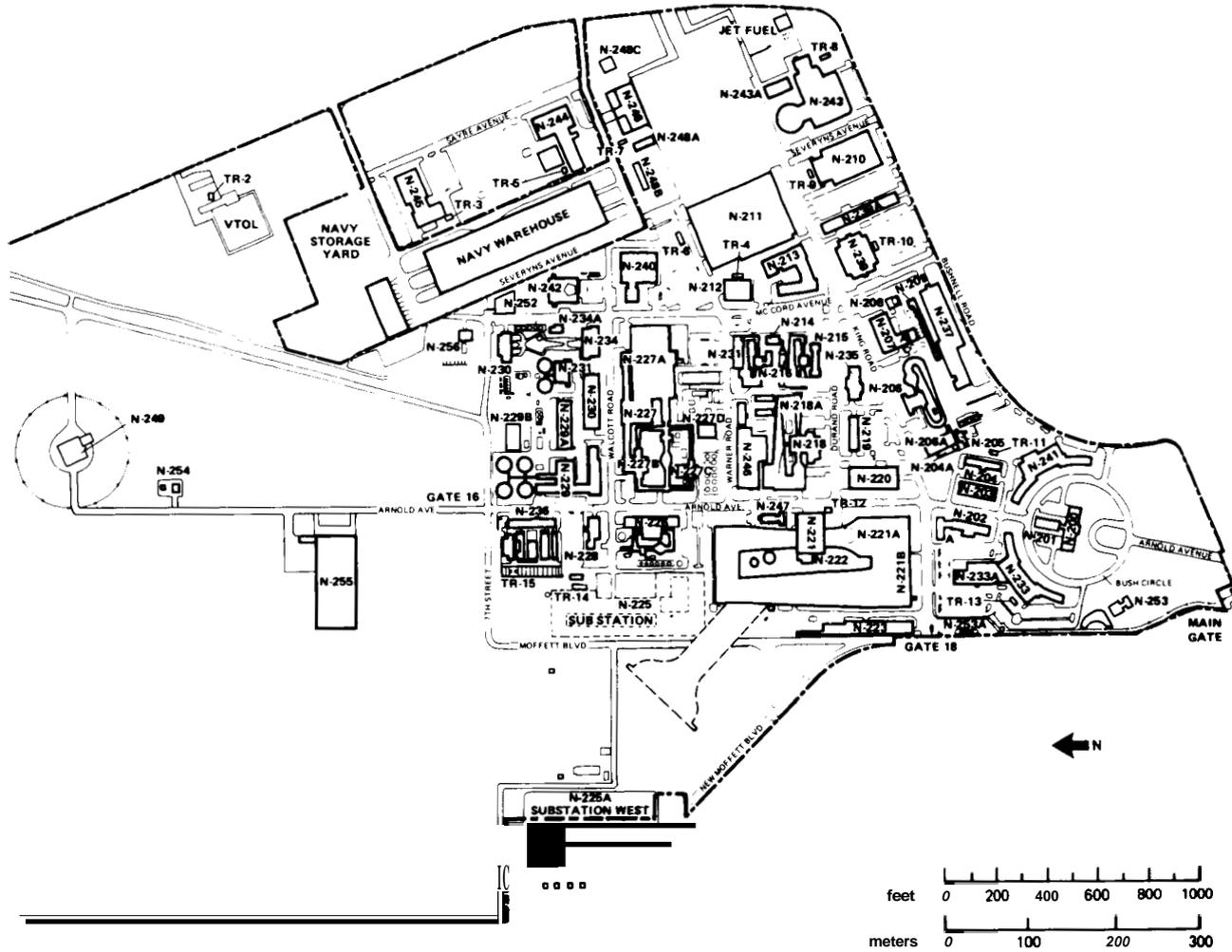
AMES RESEARCH CENTER
FISCAL YEAR 1983 ESTIMATES
LOCATION MAP

RPM 6-31



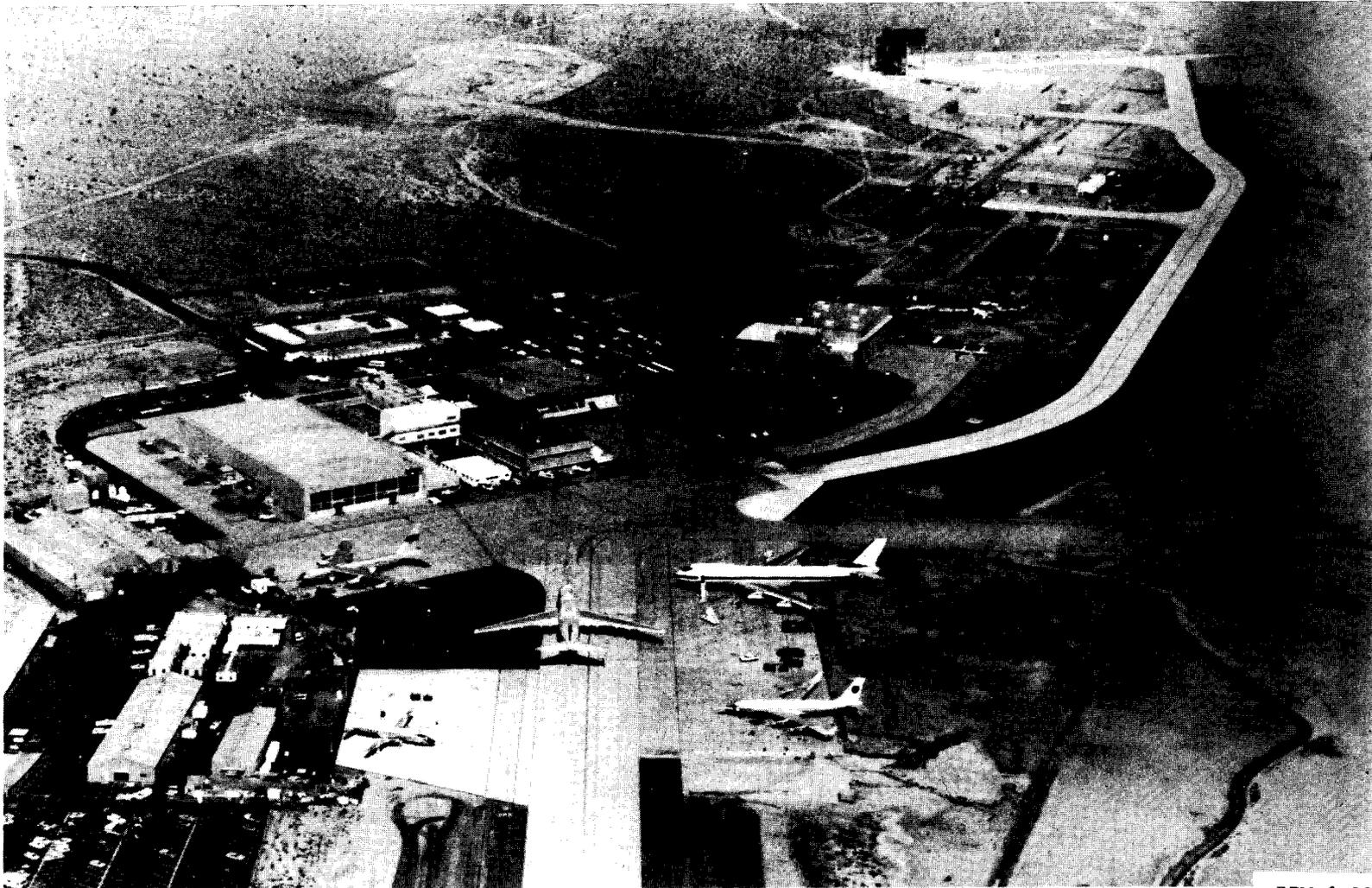
AMES RESEARCH CENTER
FISCAL YEAR 1983 ESTIMATES

LOCATION PLAN



HUGH L. DRYDEN FLIGHT RESEARCH FACILITY FISCAL YEAR 1983 ESTIMATES

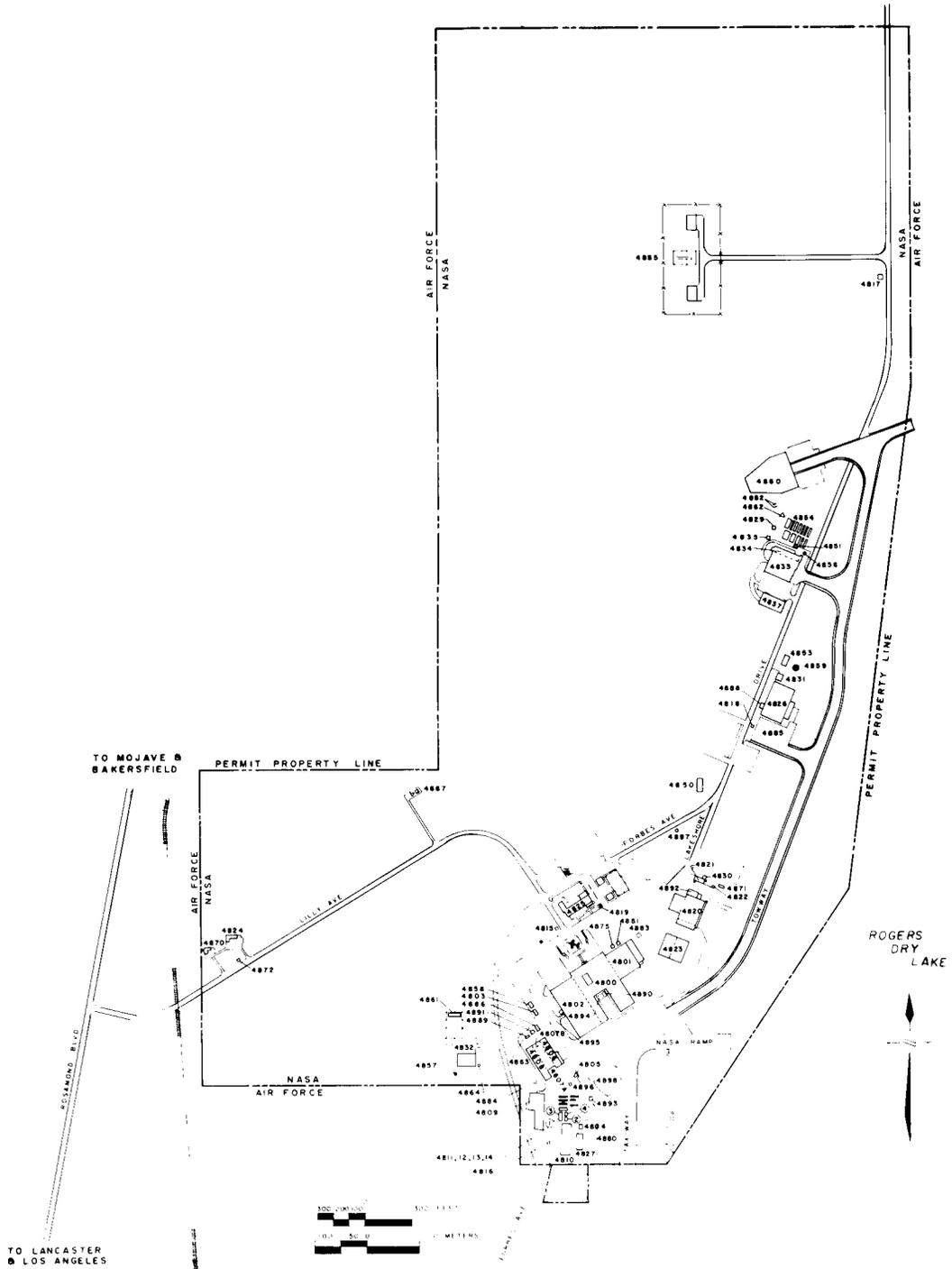
AERIAL VIEW



RPM 6-33

DRYDEN FLIGHT RESEARCH FACILITY FISCAL YEAR 1983 ESTIMATES LOCATION PLAN

QPM 6-35



LANGLEY
RESEARCH CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1983 ESTIMATE

LANGLEY RESEARCH CENTER

DESCRIPTION

The Langley Research Center is located at Hampton, Virginia. It is situated between Norfolk and Williamsburg, Virginia, in the tidewater area of Hampton Roads. The Center utilizes 807 acres of Government-owned land, divided into two areas by the runway facilities of Langley Air Force Base. The West Area consists of 787 acres, all owned by NASA. The East Area comprises 20 acres under permit from the Air Force. 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 acreage presently owned, under permit, or leased is 4,196. 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, 1981, was \$641,878,000.

CENTER ROLES AND MISSIONS

Langley Research Center (LaRC) continues to play a leading role in the development of aeronautics and space technology in the United States.

Langley has developed recognized areas of 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

Long-Haul Aircraft Technology - developing a technology base for improving long-haul aircraft as a cost effective, safe, and environmentally compatible transportation mode.

General Aviation Aircraft Technology - developing and maintaining an engineering technology base related to improving general aviation aircraft.

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

Acoustics and Noise Reduction - conducting research and developing a technology base related to reducing aircraft noise.

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

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

Military Support - providing technical support to military aviation in areas consistent with other LaRC aeronautics roles and unique capabilities.

Advanced Space Vehicle Configurations Technology - developing a technology base related to advanced configurations, including advanced space transportation concepts.

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

Technology Experiments in Space - developing and managing the Long Duration Exposure Facility. Defining and developing experiments in areas consistent with other LaRC space roles.

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

SUPPORTING

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

Hypersonic Propulsion Systems - contributing to technology base of air breathing propulsion systems by advancing the state of the art of hypersonic propulsion.

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

Computational Fluid Dynamics - contributing to the software technology base.

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

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

RY OF DUI REQUIREMENTS

Funding Plan by Function

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related Costs	97,566	99,853	100,584	100,654
II. Travel.	1,783	2,540	2,536	2,536
III. Operation of Installation..	21,427	25,227	24,831	28,113
A. Facilities Services..	(12,741)	(15,870)	(15,194)	(17,498)
B. Technical Services..	(2,487)	(2,747)	(2,984)	(3,452)
C. Management and Operations..	<u>(6,199)</u>	<u>(6,610)</u>	<u>(6,653)</u>	<u>(7,163)</u>
Total, fund requirements.....	<u>120,776</u>	<u>127,620</u>	<u>127,951</u>	<u>131,303</u>

Distribution of Permanent Positions by Program

	1981	<u>1982</u>		1983
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems and Operations</u>	38	40	37	30
Space shuttle	8	7	7	1
Space flight operations	2	1	2	1
Expendable launch vehicles	28	32	28	28
<u>Space Science and Applications</u>	224	220	207	203
Life sciences	---	---	3	1
Space applications	214	211	196	194
Technology utilization	10	9	8	8
<u>Aeronautics and Space Technology</u>	1,922	2,009	1,904	1,904
Aeronautical research and technology	1,391	1,480	1,389	1,389
Space research and technology	531	529	515	515
Subtotal. direct positions	2,184	2,269	2,148	2,137
<u>Center Management Operations Support Positions</u>	711	711	718	708
Total. permanent positions	<u>2,895</u>	<u>2,980</u>	<u>2,866</u>	<u>2,845</u>

PROGRAM DESCRIPTION

Permanent Positions
(Civil Service)

SPACE SHUTTLE..... 1

In 1983, civil service personnel will be measuring and evaluating Shuttle launch vehicle effluents and Shuttle entry sonic boom.

SPACE FLIGHT OPERATIONS..... 1

The objective of this work is to develop a reliable method of calculating the flowfield properties in the highly expanded, far-field region of rocket engine exhaust flowfields.

EXPENDABLE LAUNCH VEHICLES..... 28

The expendable launch vehicle program at Langley provides centralized procurement of the Scout launch vehicle. In 1983, 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, and the San Marco platform off the coast of Kenya, Africa.

LIFE SCIENCES..... 1

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

SPACE APPLICATIONS..... 194

The space applications program at Langley is characterized by a research capability that is a National resource 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, Langley civil service personnel will continue to study the Earth's atmosphere to assess any changes caused by man and to determine whether or not there

is any associated change in the 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 our 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 administering, managing, and participating in the NASA Global Tropospheric Experiment (GTE) an augmentation of the NASA air quality program. The GTE 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 will be fundamental to the understanding of climate phenomena. Langley has the responsibility for the science, sensor development, and data management for 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.

Permanent Positions
(Civil Service)

TECHNOLOGY UTILIZATION.....

8

The overall 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 1983, civil service personnel will provide the following support:

1. Expedite the application of new technology by compressing the time required from generation of technology to its use in the economy.
2. Encourage the use of aerospace technology in nonaerospace segments of the economy having problems amenable to technological solutions.
3. Understand more fully the technology transfer process and its impact and systematically manage and optimize the process.

Permanent Positions
(Civil Service)

AERONAUTICAL RESEARCH AND TECHNOLOGY..... **1,389**

The aeronautical and research technology program at Langley 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 look at future technology requirements. The unique wind tunnel, computing facilities, and flight operations capability at Langley complement the expertise of the technical staff to produce a broad cohesive program in aeronautical research.

The aerodynamics activity at Langley encompasses extensive theoretical and experimental activities. Basic work in fluid and flight mechanics involves theoretical and experimental determination of aerodynamic flows and complex aircraft motions. The program utilizes the unique Langley capabilities made possible by the STAR computer and recently developed cryogenic wind tunnel testing techniques which provide the capability of simulating flight conditions.

Aspects of the problems which are studied include airfoil and wing design, flowfield analysis, configuration design processes, aircraft noise prediction, control analysis, propulsion system integration, fuel efficiency, 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 instrumentation. The STAR computer will be used in the areas of far-field noise, **3-D** potential flow programs, and in the solution of **2-D** and 3-D Navier-Stokes equations. Generation and documentation of the aerodynamic characteristics of both turbulent and

laminar flow airfoils will be furthered by the development of new designs and the test evaluation and flight demonstration 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 research include research on jet noise, propeller noise, interior noise, rotor blade noise, atmospheric propagation, and structural borne noise.

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 focused on 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. A finite element structural computational device using microprocessor components will be scaled up in 1983 to evaluate the potential of reducing computational costs and/or times by a factor of 10 over present analysis methods.

Controls and guidance work at Langley includes technology development in aircraft guidance and navigation, aircraft control systems, cockpit systems, and integration and interfacing techniques. Also, major efforts in aircraft flightpath management and operations technology and active controls technology for conventional takeoff and landing (CTOL) aircraft are being conducted in this program area. The work includes requirements analyses, design studies, systems and component technology development, ground simulation, and proof-of-concept in experimental flight programs. The Langley expertise in the controls and guidance area is being applied to advanced control laws for various aircraft classes, intersystems communications networks for enhanced interfacing and integration of functions within an aircraft, and advanced technology for improved display media and pilot/system interfaces in aircraft cockpits. Emphasis in 1983 will be on continued investigations of the capacity, efficiency, and safety potential of cockpit-display of air traffic information concepts with elements of an advanced air traffic control system, the development of technology for enhanced

function and hardware integration to increase aircraft systems reliability and reduce operating costs, definition of requirements and technology to facilitate general aviation single-pilot guidance and control in IFR environments, and the investigation of concepts and technology which will result in greatly improved pilot displays and input/output capabilities. Other technology applications are also found in work on advanced digital flight control systems, fluidics instrumentation, and the development of mathematical tools to investigate and enhance reliability prediction and assessment, control algorithm design, and pilot describing functions.

The Langley Research Center has traditionally received requests from other agencies and industry for test support of their aircraft, missiles, and systems development program. The Structures Laboratory of the Army Research and Technology Laboratories of the U.S. Army Aviation Research and Development Command (AVRADCOM) is located at Langley. This laboratory, the primary investigator of Army rotorcraft structures, works on independent R&D projects and on projects of mutual interest with a staff integrated into the NASA organization. Extensive use is made of Langley facilities in these research activities. 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.

Permanent Positions
(Civil Service)

SPACE RESEARCH AND TECHNOLOGY.....

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The space research and technology program at Langley is characterized by work in several discipline areas and the application of this discipline expertise to current and future technology requirements. Longer range studies are directed at defining the technology requirements for future space systems and missions.

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. 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 STS are being derived and evaluated using specialized laboratories and wind tunnels. A complete radiation heat transfer, large deflection, and nonlinear materials property analysis capability will be available in 1982. 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, multidisciplinary program for advanced technology. By mid-1983, an integrated structural-thermal analysis methodology will be 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 development, data processing, and information systems is conducted at Langley. Sensor developments include laser backscatter and fluorescence techniques for water quality measurements, continuously tunable infrared laser techniques, and high power/high pressure tunable gas lasers for the measurement of low concentration atmospheric constituents. By 1983, Langley will complete the fabrication of a Laser Heterodyne Spectrometer aircraft instrument to measure stratospheric constituents in the 9-12 μ m region, and will evaluate an array of microwave radiometer receivers for high resolution (± 1 km) oceanographic sensing. Specific devices required to support the development of a charged coupled device onboard data processor are being developed and evaluated. The broad objective of this work is to develop an onboard processor technology base for remote sensing vehicles with the potential of leading to a 1,000-fold decrease in the density of data sent back to Earth processing stations. The evaluation of a solid state data storage system using bubble domain technology is underway at Langley. The overall objective is to provide an adequate bit solid state data storage system suitable for replacing tape recorders in many aerospace vehicle applications. Other space electronics technology efforts are focused on detectors for remote sensing (e.g., infrared and pyroelectric devices), spacecraft attitude control (using magnetically suspended momentum storage or vernier pointing devices), software development, verification, and validation techniques.

The objectives of the Langley entry technology program are to develop experimental and theoretical data bases to support (1) development of space transportation system vehicles for the 1990's and beyond, employing technologies advanced beyond those utilized for the Space Shuttle, (2) planning of advanced planetary entry missions and development of approved missions, and (3) the performing of the evolving STS program and solving operational problems as they surface.

The objectives are being met through the development and application of experimental and theoretical techniques employing Langley 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 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 measurement during routine Shuttle operation. Experiments are being developed for Shuttle flights which will provide unique measurements for direct assessment of ground-based facility measurements and theoretical techniques. The Shuttle will also be utilized as a space platform from which to perform Langley-developed payload experiments extending basic research and technology development into the space environment when economically feasible or when the development can only be achieved in space.

Langley programs in Space Power and Electric Propulsion Research and Technology have two primary foci: advanced radiant energy conversion and advanced gallium arsenide solar cells. The objective of the energy conversion effort is to perform basic research on nuclear- and solar-pumped lasers for conversion of nuclear and solar energy directly into electromagnetic radiation, laser power, or work for potential power generation, transmission, and storage for future space missions. The objective of the gallium arsenide solar cell research is to develop the technology to improve the conversion efficiency, reduce the mass and cost, and increase the operating life of the cells in the hostile space environment. Indications are that these solar cells offer the potential of significantly outperforming silicon solar cells; therefore, this effort can lead to a more reliable, economical, and refined space power system.

In 1983, the workmanship standards program is developing requirements for electrical and electronic assemblies.

Permanent Positions
(Civil Service)

CENTER MANAGEMENT AND OPERATIONS SUPPORT.....

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Center Management and Operations support is support or services provided to all Langley Research 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 immediate staff; e.g., Legal, Patent Counsel, Equal Opportunity, Public Affairs, and Safety.

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 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

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
I. <u>PERSONNEL AND RELATED COSTS</u>	<u>97,566</u>	<u>99,853</u>	<u>100,584</u>	<u>100,654</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions.. .. .	85,295	87,502	88,448	88,054
b. Other than full-time permanent positions.	1,747	1,664	1,567	1,583
c. Overtime and other compensation.. .. .	<u>911</u>	<u>745</u>	<u>984</u>	<u>984</u>
Subtotal, Compensation... .. .	87,953	89,911	90,999	90,621
2. <u>Benefits</u>	<u>8,776</u>	<u>9,035</u>	<u>8,843</u>	<u>9,291</u>
Subtotal, Compensation and Benefits.....	<u>96,729</u>	<u>98,946</u>	<u>99,842</u>	<u>99,912</u>
B. <u>Supporting Costs</u>				
1. Transfer of Personnel..... .. .	157	46	160	160
2. Personnel Training..... .. .	<u>680</u>	<u>861</u>	<u>582</u>	<u>582</u>
Subtotal, Supporting Costs..... .. .	<u>837</u>	<u>907</u>	<u>742</u>	<u>742</u>
Total, Personnel and Related Costs.. .. .	<u>97,566</u>	<u>99,853</u>	<u>100,584</u>	<u>100,654</u>

Explanation of Fund Reuirements

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
A. <u>Compensation and Benefits</u>	<u>96,729</u>	<u>98,946</u>	<u>99,842</u>	<u>99,912</u>
1. Compensation	<u>87,953</u>	<u>89,911</u>	<u>90,999</u>	<u>90,621</u>
a. Permanent positions.	85,295	87,502	88,448	88,054

The current estimate for 1982 reflects a change from the 1982 budget estimate due to the recent pay increases offset by a reduction in permanent positions in 1982.

Basis of Cost for Permanent Positions

In 1983, the cost of permanent positions will be \$88,054,000. The decrease results from the following :

Cost of permanent positions in 1982.	88,448
Cost increases in 1983.....	+1,576
Within grade and career advances:	
Full year effect of 1982 actions.....	+814
Partial year effect of 1983 actions.....	+415
Full year effect of 1982 pay increase.....	+347
Cost decreases in 1983....	-1,970
Turnover savings and abolished positions:	
Full year effect of 1982 actions... ..	- 778
Effect of 1983 actions.....	-1,192
Cost of permanent positions in 1983.....	<u>88,054</u>

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of	<u>Current</u> <u>Estimate</u> Dollars)	
b. Other than full-time permanent positions				
1. Cost.....	1,747	1,664	1,567	1,583
2. Workyears	150	148	142	142

The distribution of 1983 workyears is as follows:

Distribution of Other Than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Cooperative training	85
Summer employment	8
Opportunity programs.....	33
Other temporary employment	<u>16</u>
Total.	<u>142</u>

The decrease from the 1982 budget estimate to the 1982 current estimate is due to a reduction in the length of the summer employment program, a small change in the grade levels of the cooperative trainees and other temporary employees, slightly offset by the cost of the October 1981 pay increase. The 1983 estimate is essentially level with 1982.

c. Overtime and other compensation	911	745	984	984
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Overtime and other compensation includes overtime, 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 working hours. This includes the monitoring of on-site contracts being performed during off-duty hours and wind tunnel work required at night to take advantage of off-peak electrical rates. The increase from the 1982 budget estimate to the 1982 current estimate reflects

the effect of the October 1981 pay increase. The 1983 estimate is level with 1982 and reflects the Center's continuing effort to hold overtime to the minimum hours necessary to achieve the Center's mission.

	<u>1981 Actual</u>	<u>1982</u>		<u>1983 Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
2. <u>Benefits</u>	<u>8,776</u>	<u>9,035</u>	<u>8,843</u>	<u>9,291</u>
The following are the amounts of contribution by category:				
Civil Service Retirement Fund.. .. .	5,925	6,341	6,033	6,003
Employee life insurance.....	242	218	241	269
Employee health insurance.....	1,913	2,006	1,894	1,894
Workmen's compensation .. .	406	450	630	1,075
FICA.....	35	2	35	35
Other benefits.....	<u>255</u>	<u>18</u>	<u>10</u>	<u>15</u>
Total.....	<u>8,776</u>	<u>9,035</u>	<u>8,843</u>	<u>9,291</u>

The decrease from the 1982 budget estimate to the current estimate is primarily due to the reduction in workyears partially offset by the October 1981 pay increase and lifting of the pay cap. The increase in 1983 over the 1982 current estimate is related to the increases in workmen's compensation estimates which are based on Department of Labor billings.

B. <u>Supporting Costs</u>	<u>837</u>	<u>907</u>	<u>742</u>	<u>742</u>
1. Transfer of personnel .. .	157	46	160	160

Transfer of personnel include actual expenses involved in the movement and temporary storage of employees household goods, subsistence and temporary expenses, real estate costs, and miscellaneous moving expenses. The increase from the 1982 budget estimate to the 1982 current estimate reflects a revised number of relocations and an adjustment for rising real estate costs. The 1983 estimate reflects the same level of activity as 1982.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of	<u>Current</u> <u>Estimate</u> Dollars)	
2. Personnel training.... ..	680	861	582	582

The purpose of the training program is to continue the development and education of civil service employees to more efficiently support Langley's roles and missions. The decrease from the 1982 budget estimate to the 1982 current estimate and the 1983 estimate is due to the elimination of the Agency pilot training from the Center budget. The 1983 estimate is level with 1982.

	1981	1982		1983
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		(Thousands	of Dollars)	Estimate
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
II. TRAVEL.....	<u>1,783</u>	<u>2,540</u>	<u>2,536</u>	<u>2,536</u>

Summary of Fund Requirements

A. Program Travel.....	1,315	1,974	1,919	1,919
B. Scientific and Technical Development Travel.....	267	385	385	385
C. Management and Operations Travel.....	<u>201</u>	<u>181</u>	<u>232</u>	<u>232</u>
Total, Travel.....	<u>1,783</u>	<u>2,540</u>	<u>2,536</u>	<u>2,536</u>

Explanation of Fund Requirements

A. <u>Program Travel</u>	<u>1,315</u>	<u>1,974</u>	<u>1,919</u>	<u>1,919</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. Program travel will account for approximately 76% of total travel in 1983. The 1983 estimate reflects a decreased level of travel offset by expected increases in travel costs.

B. <u>Scientific and Technical Development Travel</u>	<u>267</u>	<u>385</u>	<u>385</u>	<u>385</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 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 1983 estimate reflects a decreased level of travel offset by expected increases in travel costs.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</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>201</u>	<u>181</u>	<u>232</u>	<u>232</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 1982 estimate reflects anticipated increases in travel costs. The 1983 estimate reflects a decreased level of travel offset by expected increases in travel costs.

III. <u>OPERATION OF INSTALLATION</u>.....,.....,.....	<u>21,427</u>	<u>25,227</u>	<u>24,831</u>	<u>28,113</u>
<u>Summary of Fund Requirements</u>				
A. Facilities Services..... ..	12,741	15,870	15,194	17,498
B. Technical Services.. ..	2,487	2,747	2,984	3,452
C. Management and Operations	<u>6,199</u>	<u>6,610</u>	<u>6,653</u>	<u>7,163</u>
Total, Operation of Installation.. ..	<u>21,427</u>	<u>25,227</u>	<u>24,831</u>	<u>28,113</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 difference in the 1982 current estimate from the 1982 budget estimate is the result of a rate decrease in electricity due in part to a lower on-peak power demand coupled with support service contractor reductions in custodial services. The 1983 budget estimate provides for utility rate increases coupled with a higher on-peak power demand in electricity associated with the National Transonic Facility, and increases in support contractor wage rates, supplies, materials, equipment and minor contracts.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
A. <u>FACILITIES SERVICES</u>	<u>12,741</u>	<u>15,870</u>	<u>15,194</u>	<u>17,498</u>

Langley Research Center is located on 807 acres of grounds in a complex made up of laboratory and office type buildings as well as research wind tunnels. This complex encompasses 2,074,145 gross square feet of building space including eleven major buildings. Also included are 18 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

1. Rental of Real Property..	1	1	1	1
2. Maintenance and Related Services.....	376	661	586	775
3. Custodial Services.....	2,516	2,699	2,515	2,767
4. Utility Services.....	<u>9,848</u>	<u>12,509</u>	<u>12,092</u>	<u>13,955</u>
Total, Facilities Services..	<u>12,741</u>	<u>15,870</u>	<u>15,194</u>	<u>17,498</u>

Explanation of Fund Requirements

	<u>1981</u>	<u>1982</u>		<u>1983</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>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
<p>The amounts provided here cover the cost of leasing rights of way for access to model drop zone areas.</p>				
2. <u>Maintenance and Related Services</u>	<u>376</u>	<u>661</u>	<u>586</u>	<u>775</u>
<p>This estimate provides funds for maintenance and repair of administrative facilities, utility lines, and ground maintenance. The decrease in the 1982 current estimate from the 1982 budget estimate is due to the deferral of maintenance and repair projects and a less than expected increase in support contractor rates. The 1983 estimate includes funding for maintenance and repair items deferred from 1982.</p>				
3. <u>Custodial Services</u>	<u>2,516</u>	<u>2,699</u>	<u>2,515</u>	<u>2,767</u>
<p>This activity provides for janitorial and security services. Also included are funds for trash disposal and fire protection services provided by the City of Hampton. The decrease from the 1982 budget estimate to the 1982 current estimate reflects a reduction of support contractor effort for janitorial services. The 1983 estimate provides for the continuation of janitorial services at the 1982 level of effort.</p>				
4. <u>Utility Services</u>	<u>9,848</u>	<u>12,509</u>	<u>12,092</u>	<u>13,955</u>
<p>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 for East Area facilities and the purchase of steam from Hampton for facilities located in the West Area of LaRC.</p>				

The decrease from the 1982 budget estimate to the 1982 current estimate is the result of a rate decrease in electricity due in part to a lower on-peak power demand coupled with a rate decrease in the cost of steam purchased from Hampton. The 1983 budget estimate reflects rate increases in all utility costs coupled with a higher on-peak power demand in electricity associated with the National Transonic Facility.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
B. <u>TECHNICAL SERVICES</u>	<u>2,487</u>	<u>2,747</u>	<u>2,984</u>	<u>3,452</u>

Summary of Fund Requirements

1. <u>Automatic Data Processing</u>	<u>1,868</u>	<u>2,079</u>	<u>2,359</u>	<u>2,675</u>
a. Equipment.....	283	238	189	230
b. Operations.....	1,585	1,841	2,170	2,445
2. <u>Scientific and Technical Information</u>	<u>619</u>	<u>668</u>	<u>625</u>	<u>777</u>
a. Library.....	186	195	194	217
b. Education and information.....	<u>433</u>	<u>473</u>	<u>431</u>	<u>560</u>
Total, Technical Services..	<u>2,487</u>	<u>2,747</u>	<u>2,984</u>	<u>3,452</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u>	<u>1,868</u>	<u>2,079</u>	<u>2,359</u>	<u>2,675</u>
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Funds for the Center's business computer complex which provides the accounting and management information data required by the Center and NASA are provided for 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 increase in the 1982 current estimate from the 1982 budget estimate is due to an increase in the level of support contractor services to begin updating the software in the administrative business computer complex. The 1983 estimate provides for expected support contractor rate escalation and equipment replacement.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
2. <u>Scientific and Technical Information</u>	<u>619</u>	<u>668</u>	<u>625</u>	<u>777</u>

This estimate provides support service contract assistance in the operation of the technical library and Visitor Information Center. Funding for all the Center's public affairs activities are included in these estimates. 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 information programs. The decrease from the 1982 budget estimate to the 1982 current estimate reflects the 1981 experience. The increase in 1983 is due to upgrade of exhibits in the Visitor Information Center and support contractor rate escalation.

C. <u>MANAGEMENT AND OPERATIONS</u>	<u>6,199</u>	<u>6,610</u>	<u>6,653</u>	<u>7,163</u>
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Summary of Fund Requirements

1. Administrative Communications.....	1,421	1,443	1,425	1,448
2. Printing and Reproduction.. ..	132	200	141	156
3. Transportation	1,736	1,742	2,014	2,178
4. Installation Common Services.. ..	<u>2,910</u>	<u>3,225</u>	<u>3,073</u>	<u>3,381</u>
Total, Management and Operations	<u>6,199</u>	<u>6,610</u>	<u>6,653</u>	<u>7,163</u>

Explanation of Fund Requirements

	1981	1982		1983
	<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>1,421</u>	<u>1,443</u>	<u>1,425</u>	<u>1,448</u>

This estimate includes funds for local telephone and exchange costs; Federal Telecommunications System (FTS) service; and datafax and telegraph service. The budgets for 1982 and 1983 reflect the same level of service as 1981.

2. <u>Printing and Reproduction</u>	<u>132</u>	<u>200</u>	<u>141</u>	<u>156</u>
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This estimate provides for special supplies for reproduction services. The 1982 current estimate is consistent with prior year experience. The 1983 estimate reflects the same level of service as 1982.

3. <u>Transportation</u>	<u>1,736</u>	<u>1,742</u>	<u>2,014</u>	<u>2,178</u>
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This activity 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, 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 increase in the 1982 current estimate from the 1982 budget estimate is due to an increase in support contractor rates, a small increase in effort in aircraft maintenance and the one-time cost of a new aeronauticsmobile. The 1983 estimate provides for continuation of the 1982 level.

4. <u>Installation Common Services</u>	<u>2,910</u>	<u>3,225</u>	<u>3,073</u>	<u>3,381</u>
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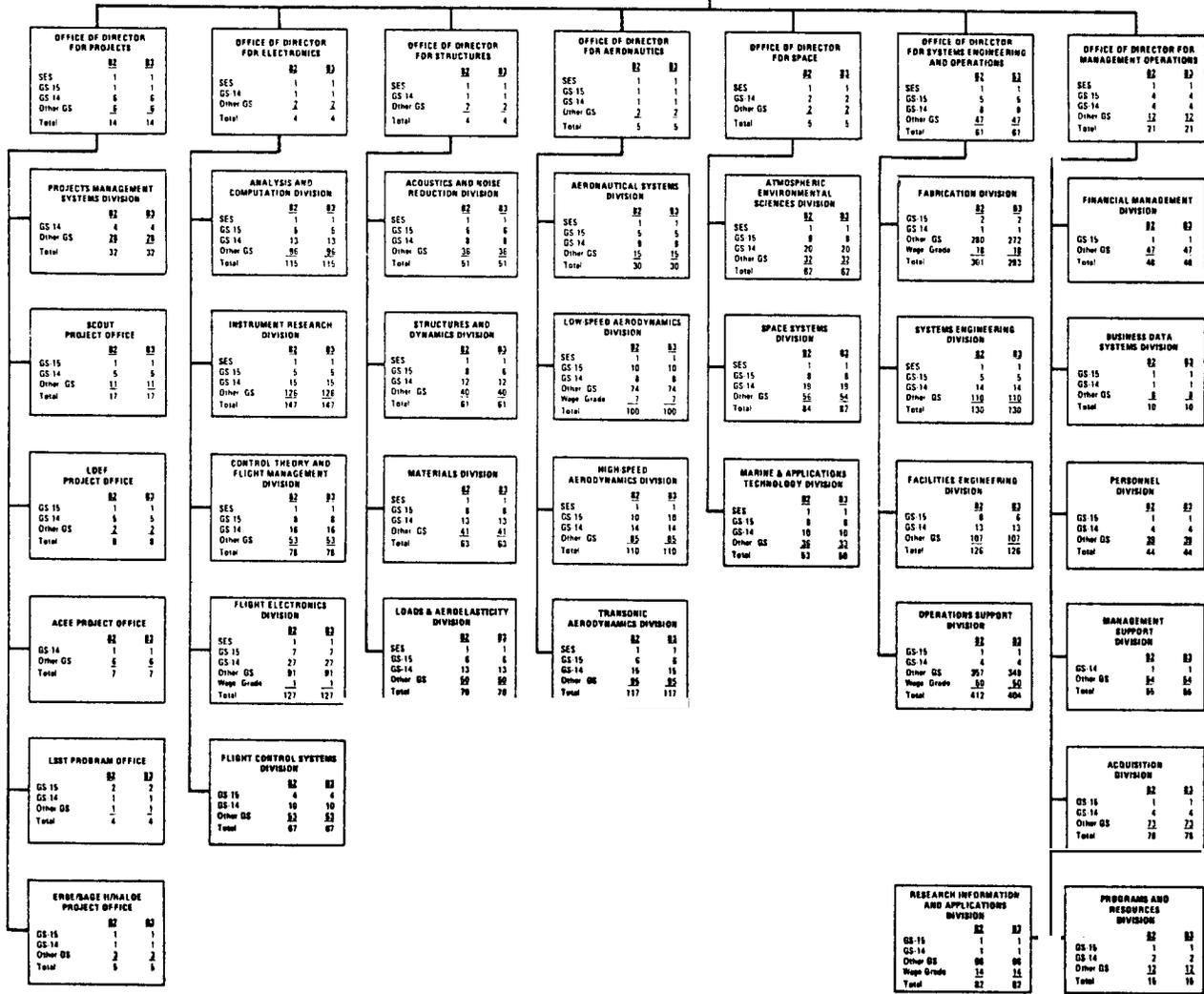
These funds provide for medical services, mail delivery, stock issue and warehousing, and other general administrative support. Also included are the rental and maintenance of office copy machines and equipment, minority programs, and other administrative services and supplies. The 1983 estimate reflects the same level as 1982 with an increase in the cost of support contractor effort and increases in the cost of office copier maintenance.

LANGLEY RESEARCH CENTER

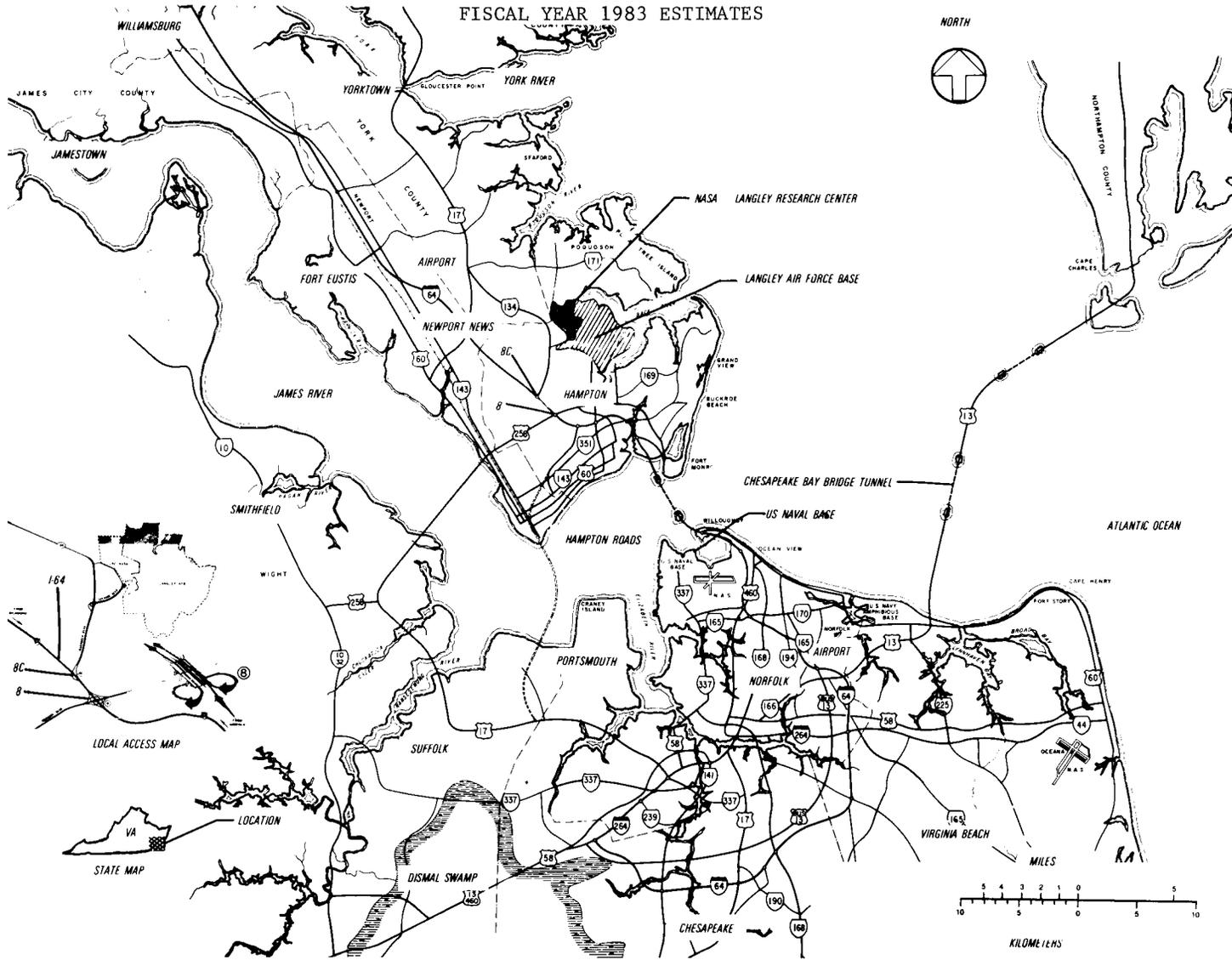
RPM 7-25

STAFFING SUMMARY	
SES	30
AD	2
GS-15	150
GS-14	310
Other GS	2784
Wage Grade	30
Total	2866

OFFICE OF DIRECTOR	
SES	7
AD	2
GS-15	3
GS-14	3
Other GS	28
Total	43



**LANGLEY RESEARCH CENTER
AND VICINITY
FISCAL YEAR 1983 ESTIMATES**



LANGLEY RESEARCH CENTER
FISCAL YEAR 1983 ESTIMATES
AERIAL VIEW



LEWIS
RESEARCH CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1983 ESTIMATES

LEWIS RESEARCH CENTER

DESCRIPTION

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

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 5,853 acres owned and approximately 47 acres in easements. There are 69 buildings and 99 concrete storage bunkers. A 100 kW electric wind turbine generator facility designed to be operated remotely is in operation for a program jointly sponsored by the Department of Energy and NASA. During 1975, consistent with our future research and technology needs, the principal facilities were placed in a standby mode.

The total capital investment of the Lewis Research Center and the Plum Brook Station, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1981, was \$465,604,000.

CENTER ROLES AND MISSIONS

The Lewis Research Center (LeRC) was established in 1941 as an aircraft engine research laboratory to meet the immediate needs at that time to develop superior aircraft propulsion systems. Since then, Lewis has developed and constructed many outstanding facilities for testing full-scale aircraft engines and engine components, chemical rocket engines, electric propulsion, space and terrestrial power generation systems and space communication systems. The principal and supporting roles are:

PRINCIPAL :

Aeronautics - Development of an advanced technology base for aircraft propulsion systems within environmental, safety, and energy constraints. Development of a technology base to advance the state-of-the-art in aeronautical propulsion systems and components, including high temperature materials and

structures, improved engine efficiency and performance, digital electronic engine controls, computational fluid mechanics, and technical support to military aviation programs.

Launch Vehicle Procurement - Management and operation of the Centaur launch vehicle system for scientific and applications missions for Government and commercial users.

Space Propulsion Systems Research and Technology - Development and maintenance of the space propulsion technology base for both chemical liquid and electric propulsion, including associated structures and materials work.

Space Energy Processes and Systems Research and Technology - Development and maintenance of a technology base for advanced space power generation and conversion.

Advanced Communications Systems Technology - Development of advanced communications technology, including high power microwave and millimeter-wave components and systems oriented towards satellite-based applications. Includes flight experiment development and management.

SUPPORTING :

Environmental Observations - Development of remote sensing technology and systems for applications to water quality in the Great Lakes.

SUMMARY OF RESOURCES REQUIREMENTS

Funding Plan by Function

	<u>1981</u>	<u>1982</u>		<u>1983</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. Personnel and Related Costs.....	82,854	87,772	87,973	89,086
11. Travel.....	997	1,554	1,545	1,545
III. Operation of Installation.....	16,035	18,710	17,442	19,960
A. Facilities Services..	(12,705)	(14,756)	(14,308)	(16,307)
B. Technical Services.....	(1,005)	(969)	(570)	(627)
C. Management and Operations	(2,325)	(2,985)	(2,564)	(3,026)
Total, fund requirements	<u>99,886</u>	<u>108,036</u>	<u>106,960</u>	<u>110,591</u>

Distribution of Permanent Positions by Program

	<u>1981</u>	<u>1982</u>		<u>1983</u>
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems and Operations</u>	140	77	<u>141</u>	<u>141</u>
Expendable launch vehicles.....	140	77	141	141
<u>Space Science and Applications</u>	<u>80</u>	140	57	<u>57</u>
Space applications.....	80	128	<u>57</u>	57
Technology utilization.....	---	12	---	
<u>Aeronautics and Space Technology</u>	<u>1,820</u>	<u>1,958</u>	<u>1,813</u>	<u>1,663</u>
Aeronautical research and technology	1,267	1,221	1,271	1,283
Space research and technology	343	387	380	380
Energy technology	<u>210</u>	<u>350</u>	<u>162</u>	<u>---</u>
Subtotal, direct positions	<u>2,040</u>	<u>2,175</u>	<u>2,011</u>	<u>1,861</u>
<u>Center Management and Operations Support Positions..</u>	<u>650</u>	<u>660</u>	<u>652</u>	<u>618</u>
Total, permanent positions	<u>2,690</u>	<u>2,835</u>	<u>2,663</u>	<u>2,479</u>

PROGRAM DESCRIPTION

Permanent Positions
(Civil Service)

EXPENDABLE LAUNCH VEHICLES..... 141

The Centaur launch vehicle 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 maintenance and operation of ground support equipment. In 1983, civil service personnel working on the Centaur launch vehicle program will continue to support the INTELSAT VA program which requires substantial performance improvement of the Atlas/Centaur vehicle. In addition to support of the INTELSAT VA program, Atlas vehicles are being procured to support DOD missions.

SPACE APPLICATIONS..... 57

Space applications at Lewis Research Center consists principally of space communications research. In 1983, Lewis civil service personnel will continue to support the studies of the capabilities and costs of various advanced satellite communications systems concepts directed at providing additional frequency bands and improved communication service. These studies are being focused on the needs of the public and private sectors both nationally and internationally. Lewis has been developing technology with possible application to both the ground and space segments of any future advanced civil or military communications systems. In 1983, the Proof-of-Concept model technology development program will be completed and limited laboratory test phase conducted.

AERONAUTICS RESEARCH AND ~~TECHNOLOGY~~..... 1,283

Lewis' major research and technology responsibility in aeronautics is propulsion. The general goals are to provide the technology base for developing advanced civil and military aeronautical propulsion systems which are economical, fuel-conservative, and reliable, and which operate with minimum environmental impact. The civil service personnel in 1983 will be involved in conducting the ongoing program at the Center as described below.

In aeronautical propulsion-related research, the goals are to develop an understanding of the physical phenomena related to propulsion systems and components including: aeroelasticity phenomena, computational fluid mechanics, low and high temperature composite materials, fatigue mechanisms,

reduced fuel consumption for rotary, diesel and turbine engines, alternate fuels characterization, noise generation mechanisms, and integrated control concepts.

The major goal in components research is to advance the state of the art in engine components including low aspect ratio compressor stages, core turbine cooling, blade clearance controls, advanced transmissions, fuel-flexible combustors, two-dimensional nozzles, supersonic inlets, high and low speed propellers, bearings, seals and instrumentation.

In engine systems research, Lewis is studying 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, techniques for reduced fuel consumption, propulsion system airframe interactions, aviation safety, and icing research associated with propulsion systems.

An extensive effort in materials and structures development supports the aeronautics propulsion program. The scope of this program involves both metallic and nonmetallic materials and their application to advanced aircraft engines. Areas of emphasis include the development of alloys and matrix composites capable of higher operating temperature, with longer operating lifetimes, and lower fabrication costs. The fatigue and fracture behavior of alloys under operating conditions and the development of operating life prediction techniques are an integral part of this materials development effort.

Permanent Positions
(Civil Service)

SPACE RESEARCH AND TECHNOLOGY.....

380

The major roles of the Lewis Research Center 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. The civil service personnel in 1983 will be utilized in the activities described below.

The Lewis space propulsion programs include chemical and electric propulsion technology and component development. The chemical propulsion program emphasizes advanced engine systems and components required for future space systems and provides the technology base to support the upgrading of life and performance of the Shuttle main engine. Improved components and methods of life



prediction are being developed and demonstrated, advanced fuel-oxidant combinations are being tested, and engine systems tests are being conducted. Technology developments include advanced cooling techniques, fabrication techniques and materials for rocket chambers and nozzles, advanced high pressure fuel/oxidant feed systems, and the storage and use of cryogenic propellants in reduced gravity.

Electric propulsion supports both primary propulsion and auxiliary propulsion applications. The primary propulsion technology program consists of advanced thruster performance investigations, performance testing of supporting power processor systems to deliver power to the thruster and its controls, and the integration testing of complete thruster systems, including the thruster, power processor, propellant storage and distribution system, thruster gimbal mechanism, controllers, and thermal control systems. Auxiliary electric propulsion meets spacecraft requirements for maneuvering, station keeping and attitude control. The present program objectives are similar to those of the primary propulsion program. New concepts in electric propulsion are investigated for feasibility and definition or development of enabling technologies.

Space power generation studies include solar photovoltaic, electrochemical 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.

Power circuit technology development is needed 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 antennas 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 Lewis program in space materials technology emphasizes the development of improved materials for advanced space power generation, propulsion and communications systems. Studies include space

environmental effects on superalloys and composites, and lubrication problems in mechanical components.

Permanent Positions
(Civil Service)

CENTER MANAGEMENT AND OPERATIONS SUPPORT.....

618

Center Management and Operations Support is support or services being provided to all Lewis Research 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 immediate staff, e.g., 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 manage or provide for the operation and maintenance of institutional facilities, buildings, system, 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

	1981	1982		1983
	<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. <u>PERSONNEL AND RELATED COSTS</u>.....	<u>82,854</u>	<u>87,772</u>	<u>87,973</u>	<u>89,086</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions.....	71,636	76,773	76,888	76,314
b. Other than full-time permanent positions..	1,604	1,460	1,848	1,955
c. Overtime and other compensation.....	<u>1,224</u>	<u>1,436</u>	<u>1,155</u>	<u>1,068</u>
Subtotal, Compensation.....	74,464	79,669	79,891	79,337
2. <u>Benefits</u>.....	<u>7,831</u>	<u>7,628</u>	<u>7,412</u>	<u>9,079</u>
Subtotal, Compensation and Benefits..	<u>82,295</u>	<u>87,297</u>	<u>87,303</u>	<u>88,416</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel....	25	29	20	20
2. Personnel training...	<u>534</u>	<u>446</u>	<u>650</u>	<u>650</u>
Subtotal, Supporting Costs.....	<u>559</u>	<u>475</u>	<u>670</u>	<u>670</u>
Total, Personnel and Related Costs	<u>82,854</u>	<u>87,772</u>	<u>87,973</u>	<u>89,086</u>

Explanation of Fund Requirements

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
A. <u>Compensation and Benefits</u>	82,295	87,297	87,303	88,416
1. Compensation... ..	74,464	79,669	79,891	79,337
a. Permanent positions.....	71,636	76,773	76,888	76,314

The current estimate for 1982 reflects a change from the 1982 budget estimate due to the recent pay increases offset by a reduction in permanent positions.

Basis of Cost for Permanent Positions

In 1983, the cost of permanent positions will be \$76,314,000. The decrease from the 1982 level results from the following:

Cost of permanent positions in 1982.....	76,888
Cost of increases in 1982.....	+3,648
Within grade and career advances:	
Full year effect of 1982 actions.....	+1,590
Partial year effect of 1983 actions	+1,057
Full year effect of 1982 pay increases	+1,001
Cost decreases in 1983.....	-4,222
Turnover savings and abolished positions:	
Full year effect of 1982 actions.....	-567
Effect of 1983 actions.....	-3,655
Cost of permanent positions in 1983.....	<u>76,314</u>

	<u>1981</u>	<u>1982</u>		<u>1983</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)		
b. Other than full-time permanent positions				
1. cost.....	1,604	1,460	1,848	1,955
2. Workyears	148	123	182	182

The distribution of 1983 workyears is as follows:

Distribution of Other than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Cooperative training	76
Summer employment	18
Opportunity programs.....	29
Other temporary employment	<u>59</u>
 Total.....	 ... <u>182</u>

The increase from the 1982 budget estimate to the 1982 current estimate reflects a build-up of the cooperative training and youth opportunity programs. The 1983 estimate is essentially level with 1982.

c. Overtime and other compensation	1,224	1,436	1,155	1,068
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The decrease from the 1982 budget estimate to 1982 current estimate reflects a revised overtime plan partially offset by the effect of the October 1981 pay raise. The 1983 estimate reflects the Center's continuing effort to hold overtime to the minimum level necessary to achieve the Center's mission.

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
2. <u>Benefits</u>	<u>7,831</u>	<u>7,628</u>	<u>7,412</u>	<u>9,079</u>
The following are the amounts of contribution by category:				
Civil Service Retirement Fund.. .. .	4,903	5,356	5,117	5,096
Employee life insurance.....	193	222	203	254
Employee health insurance.....	1,651	1,615	1,670	1,770
Workmen's compensation... ..	317	347	377	1,164
FICA.....	42	45	45	45
Other benefits.....	<u>725</u>	<u>43</u>	<u>---</u>	<u>750</u>
Total.....	<u>7,831</u>	<u>7,628</u>	<u>7,412</u>	<u>9,079</u>

The decrease from the 1982 budget estimate to the 1982 current estimate is primarily due to the reduction in permanent workyears offset by the cost of the October 1981 pay increase. The workmen's compensation estimates for 1982 and 1983 reflect estimates based on Department of Labor billings.

B. <u>Supporting Costs</u>	<u>559</u>	<u>475</u>	<u>670</u>	<u>670</u>
1. Transfer of personnel	25	29	20	20

The decrease from the 1982 budget estimate to the 1982 current estimate reflects a revised number of transfers in 1982. The 1983 estimate is level with 1982.

2. Personnel training.....	534	446	650	650
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The purpose of the training program is to continue the development of skill and education of the civil service employees to more efficiently support LeRC roles and missions. The increase from the 1982 budget estimate to the 1982 current estimate is due to a greater than anticipated rise in tuition costs. The 1983 estimate is level with the 1982 plan.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands	<u>Current</u> <u>Estimate</u> of Dollars)	
II. TRAVEL	<u>997</u>	<u>1,554</u>	<u>1,545</u>	<u>1,545</u>

Summary of Fund Requirements

A. Program Travel.....	740	1,267	1,266	1,266
B. Scientific and Technical Development Travel..	146	200	160	160
C. Management and Operations Travel.....	<u>111</u>	<u>87</u>	<u>119</u>	<u>119</u>
Total, Travel.....	<u>997</u>	<u>1,554</u>	<u>1,545</u>	<u>1,545</u>

Explanation of Fund Requirements

A. <u>Program Travel</u>	<u>740</u>	<u>1,267</u>	<u>1,266</u>	<u>1,266</u>
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Program travel is directly related to the accomplishment of the Center's mission and accounts for approximately 81% of travel costs. It provides funds necessary to manage 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 1983 estimate provides for slightly less travel than 1982 offset by expected increases in travel costs.

B. <u>Scientific and Technical Development Travel</u>	<u>146</u>	<u>200</u>	<u>160</u>	<u>160</u>
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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 them to benefit from exposure to technological advances outside Lewis, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve problems for the benefit of the Government. The 1983 estimate reflects a decreased level of travel offset by anticipated increases in travel costs.

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
C. <u>Management and Operations Travel</u>	111	<u>87</u>	<u>119</u>	<u>119</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 1982 budget estimate to the 1982 current estimate more accurately reflects 1981 experience. The 1983 estimate reflects a decreased level of travel offset by anticipated increases in travel costs.

III. OPERATION OF INSTALLATION..... 16,035 18,710 17,442 19,960

Summary of Fund Requirements

A. Facilities Services.. ..	12,705	14,756	14,308	16,307
B. Technical Services.. ..	1,005	969	570	627
C. Management and Operations.....	<u>2,325</u>	<u>2,985</u>	<u>2,564</u>	<u>3,026</u>
Total, Operation of Installation.. ..	<u>16,035</u>	<u>18,710</u>	<u>17,442</u>	<u>19,960</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 1982 budget estimate to the 1982 current estimate is due to lower utilities consumption, partially offset by slightly higher support contractor rates. The increase from the 1982 current estimate to 1983 is rate escalation in both the utilities and support contractor areas.

	<u>1981 Actual</u>	<u>1982</u>		<u>1983</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
A. <u>FACILITIES SERVICES</u>	<u>12,705</u>	<u>14,756</u>	<u>14,308</u>	<u>16,307</u>
<u>Summary of Fund Requirements</u>				
1. Maintenance and Related Services.. .. .	1,421	1,124	1,538	1,693
2. Custodial Services	2,709	3,062	2,899	3,178
3. Utility Services.....	<u>8,575</u>	<u>10,570</u>	<u>9,871</u>	<u>11,436</u>
Total, Facilities Services.. .. .	<u>12,705</u>	<u>14,756</u>	<u>14,308</u>	<u>16,307</u>

Explanation of Fund Requirements

1. <u>Maintenance and Related Services</u>	<u>1,421</u>	<u>1,124</u>	<u>1,538</u>	<u>1,693</u>
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This activity provides for the operation and maintenance of facilities at the main installation in Cleveland and at Plum Brook Station. Facilities maintenance includes buildings and grounds maintenance and maintenance of heating, ventilating, and air-conditioning systems and equipment. The increase in the 1982 current estimate from the 1982 budget estimate reflects 1981 experience. The increase in 1983 is primarily due to contractor rate escalation.

2. <u>Custodial services</u>	<u>2,709</u>	<u>3,062</u>	<u>2,899</u>	<u>3,178</u>
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Security and janitorial services are provided by support contractors. Other services include rubbish disposal, fly ash removal, and industrial cleaning of walls, lights and windows on an as needed basis. The decrease in the 1982 current estimate from the 1982 budget estimate reflects a decrease in support contractor effort. The expected increase from 1982 to 1983 is due to support contractor rate escalation.

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
3. <u>Utility Services</u>	<u>8,575</u>	<u>10,570</u>	<u>9,871</u>	<u>11,436</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 in the 1982 current estimate from the 1982 budget estimate is due primarily to lower electricity consumption. The 1983 increase is due to rate increases more than offsetting a decrease in consumption.

B. <u>TECHNICAL SERVICES</u>	<u>1,005</u>	<u>969</u>	<u>570</u>	<u>627</u>
1. <u>Automatic Data Processing</u>	<u>354</u>	<u>165</u>	<u>160</u>	<u>176</u>
a. <u>Equipment</u>	45	22	22	24
b. <u>Operations</u>	309	143	138	152
2. <u>Scientific and Technical Information</u>				
a. <u>Education and Information</u>	<u>651</u>	<u>804</u>	<u>410</u>	<u>451</u>
Total, Technical Services.....	<u>1,005</u>	<u>969</u>	<u>570</u>	<u>627</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u>	<u>354</u>	<u>165</u>	<u>160</u>	<u>176</u>
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Funding provides for administrative data processing, including maintenance and periodic replacement of equipment, programming, and operations. The 1981 actual includes a one-time study of ADP support to LeRC management systems. The 1983 estimate contains the same level of support as in 1982.

	<u>1981 Actual</u>	<u>1982</u>		<u>1983</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
2. <u>Scientific and Technical Information</u>	<u>651</u>	<u>804</u>	<u>410</u>	<u>451</u>

Included in this activity are the support of the Center's educational programs and public information services. Funding for operation of the Visitor Information Center, conduct of tours and special events, construction and transport of special exhibits, and related activities are also included. The construction and modification of public affairs exhibits was accomplished in 1981. The 1982 current estimate reflects the 1981 level of effort less the one time exhibit costs. The increase in 1983 is due to contractor rate escalation.

C. <u>MANAGEMENT AND OPERATIONS</u>	<u>2,325</u>	<u>2,985</u>	<u>2,564</u>	<u>3,026</u>
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Summary of Fund Requirements

1. Administrative Communications.....	469	946	410	469
2. Printing and Reproduction.. .. .	33	38	25	40
3. Transportation..... .. .	1,294	1,286	1,528	1,854
4. Installation Common Services.....	<u>529</u>	<u>715</u>	<u>601</u>	<u>663</u>
Total, Management and Operations.. .. .	<u>2,325</u>	<u>2,985</u>	<u>2,564</u>	<u>3,026</u>

Explanation of Fund Requirements

1. <u>Administrative Communications</u>	<u>469</u>	<u>946</u>	<u>410</u>	<u>469</u>
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This estimate provides local and long distance telephone service and nontelephone 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 1982 current estimate reflects 1981 experience. The increase in 1983 reflects higher rates.

	1981	1982		1983
	<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. <u>Printing and Reproduction</u>	<u>33</u>	<u>38</u>	<u>25</u>	<u>40</u>

This activity provides for administrative printing and copier service. The 1983 estimate provides for minor equipment replacement.

3. <u>Transportation</u>	<u>1,294</u>	<u>1,286</u>	<u>1,528</u>	<u>1,854</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 1982 budget estimate to the 1982 current estimate is due to the partial year costs of a new support contract for aircraft maintenance. The 1983 budget estimate includes the first full-year costs of this contract plus rate increases on other contracts in this function.

4. <u>Installation Common Services</u> ..	<u>529</u>	<u>715</u>	<u>601</u>	<u>663</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, and special x-ray equipment for the in-house occupational health program. These services are provided by a support contractor. At Plum Brook Station, a health physicist is required to monitor the nuclear reactor. This function also includes funding for maintenance and periodic replacement of administrative equipment, administrative supplies, and postage. The decrease from the 1982 budget estimate to the 1982 current estimate is in keeping with 1981 experience. The increase in 1983 is primarily due to expected support contractor rate escalation and higher costs for purchased supplies and services.

**National Aeronautics and Space Administration
Organization and Staffing Chart
LEWIS RESEARCH CENTER
Cleveland, Ohio**

STAFFING SUMMARY		
	82	83
SES	10	30
GS-16	1	1
GS-15	104	97
GS-14	240	242
OTHER GS	1084	1325
WB	184	284
TOTAL	2461	2479

OFFICE OF THE DIRECTOR		
	82	83
SES	1	0
OTHER GS	1	1
TOTAL	11	11

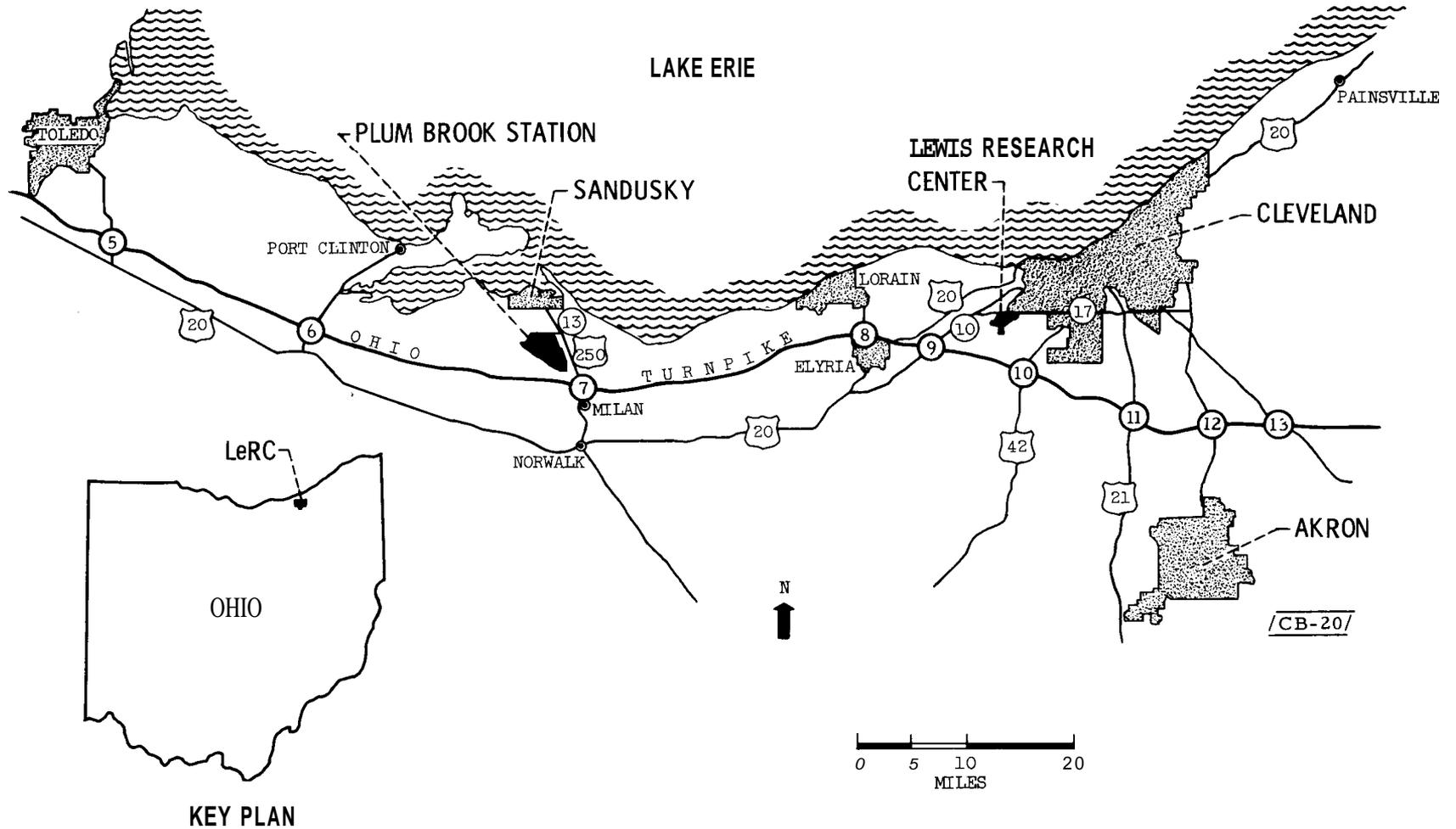
DIRECTOR OF TECHNOLOGY UTILIZATION & PUBLIC AFFAIRS		
	82	83
SES	1	0
GS-15	1	1
GS-14	1	1
OTHER GS	17	13
TOTAL	10	15

OFFICE OF EQUAL EMPLOYMENT OPPORTUNITY		
	82	83
GS-14	1	1
OTHER GS	2	2
TOTAL	3	3



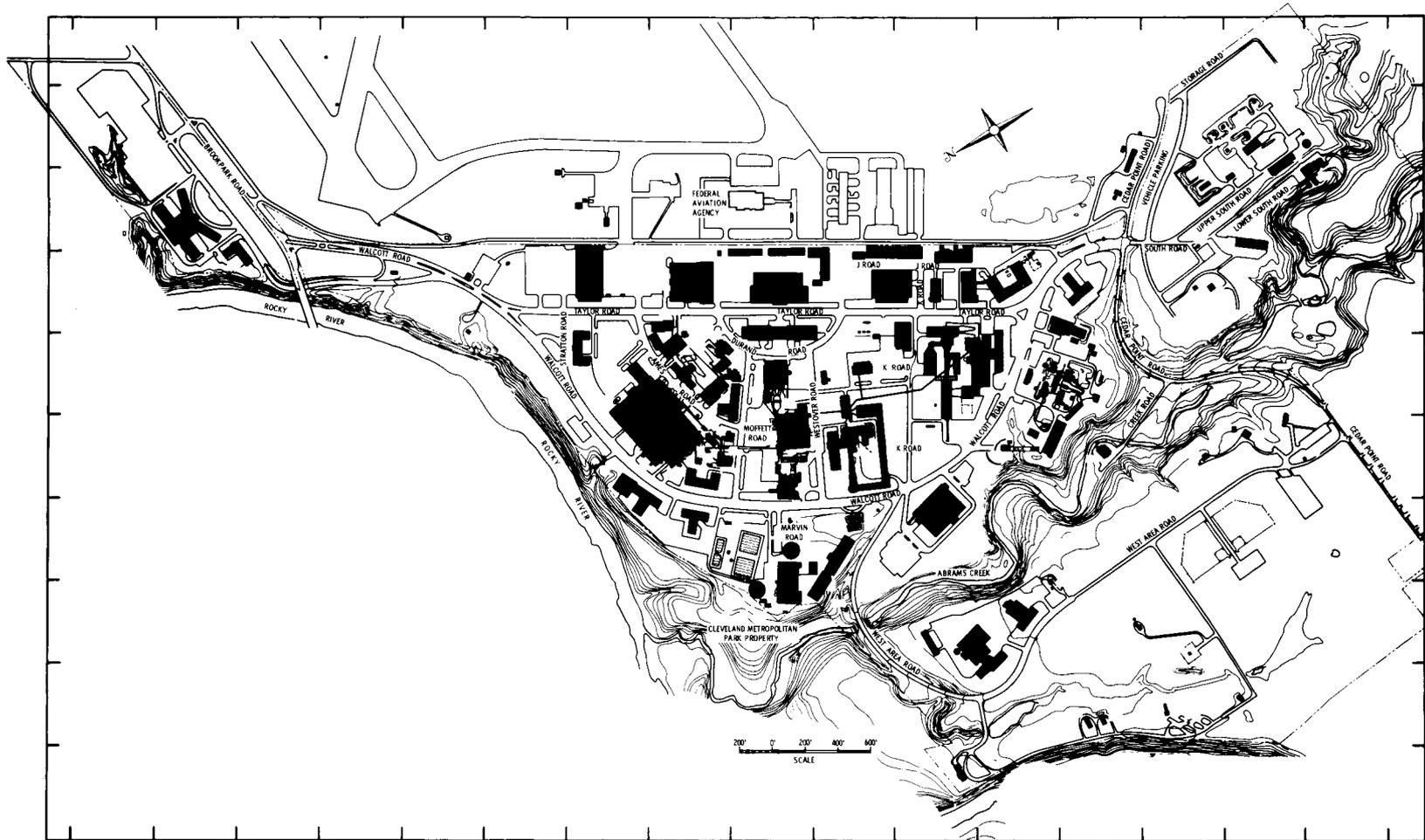
LEWIS RESEARCH CENTER
FISCAL YEAR 1983 ESTIMATES

AREA MAP



LEWIS RESEARCH CENTER
FINAL YEAR 1983 ESTIMATES

LOCATION PLAN



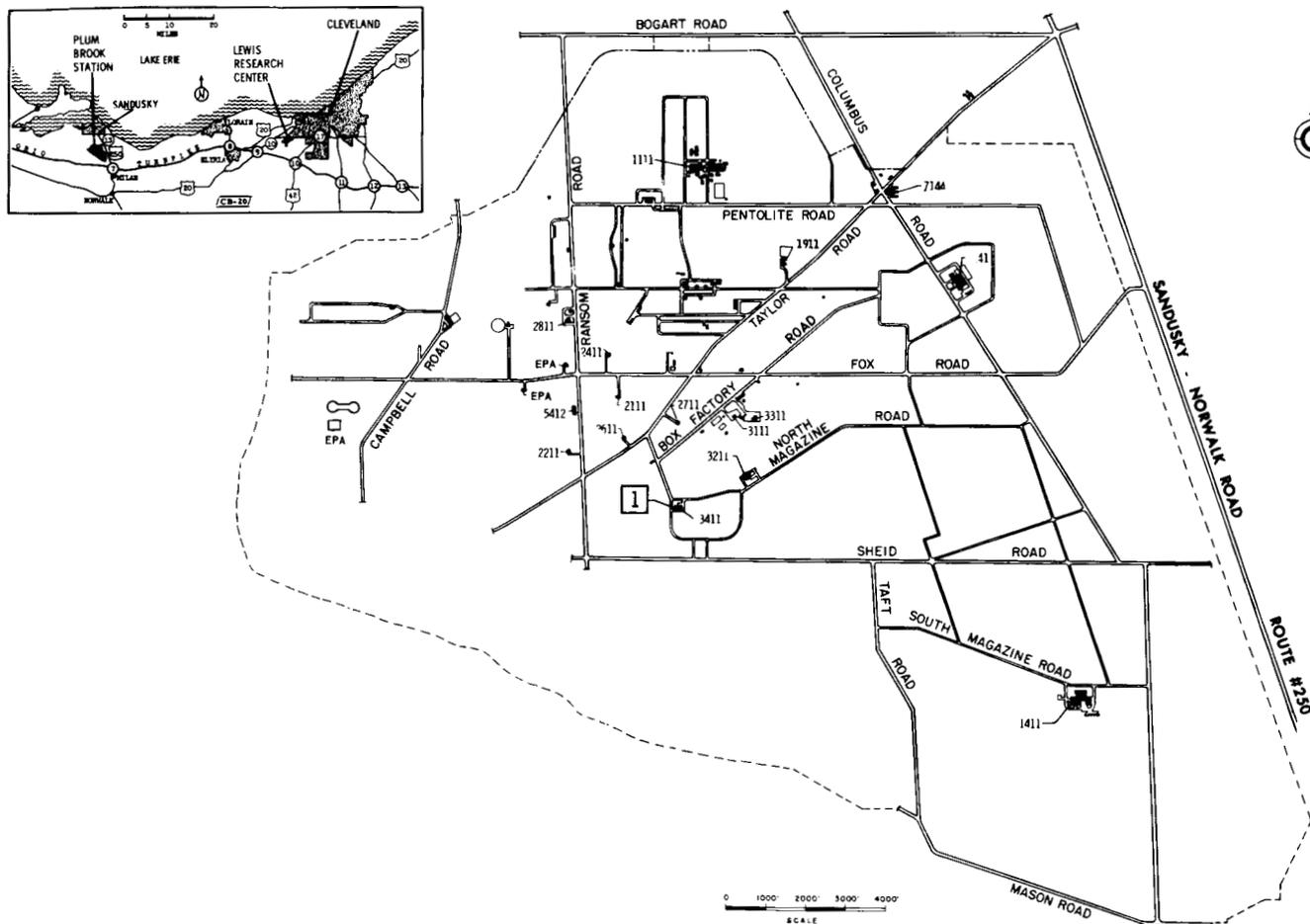
LEWIS RESEARCH CENTER
FISCAL YEAR 1983 ESTIMATES

CLEVELAND FACILITIES



LEWIS RESEARCH CENTER
PLUM BROOK STATION
FISCAL YEAR 1983 ESTIMATES

LOCATION PLAN



LEWIS RESEARCH CENTER
FISCAL YEAR 1983 ESTIMATES

PLUM BROOK FACILITIES



NASA
HEADQUARTERS

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1983 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. Except for some office space leased in the District of Columbia, personnel occupy Government-owned buildings.

HEADQUARTERS ROLES AND MISSIONS

The mission of the National Aeronautics and Space Administration 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 Transportation Systems—Plans, directs, executes, and evaluates the research, development and acquisition of space flight programs research, development and acquisition of space flight programs which includes the Space Shuttle, a reusable manned vehicle, the essential element of the Space Transportation System that will be used to conduct space operations. Included in Space Transportation Systems are the orbiters, engines, external tanks, solid rocket boosters, upper stages and ground systems.

Office of Space Transportation Operations—Plans, directs, executes and evaluates assigned projects and activities concerned with space transportation operations. Develops and implements necessary policy for all space transportation system users to interface with STS. Develops and implements appropriate transition policies for expendable launch vehicle users to transfer to the STS. Promotes improvements in effectiveness, cost efficiency and timeliness of STS operational performance. 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.

Office of Space Science and Applications—Responsible for scientific research and development effort 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 to understand 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: resource observation, environmental observation, space communications, material processing in space, technology transfer, and technology utilization.

Office of Aeronautics and Space Technology—Plans, directs, executes, and evaluates the aeronautical, space, and energy 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 reimbursable energy program provides support to the Department of Energy in the execution of interagency related activities conducted by NASA. 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—Responsible for the development, implementation, and operation of 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.

Research and Program Management (R&PM) funding is used to support the staffing and operation of NASA Headquarters in Washington, D.C. The overall capability of the Agency to operate effectively is dependent upon sufficient R&PM funds to hire and support a Headquarters workforce to furnish direction and coordinate the accomplishment of the Agency mission. This portion of the budget is prepared to accomplish the following objectives:

- Provide a balanced Agency Headquarters workforce capable of planning, formulating, advocating and providing executive direction to national programs to implement the objectives stated in the National Aeronautics and Space Act of 1958, as amended.
- Provide a balanced Headquarters supporting workforce capable of providing necessary administrative, operational and logistical support to those Headquarters elements concerned with carrying out the mission of the National Aeronautics and Space Administration.
- Provide adequate facilities to house the workforce in Washington, D.C.
- Provide for technical, administrative and logistical support necessary to facilitate accomplishment of NASA goals and objectives as administered by the Headquarters.

The Headquarters workforce consists of a 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 Headquarters 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. He is assisted by heads of special and technical staff offices which perform functions necessary to the effective operation of the Agency and the Headquarters. Such offices are concerned with administration management or support of the Headquarters. Included are such offices as the Chief Engineer, Comptroller, General Counsel, External Relations, Office of Management, Aerospace Safety Advisory Panel, Equal Opportunity, Procurement and the Inspector General. The Headquarters currently has eight (8) installations, and JPL, throughout the U.S. which perform agency operational missions under direction of the Headquarters staff.

Facilities consist of GSA leased space at FB-6, FB-10B and Reporters Building in Washington, D.C., and a facility at Baltimore-Washington Airport in Maryland.

Technical support required by Headquarters is performed primarily by support contractors. Currently, contractors support Headquarters automatic data processing and the scientific and technical information programs. 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

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
I. Personnel and Related Costs.....	61,113	65,478	67,727	68,360
II. Travel.....	2,990	3,930	4,270	4,270
III. Operation of Installation.....	32,266	37,384	38,035	39,993
A. Facilities Services.. ..	(5,978)	(6,326)	(6,001)	(8,580)
B. Technical Services.....	(18,155)	(19,942)	(19,474)	(19,918)
C. Management and Operations.	<u>(8,133)</u>	<u>(11,116)</u>	<u>(12,560)</u>	<u>(11,495)</u>
Total, fund requirements... ..	<u>96,369</u>	<u>106,792</u>	<u>110,032</u>	<u>112,623</u>

Distribution of Permanent Positions by Program

	<u>1981</u>	<u>1982</u>		<u>1983</u>
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems and Operations....</u>	<u>192</u>	<u>230</u>	211	211
Space shuttle.....	110	112	105	88
Space flight operations.....	69	105	93	110
Expendable launch vehicles.....	13	13	13	13
<u>Space Science and Applications</u>	<u>214</u>	<u>228</u>	<u>243</u>	232
Physics and astronomy.....	53	60	69	65
Planetary exploration	29	31	32	30
Life sciences.....	23	23	23	23
Space applications	89	94	104	99
Technology utilization.....	20	20	15	15
<u>Aeronautics and Space Technology</u>	<u>126</u>	<u>134</u>	<u>131</u>	<u>113</u>
Aeronautical research and technology....	60	63	66	66
Space research and technology	44	44	47	47
Energy technology... ..	22	27	18	--
<u>Space Tracking and Data Systems Program</u>	<u>54</u>	<u>57</u>	<u>54</u>	<u>54</u>
Tracking and data acquisition....	54	57	54	54
Subtotal, direct positions	<u>586</u>	649	<u>639</u>	<u>610</u>
<u>Management and Operations Support Positions</u>	<u>920</u>	<u>937</u>	852	847
Total, permanent positions.....	<u>1,506</u>	<u>1,586</u>	<u>1,491</u>	<u>1,457</u>

RESOURCE REQUIREMENTS BY FUNCTION

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
I. <u>PERSONNEL AND RELATED COSTS..</u>	<u>61,113</u>	<u>65,478</u>	<u>67,727</u>	<u>68,360</u>
<u>Summary of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions..	52,491	54,310	54,923	54,522
b. Other than full-time permanent positions..	2,288	1,947	2,837	2,667
c. Reimbursable detailees.....	380	508	532	585
d. Overtime and other compensation...	<u>1,039</u>	<u>1,245</u>	<u>1,386</u>	<u>1,386</u>
Subtotal, Compensation.....	56,198	58,010	59,678	59,160
2. <u>Benefits</u>	<u>3,647</u>	<u>5,245</u>	<u>5,814</u>	<u>6,815</u>
Subtotal, Compensation and Benefits.. ...	<u>59,845</u>	<u>63,255</u>	<u>65,492</u>	<u>65,975</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel	399	1,016	617	617
2. Office of Personnel Management services	256	187	258	294
3. Personnel training.	<u>613</u>	<u>1,020</u>	<u>1,360</u>	<u>1,474</u>
Subtotal, Supporting Costs.....	<u>1,268</u>	<u>2,223</u>	<u>2,235</u>	<u>2,385</u>
Total, Personnel and Related Costs..	<u>61,113</u>	<u>65,478</u>	<u>67,727</u>	<u>68,360</u>

Explanation of Fund Requirements

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
A. <u>Compensation and Benefits</u>	59,845	63,255	65,492	65,975
1. <u>Compensation</u>	56,198	58,010	59,678	59,160
a. Permanent positions	52,491	54,310	54,923	54,522

The current estimate for 1982 reflects a change from the 1982 budget estimate due to the recent pay increases partially offset by a reduction in permanent positions in 1982.

Basis of Cost for Permanent Positions

In 1983 the cost of permanent positions will be \$54,522,000. The decrease from 1982 results from the following:

Cost of permanent positions in 1982.....	54,923
Cost increase in 1983.....	+1,573
Within grade and career advances:	
Full year effect of 1982 actions.....	+479
Partial year effect of 1983 actions.....	+278
Full year effect of 1982 pay increases.....	+816
Cost decreases in 1983.....	-1,974
Turnover savings and abolished positions:	
Full year effect of 1982 actions.....	-471
Effect of 1983 actions.....	-1,503
Cost of permanent positions in 1983.....	<u>54,522</u>

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</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 positions				
(1) Cost.....	2,288	1,947	2,837	2,667
(2) Workyears	139	132	164	164

The distribution of 1983 workyears is as follows:

Distribution of Other Than Full-Time Permanent Workyears

<u>Program</u>	<u>Workyears</u>
Cooperative training.	12
Summer employment... ..	20
Opportunity programs.....	21
Other temporary employment....	<u>111</u>
Total.....	<u>164</u>

The increase from the 1982 budget estimate to the 1982 current estimate is due to the effect of the October 1981 pay increase, and reflects increased emphasis on temporary employment, and the scheduled buildup of the Presidential Intern program.

c. Reimbursable detailees.....	380	508	532	585
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The services of a **small** group of military officer and civilian detailees from other government agencies are used by NASA Headquarters where such assignments are of mutual benefit. The increase from the 1982 budget estimate to the 1982 current estimate and the 1983 estimate is attributable to the October 1981 pay increase and an increase in the number of detailees.

	1981 Actual	1982		1983
		Budget Estimate (Thousands of Dollars)	Current Estimate (Dollars)	Budget Estimate
d. Overtime and other compensation.....	1,039	1,245	1,386	1,386

The increase from the 1982 budget estimate to the 1982 current estimate reflects the effect of the October 1981 pay increase. The 1983 estimate is level with 1982.

2. <u>Benefits</u>	<u>3,647</u>	<u>5,245</u>	<u>5,814</u>	<u>6,815</u>
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The following are the amounts of contribution by category:

Civil Service Retirement Fund..	1,606	3,793	4,021	4,043
Employees life insurance.....	153	170	157	179
Employees health insurance.....	922	930	925	1,025
Workmen's compensation.....	150	167	464	1,071
FICA.....	63	90	67	67
Other benefits.....	<u>753</u>	<u>95</u>	<u>180</u>	<u>430</u>
Total..	<u>3,647</u>	<u>5,245</u>	<u>5,814</u>	<u>6,815</u>

The increase in the 1982 current estimate from the 1982 budget estimate reflects the cost of the recent pay increases. The workmen's compensation for 1982 and 1983 reflect estimates based on Department of Labor billings.

B. <u>Supporting Costs</u>	<u>1,268</u>	<u>2,223</u>	<u>2,235</u>	<u>2,385</u>
1. Transfer of personnel.....	399	1,016	617	617

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 decrease from the 1982 budget estimate to the 1982 current estimate reflects a revised number of relocations. The 1983 estimate is level with 1982.

	1981	1982		1983
	<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. Office of Personnel Management services	256	187	258	294

Headquarters reimburses the Office of Personnel Management (OPM) and others 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.	613	1,020	1,360	1,474
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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 in the 1982 current estimate and 1983 over the 1982 budget estimate reflects the cost of pilot training previously shown at Langley Research Center.

II. TRAVEL.....	<u>2,990</u>	<u>3,930</u>	<u>4,270</u>	<u>4,270</u>
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Summary of Fund Requirements

A. Program Travel.....	1,628	2,486	2,500	2,500
B. Scientific and Technical Development Travel.. ..	345	393	491	491
C. Management and Operations Travel.....	<u>1,017</u>	<u>4,051</u>	<u>1,279</u>	<u>1,279</u>
Total Travel.	<u>2,990</u>	<u>3,930</u>	<u>4,270</u>	<u>4,270</u>

Explanation of Fund Requirements

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
A. <u>Program Travel</u>	1,628	2,486	2,500	2,500

Program travel funds are used in support of NASA's research and development programs, such as the Space Shuttle, Space Flight Operations, Aeronautics and Space Technology, Space Science and Applications, and other direct research and development programs. This category represents approximately 59 percent of the Headquarters travel requirements for 1983. The increase from the 1982 budget estimate to the 1982 current estimate is a result of anticipated increases in travel costs and travel associated primarily with Space Shuttle development and preparation for space transportation systems operations. The 1983 estimate reflects a decreased level of travel, offset by expected increases in travel costs.

B. <u>Scientific and Technical Development Travel</u>	345	393	491	491
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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. The increase from the 1982 budget estimate to the 1982 current estimate is a result of expected increases in travel costs. The 1983 estimate reflects a decreased level of travel, offset by expected increases in travel costs.

C. <u>Management and Operations Travel</u>	1,017	1,051	1,279	1,279
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Management and operations travel is for the direction and coordination of general management matters, travel by senior officials to review Center requirements and operations. 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 increase from the 1982 budget estimate to the 1982 current estimate reflects anticipated increases in travel costs. The 1983 estimate reflects a decreased level of travel, offset by expected increases in travel costs.

	1981 <u>Actual</u>	1982		1983 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
III. <u>OPERATION OF INSTALLATION</u>	<u>32,266</u>	<u>37,384</u>	<u>38,035</u>	<u>39,993</u>

Summary of Fund Requirements

A. Facilities Services.....	5,978	6,326	6,001	8,580
B. Technical Services.. ..	18,155	19,942	19,474	19,918
C. Management and Operations.. ..	<u>8,133</u>	<u>11,116</u>	<u>12,560</u>	<u>11,495</u>
Total, Operation of Installation.. ..	<u>32,266</u>	<u>37,384</u>	<u>38,035</u>	<u>39,993</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 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 1982 budget estimate to the 1982 current estimate reflects an increase in support contractor rates, general purchases and services, and a one-time purchase of multiplexors to support the increased demand for transmission capability between the Centers and Headquarters. The increase in 1983 reflects expected support contractor rate increases and an increase in GSA rental charges (Standard Level User Charge) resulting from their triennial rate review.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</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>
A. <u>FACILITIES SERVICES</u>	<u>5,978</u>	<u>6,326</u>	<u>6,001</u>	<u>8,580</u>

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 GSA in accordance with P.L. 92-313. Headquarters leased facilities in Virginia, were given up in the fourth quarter 1981 upon completion of the move of the Headquarters warehouse to the Goddard Space Flight Center.

The current complex encompasses some 529,000 gross square feet of building space including four buildings. This complex of primary office space supports an average daily Headquarters population of 1,900 personnel.

Summary of Fund Requirements

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</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>
1. <u>Rental of Real Property</u>	<u>4,965</u>	<u>5,005</u>	<u>4,888</u>	<u>7,430</u>
2. <u>Maintenance and Related Services</u>	<u>764</u>	<u>1,043</u>	<u>873</u>	<u>880</u>
a. Facilities.....	521	800	873	880
b. Equipment..... ..	243	243	---	---
3. <u>Custodial Services</u>	<u>249</u>	<u>278</u>	<u>240</u>	<u>270</u>
Total, Facilities Services.. ..	<u>5,978</u>	<u>6,326</u>	<u>6,001</u>	<u>8,580</u>

Explanation of Fund Requirements

	<u>1981</u>	<u>1982</u>		<u>1983</u>
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		<u>(Thousands of Dollars)</u>		
1. <u>Rental of Real Property</u>	<u>4,965</u>	<u>5,005</u>	<u>4,888</u>	<u>7,430</u>

Public Law 92-313 requires that agencies be charged for space and related services provided by the General Services Administration (GSA) at approximate commercial equivalent rates. The amounts provided here cover the cost of office space utilized by NASA Headquarters personnel. The decrease in the 1982 current estimate from the 1982 budget estimate reflects the closing of the emergency preparedness center in Lynchburg, Virginia. The increase in the 1983 budget estimate reflects increased rental rates as projected by GSA.

2. <u>Maintenance and Related Services</u>	<u>764</u>	<u>1,043</u>	<u>873</u>	<u>880</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 decrease from the 1982 budget estimate to the 1982 current estimate reflects an adjustment to the level of effort required in 1981. The 1982 current estimate and the 1983 estimate include amounts for projected increased supply and equipment costs.

3. <u>Custodial Services</u>	<u>249</u>	<u>278</u>	<u>240</u>	<u>270</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 decrease from the 1982 budget estimate to the 1982 current estimate reflects a cost savings due to a new GSA contract negotiated with the guard force. The increase in the 1983 current estimate reflects increased rates as projected by GSA.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</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>
B. <u>TECHNICAL SERVICES</u>	<u>18,155</u>	<u>19,942</u>	<u>19,474</u>	<u>19,918</u>

Summary of Fund Requirements

1. <u>Automatic Data Processing</u>.....	.....	<u>6,537</u>	<u>6,186</u>	<u>7,416</u>	<u>7,545</u>
a. <u>Equipment</u>....	.....	1,080	1,441	1,001	1,063
b. <u>Operations</u>.....	....	5,457	4,745	6,415	6,482
2. <u>Scientific and Technical Information</u>..	.....	<u>11,065</u>	<u>13,047</u>	<u>11,427</u>	<u>11,667</u>
a. <u>Library</u>....	.....	294	339	347	382
b. <u>Education and Information</u> ..	.....	10,771	12,708	11,080	11,285
3. <u>Shop and Support and Services</u>		<u>553</u>	<u>709</u>	<u>631</u>	<u>706</u>
Total, Technical Services..	.....	<u>18,155</u>	<u>19,942</u>	<u>19,474</u>	<u>19,918</u>

Explanation of Fund Requirements

1. <u>Automatic Data Processing</u>	<u>6,537</u>	<u>6,186</u>	<u>7,416</u>	<u>7,545</u>
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This estimate provides for the lease, purchase, maintenance, programming and operations services of ADP in equipment. The increase from the 1982 budget estimate to the 1982 current estimate reflects an increase in support contractor effort, wage determination board increases, and an increased effort to apply ADP to the areas of procurement, legal research and litigation support. The 1983 budget estimate reflects expected support contractor rate increases.

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
2. <u>Scientific and Technical Information..</u>	<u>11,065</u>	<u>13,047</u>	<u>11,427</u>	<u>11,667</u>

Three major activities are contained in this subfunction; educational-informational programs, NASA Headquarters scientific and technical information activity, 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 (with over 30,000 teachers participating); 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, the key roles that women and minorities have in the United States space program.

The scientific and technical information activity includes the cost of the NASA Scientific and Technical Information Facility (STIF), documentation and publication services, systems development, and translation services. The largest requirement is the NASA Scientific and Technical Facility, with an estimated cost of \$5.3 million in 1983. The cost of all other information services is estimated at approximately \$3.7 million in 1983. These costs are for the documentation of worldwide aerospace journal and report literature; monographs and technical reviews; analyzing, evaluating, and testing new methods and systems in the field of scientific communications to increase the effectiveness of the technical information program; and translating foreign language technical books, reports, and journal articles required to meet the needs of NASA and its contractor scientific personnel to keep abreast of world developments in the space science and related fields.

The technical libraries provide reference acquisition, cataloging, translating and dissemination services to all NASA employees.

The decrease from the 1982 budget estimate to the 1982 current estimate is to reflect prior experience more accurately. The 1983 budget estimate reflects expected support contractor rate increases.

	<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
3. <u>Shop Support and Services</u>	<u>553</u>	<u>709</u>	<u>631</u>	<u>706</u>

These funds provide for the continuation of studies on parts applications, NASA-wide safety, reliability and quality assurance standards. They also provide for graphic and photo processing services. The decrease from the 1982 budget estimate to the 1982 current estimate reflects a decrease in graphic and photo processing services. The increase in the 1983 budget estimate is due to increased cost of graphics, photographic supplies and materials and the NASA standard parts application documentation.

C. <u>MANAGEMENT AND OPERATIONS</u>	<u>8,133</u>	<u>11,116</u>	<u>12,560</u>	<u>11,495</u>
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Summary of Fund Requirements

1. Administrative Communications.....	1,574	1,681	2,830	2,514
2. Printing and Reproduction	1,235	1,277	1,368	1,583
3. Transportation.....	516	1,973	2,002	555
4. Installation Common Services.. ..	<u>4,808</u>	<u>6,185</u>	<u>6,360</u>	<u>6,843</u>
Total, Management and Operations.....	<u>8,133</u>	<u>11,116</u>	<u>12,560</u>	<u>11,495</u>

	1981 <u>Actual</u>	1982		1983
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

Explanation of Fund Requirements

1. <u>Administrative Communications</u>	<u>1,574</u>	<u>1,681</u>	<u>2,830</u>	<u>2,514</u>
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Included in this category are the costs of leased lines, long distance tolls, telephone exchange services, and other communications. The increase from the 1982 budget estimate to the 1982 current estimate is due to rate increases for FTS, local telephone and exchange services, and long distance tolls, and the purchase of multiplexors. The 1983 estimate reflects full funding for the same level of service.

2. <u>Printing and Reproduction</u>	<u>1,235</u>	<u>1,277</u>	<u>1,368</u>	<u>1,583</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 increases from the 1982 budget estimate to the 1982 current estimate and in the 1983 budget estimate are due to an increase in the cost of paper, supplies and materials.

3. <u>Transportation</u>	<u>516</u>	<u>1,973</u>	<u>2,002</u>	<u>555</u>
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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 1982 estimate includes the cost of replacing a 19-year-old Queenaire aircraft with a more modern fuel efficient, turbine powered, reliable aircraft. The increase from the 1982 budget estimate to the 1982 current estimate reflects increased costs for fuel and parts for the operation and maintenance of the administrative aircraft.

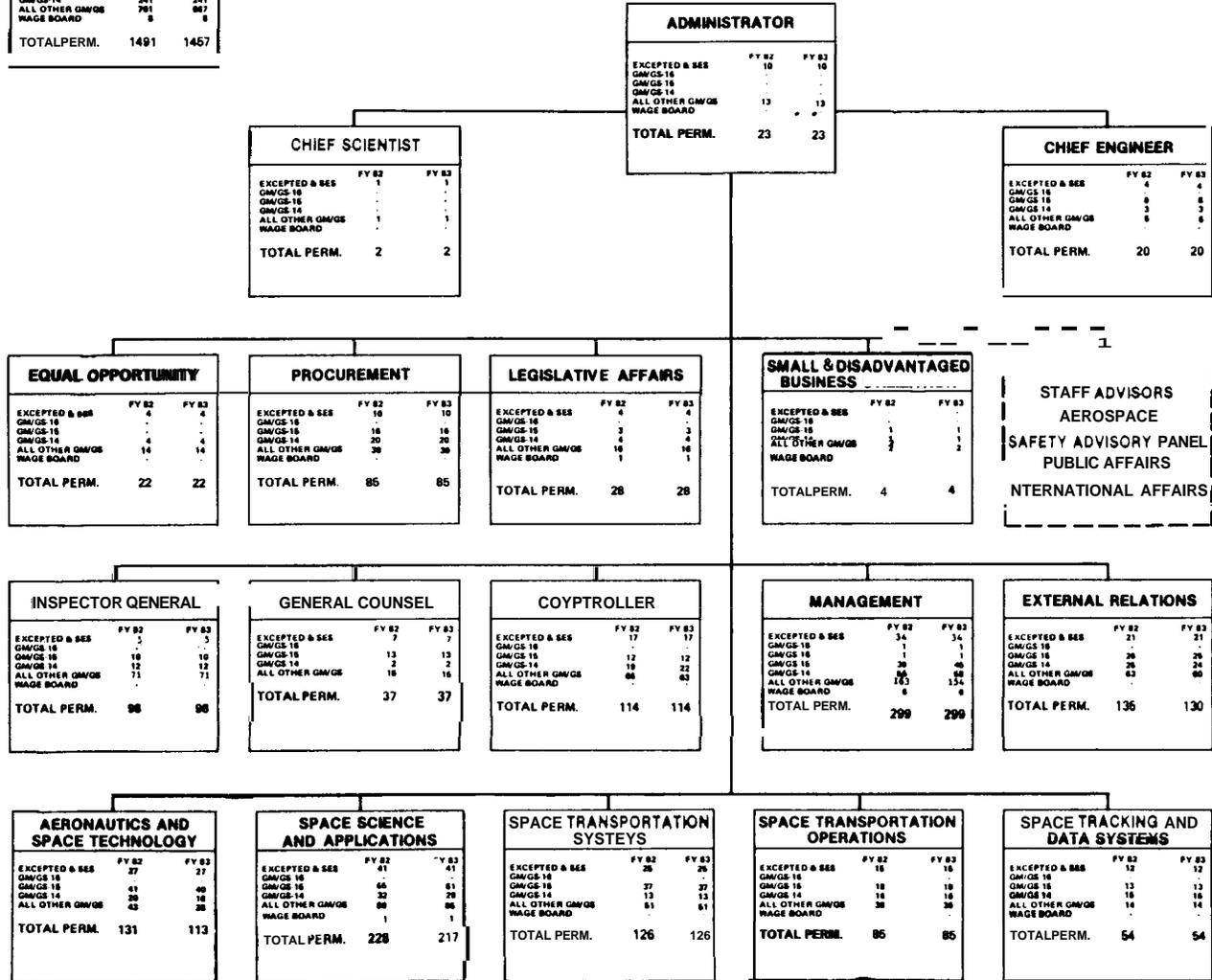
	<u>1981</u>	<u>1982</u>		<u>1983</u>
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
4. <u>Installation Common Services</u>	<u>4,808</u>	<u>6,185</u>	<u>6,360</u>	<u>6,843</u>

This function provides for those services which support the Headquarters generally, such as: patent services, maintenance and repair of office equipment and vehicles; minor Government services; contract histories; trucking and laboring 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 increase from the 1982 budget estimate to the 1982 current estimate reflects an increase in the cost of supplies, materials and postage. The 1983 budget estimate reflects expected support contractor rate increases and an increase in the cost of supplies and materials.

ORGANIZATION AND STAFFING

NASA HEADQUARTERS

HEADQUARTERS		
WYYARY STAFFNG		
EXCEPTED & SES	FY 82	FY 83
GM/GS-18	237	237
GM/GS-16	1	1
GM/GS-15	1	1
GM/GS-14	382	302
ALL OTHER GM/GS	241	241
WAGE BOARD	791	967
TOTAL PERM.	1491	1467



SPECIAL
ANALYSES



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1983 ESTIMATES

JET PROPULSION LABORATORY

DESCRIPTION

The Jet Propulsion Laboratory (JPL) is located in Pasadena, California, approximately 20 miles north of downtown Los Angeles. Subsidiary facilities are 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, JPL 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. 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, 1981 was \$407,665,000.

The Jet Propulsion Laboratory is a Government-owned installation of NASA, but it is also an operating division of the California Institute of Technology staffed with regular Caltech employees. Contract NAS7-100 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 entire cost of operating JPL is borne by the Research and Development appropriation, except for the lease or purchase of administrative aircraft and the purchase of passenger motor vehicles, which are funded from the Research and Program Management appropriation and are included in the NASA Headquarters budget. Accordingly, the Research and Program Management type costs presented in this special analysis for JPL are for purposes of comparison only and are not a part of the NASA Research and Program Management budget.

MISSION

The Jet Propulsion Laboratory has been assigned primary responsibility for the conduct of NASA projects concerned with scientific exploration of the planets and interplanetary space. The Laboratory is also assigned the 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 scientific investigation, research and analysis.

In more specific terms, Laboratory activities in support of NASA can be categorized as follows:

Planetary Exploration - Since the beginning of the nation's space activities, a major part of the Jet Propulsion Laboratory effort has been devoted to exploration of the solar system. The Nation's planetary exploration program is concentrated at the Jet Propulsion Laboratory which has an extraordinary record of successes over two decades in the exploration of planets, their satellites, and the interplanetary medium. The scientific return from these projects has been prodigious, and the implications for the future are boundless. In addition to the scientific return of the planetary projects, JPL has made a real contribution to the strength and security of the Nation through important technological advances that have been driven by the exceptionally demanding nature of deep space missions.

In the continuing series of planetary missions, the Jet Propulsion Laboratory has management responsibility for the Voyager mission. The two Voyager spacecraft were launched in 1977 and made close flybys of Jupiter and its major satellites in 1979. In 1980 and 1981 the Voyager spacecraft encountered Saturn. The Voyager planetary encounters obtained exceptionally unique scientific data. Voyager 2 is now on a trajectory to reach Uranus in 1986. In the meantime, Voyager 1 continues to collect and transmit data on the interplanetary space environment as it proceeds out of the solar system.

The Jet Propulsion 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. The orbiter will observe Jupiter and several of its major satellites at close range. JPL is the management center for the total project (orbiter and probe) and is developing the orbiter. The Ames Research Center is responsible for the probe development.

The International Solar Polar Mission (ISPM) is a cooperative effort between NASA and the European Space Agency (ESA). JPL is managing U.S. principal investigator instrument development and data analysis as well as providing mission support to ESA. ESA is developing a spacecraft and European instruments.

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 the two Landers, reached Mars during the summer of 1976. The Viking mission operations were repeatedly extended as the spacecraft far out-lived their design lifetimes. One Viking lander and the two Viking orbiters have now completed operations, but Viking Lander 1 continues to function and is programmed to transmit scientific data to Earth at weekly intervals for several more years.

The Jet Propulsion Laboratory has had project management responsibility for all Mariner missions, including design, assembly, integration, and testing of the spacecraft. The two most recently completed missions in the Mariner series are those of Mariner 9, which returned scientific data for nearly a year from an orbit around Mars, and Mariner 10, which gathered data in a close flyby of Venus followed by three separate encounters with Mercury.

Scientific Satellites - Consistent with the role as a center for Earth-orbital spacecraft development, JPL is managing the Infrared Astronomical Satellite (IRAS) project. This is a cooperative mission with the Netherlands and the United Kingdom. The spacecraft is being designed and built in the Netherlands while JPL is responsible for science experiment development and system testing activities now in progress. The launch is scheduled for late 1982.

JPL is also the project manager for an atmospheric science satellite, the Solar Mesosphere Explorer (SME), which was successfully launched from the Western Test Range 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 competitively procured through the Announcement of Opportunity process.

Space Applications - In support of the NASA Space Applications program, JPL is one of the principal Centers 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.

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 technology, 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.

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 Deep Space Network tracking stations are located in California, Spain, and Australia. The network supports projects involving flights beyond near-Earth orbits. The Mission Control and Computing Center is located in Pasadena. JPL is also implementing the Network Consolidation program which will collocate the residual Space Tracking and Data Network (STDN) near-Earth tracking stations (after the TDRSS becomes operational and eight STDN stations are closed) with the DSN stations located in California, Spain, and Australia. These consolidated facilities will be managed by JPL and will provide a more efficient, technically advanced and cost effective means of operation by the mid-1980's period.

Distribution of JPL Staff by NASA Program

	<u>1981</u> Actual	<u>1982</u>		<u>1983</u>
		Budget Estimate	Current Estimate	Budget Estimate
(Thousands of Dollars)				
<u>Direct Positions</u>				
<u>Space Transportation Systems and Operations</u>	5	4	4	4
Space shuttle.....	5	4	4	4
<u>Space Science and Applications</u>	<u>1.423</u>	<u>1.466</u>	<u>1.337</u>	<u>1.250</u>
Physics and astronomy.....	243	232	168	154
Planetary exploration.....	866	940	804	688
Life sciences.....	18	27	27	33
Space applications.....	267	266	330	372
Technology utilization.....	29	1	8	3
<u>Aeronautics and Space Technology</u>	<u>211</u>	<u>283</u>	<u>234</u>	<u>234</u>
Aeronautical research and technology.....	4	1	1	1
Space research and technology.....	185	257	233	233
Energy technology.....	22	25	--	--
<u>Space Tracking and Data Systems</u>	<u>449</u>	<u>432</u>	<u>468</u>	<u>480</u>
Tracking and data acquisition.....	<u>449</u>	432	468	480
Subtotal. direct positions.....	2.088	2.185	2.043	1.968
<u>Direct Support</u>	567	591	565	565
<u>Center Management and Operations Support</u>	<u>1.137</u>	<u>1,150</u>	<u>1.091</u>	<u>1.051</u>
<u>Total. permanent positions</u>	<u>3.792</u>	<u>3.926</u>	<u>3.699</u>	<u>3.584</u>

SIMULATED RESEARCH AND PROGRAM MANAGEMENT BUDGET

Summary of Fund Requirements

		1982		1983
	1981	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related Costs.....	144,789	146,357	158,077	154,383
II. Travel.....	6,099	8,150	6,751	8,224
III. Operation of Installation.....	30,897	37,526	35,067	40,006
A. Facilities Services.....	(16,702)	(20,896)	(18,522)	(20,933)
B. Technical Services.....	(5,531)	(5,557)	(6,095)	(6,734)
C. Management and Operations.....	<u>(8,664)</u>	<u>(11,073)</u>	<u>(10,450)</u>	<u>(12,339)</u>
Total, fund requirement....	<u>181,785</u>	<u>192,033</u>	<u>199,895</u>	<u>202,613</u>

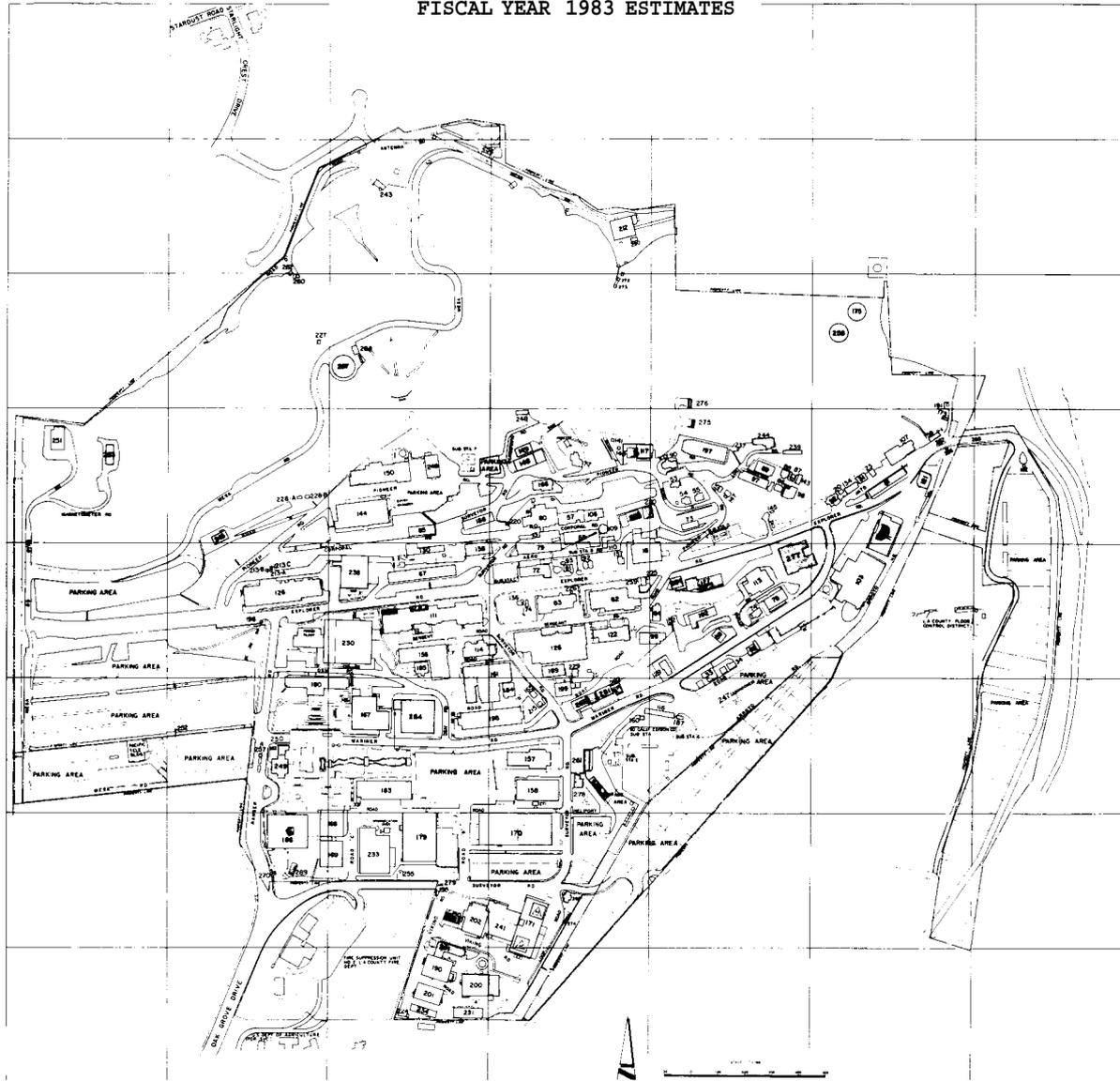
EXPLANATION OF FUND REQUIREMENTS

	1981	1982		1983
	<u>Actual</u>	<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
I. <u>PERSONNEL AND RELATED COSTS</u>.. .. .	144,789	146,357	158,077	154,383
<p>The increase from the 1982 budget estimate to the 1982 current estimate is due to the cost of pay increases and associated employee benefits. The decrease from the 1982 current estimate to the 1983 estimate is due to reduced workforce.</p>				
II. <u>TRAVEL</u>.....	6,099	8,150	6,751	8,224
<p>The decrease from the 1982 budget estimate to the 1982 current estimate is attributable to NASA programmatic changes that resulted in a lower 1982 JPL workforce. The increase from the 1982 current estimate to the 1983 estimate is due to higher air fares, hotel rates, and rental car costs.</p>				
III. <u>OPERATION OF INSTALLATION</u>.....	30,897	37,526	35,067	40,006
A. <u>Facilities Services</u>.....	(16,702)	(20,896)	(18,522)	(20,933)
<p>The decrease from the 1982 budget estimate to the 1982 current estimate is due to less than expected lease cost increases, decreased utility costs, and less equipment purchases. The increase from the 1982 current estimate to the 1983 estimate are due to higher utility rates.</p>				
B. <u>Technical Services</u>.....	(5,531)	(5,557)	(6,095)	(6,734)
<p>The increase from the 1982 budget estimate to the 1982 current estimate is based on experienced cost increases for services contracts. The increase from the 1982 current estimate to the 1983 estimate is due to increased costs for a continuing level of technical services.</p>				
C. <u>Management and Operations</u>.....	(8,664)	(11,073)	(10,450)	(12,339)
<p>The decrease from the 1982 budget estimate to the 1982 current estimate is due to lower usage of supplies, materials, and furniture and offset by increased communications costs. The increase from the 1982 current estimate to the 1983 estimate is due to communications costs as well as increased costs for documentation, transportation, and other administrative services.</p>				

**JET PROPULSION LABORATORY
FISCAL YEAR 1983 ESTIMATES**



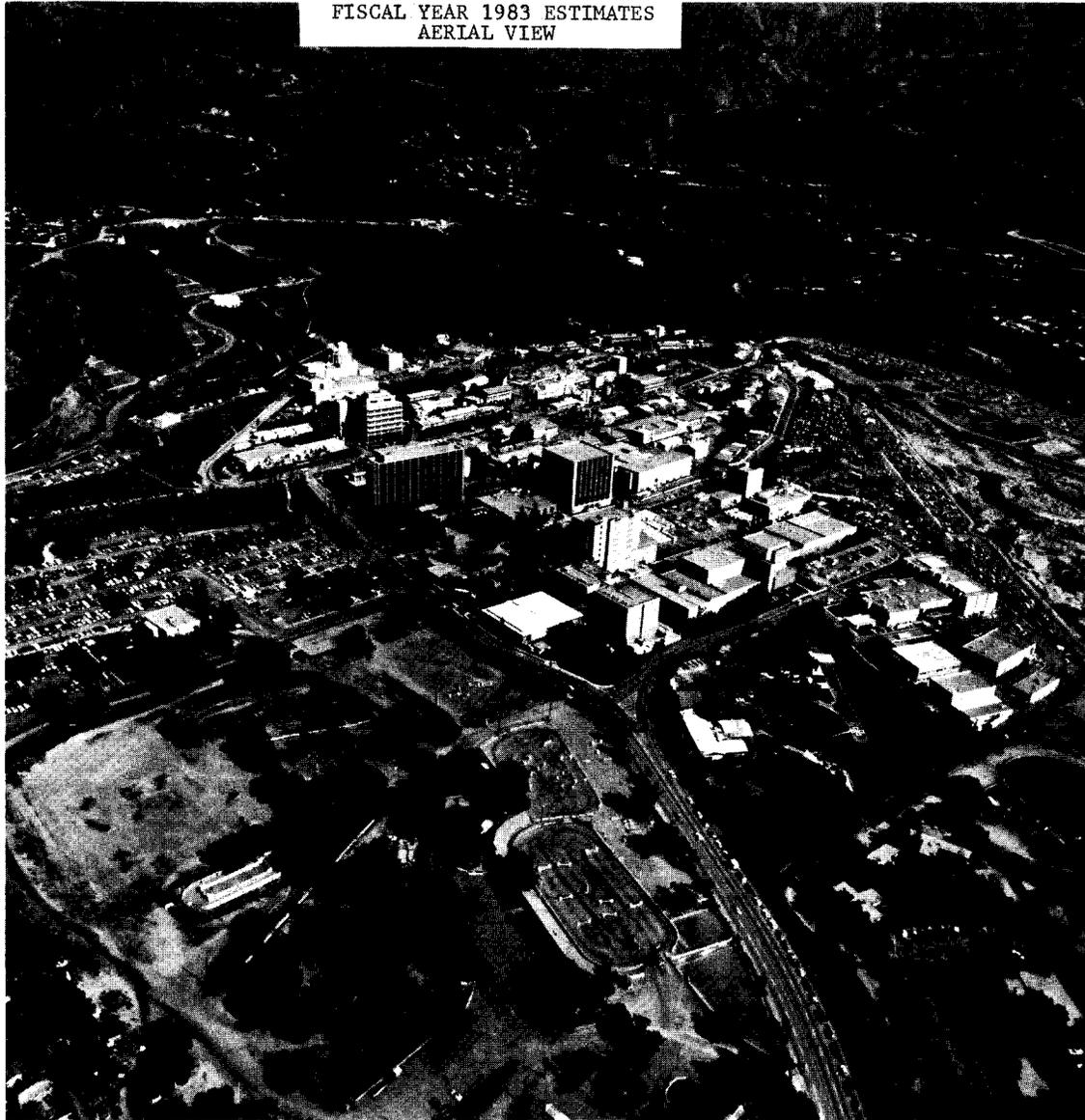
JET PROPULSION LABORATORY
LOCATION PLAN
FISCAL YEAR 1983 ESTIMATES



**JET PROPULSION LABORATORY
LEGEND**

Bldg. No.	Title	Location	Bldg. No.	Title	Location	Bldg. No.	Title	Location	Bldg. No.	Title	Location
11	Space Sciences Lab	E-2	103	Fabrication Shop	E-3	177	Transportation Garage	D-2	249	Visitor Reception Bldg	
13	Officer. Lab & Shop	D-3	106	Test Cell (Air Fuel)	C-2	179	Spacecraft Airy Facility	B-3	250	Guard Shelter	
18	Structural Test Lab	D-2	107	Test Cell	E-2	180	Central Engineering Bldg	B-3	251	Gyro Lab	
20	Shop Test Cell No. 2 (Liq)	D-2	109	Cooling Tower (Wind Tunnel)	C-2	182	Bus Stop Shelter	E-2	253	Low-Mag Interference Lab	A-?
23	Shop Test Cell No. 12 (Liq)	F-2	110	Fuel Star Tank	C-2	183	Physical Science Lab	B-3	255	Sewage Lift Station	B-?
31	Test Cell (Liq)	E-2	111	General Offices Bldg	B-2	184	Electronic Stores	C-3	256	Model Range Control Bldg	B-?
32	Test Cell (Liq)	D-2	114	Cafeteria & Offices	C-3	185	Programming Office	B-3	257	Guard Island	B-3
33	Test Cell (Liq)	D-3	115	Heating Plant (Solid)	D-2	186	Space Sciences Div Bldg	A-3	258	Water Reservoir	
34	Shop Test Cell No. 33 (Liq)	D-3	116	Propellant Storage Dock	D-3	187	Chemical (tor - e)	D-3	259	Liquid Nitrogen Bottling Sta	D-2
35	Mag Flux Tank Shelter	B-1	117	Test Cell (Solid)	D-2	188	Engineering Facilities Bldg	C-2	260	Illuminator Equipment Bldg	B-1
41	Hi-Temp Lab	D-3	118	Cooling Tower	C-3	189	Electronics Lab - Annex	C-3	261	Material Storage	C-3
42	Test Cell (Liq)	D-3	120	Cooling Tower	D-2	190	190A - Procurement Offices	B-4	262	Radiometer Bldg	B-1
46	Shop Test Cell No. 42 (Liq)	D-3	121	Employment Development Ctr	E-2	191	Hazardous Test Bay	E-2	263	Protective Services Bldg	C-3
47	Plant Protection	D-2	122	Engineering Offices	C-3	192	Propulsion Engineering	D-3	264	SFOF Sys Dev Lab	B-3
53	Conditioning Lab (Solid)	D-3	125	Combined Electronics	C-3	195	Guord Shelter	B-3	267	Water Reservoir	B-2
54	Blending Lab (Solid)	D-2	126	Systems Div Office Bldg	B-2	196	Guord Shelter	B-2	268	Pump House	B-1
55	Mixing Lab (Solid)	D-2	129	Test Cell (Chemistry)	D-3	197	Solid-Propellant Process Lab	D-2	269	Grounds Maintenance Bldg	C-4
57	Test Cell (Air Fuel)	C-2	130	Engineering Offices	C-2	198	Guidance Lab	C-3	270	Sewage Metering Station	A-J
58	Compressor Bldg	C-2	133	Service Dock	C-2	199	Celestial Simulator Bldg	C-3	271	Oil Barrel Stor	C-3
59	Chemistry Lab	D-3	134	Shop Test Cell	E-2	700	Plant Engineering Services	B-4	272	East Illuminator Bldg	C-1
65	Materials Lab	D-3	135	Guard Shelter	A-2	201	Carpenter Shop	E-4	273	East Illuminator Tower	C-1
67	Microbiology Facility	B-2	136	Cooling Tower	C-2	202	Procurement Offices	B-4	274	Cooling Tower	C-3
71	Mechanics Store	D-2	137	Cooling Tower	C-2	209	Illuminator Tower	D-1	775	Chemical Stor Prop Bldg	D-2
72	Engineering Officer	C-2	138	Engineering Offices	C-?	210	Blaine Truck	D-1	276	Chemical Stor Prop Bldg	D-2
73	Utilities Area Storage	D-2	140	Magazine X Temp	C-2	212	Antenna Lab	D-1	277	Isotope Thermoelectric Lab	D-2
74	Test Cell (Chemistry)	D-3	141	Magazine X Temp	C-7	213	Cooling Tower 'A', 'B' & 'C'	B-2	278	Helicopter Maint Hangar	C-3
77	Soil Science Lab	C-2	145	Magazine Propellant	D-2	218	Credit Union	B-3	279	Guord Island	B-3
78	Hydraulics Lab	D-3	147	Cooling Tower	D-2	220	C. R. S. Terminal Bldg	C-2	260	Static Test Tower	D-2
79	Wind Tunnel (20 inch)	C-2	148	Energy Conversion Lab	C-2	224	Sewer Lift Station	B-4	281	Fireman / Guard Station	C-3
80	Wind Tunnel (21 inch)	C-2	150	25-11 Space Simulator	B-2	225	Guord Shelter-Mela	C-1	283	Metal Storage Building	C-3
81	Battery Laboratory	E-2	152	Hazardous Chemical Stor	C-3	226	Solvent Storage Bldg	C-2	284	Transportation Office Bldg	D-2
82	Environmental Test Lab	C-2	156	Computer Program Office	B-3	227	Guord Shelter	B-1	285	Arroyo Bridge	E-2
83	Electronic Ports 6 Engineering	C-2	157	Engineering & Mechanics Bldg	C-3	228	Cooling Tower IA (6 B)	B-2	286	Guord Bldg. Arroyo	E-2
84	Test Cell & Solid Chemistry	D-2	158	Material Research Proc - Lab	C-3	229	Shielded Room Bldg	C-3	287	Island Guord Bldg	E-2
85	Business Systems Office	C-2	159	Pump House (Water)	E-2	230	Space Flight Operations Facility	B-2	288	Project Equipment Storage	C-2
86	Oxidizer Grinding (Solid)	D-2	160	Sewage Lift Station	C-3	231	Point Shop	B-4	'A' Gate	A-3	
87	Ovens (Solid)	D-2	161	Telecommunications Lab	C-3	233	Spacecraft Development Bldg	B-3	'B' Gate	A-1	
88	Mixing Lab (Solid)	D-2	165	Cooling Tower	C-3	234	Lumber Stor Bldg	B-4	'C' Gate	B-2	
89	Processing Lab (Solid)	D-2	166	Cooling Tower	C-2	237	Cooling Tower	D-2	'D' Gate	F-2	
90	Shop Test Cell No. 51	D-2	167	Cafeteria	B-3	238	Telecommunications Lab	B-2	'E' Gate	B-3	
91	Air Dryer (Wind Tunnel)	C-2	168	Space Sciences Instrmt Sys Lab	B-3	239	Low-Temp Solid Prop Mag	D-2	'F' Gate	B-2	
92	Cooling Tower (Wind Tunnel)	C-2	169	Engineering Office Bldg	B-3	241	Shipping & Receiving	B-4	'G' Gate	A-?	
93	Vaporizer (Wind Tunnel)	C-2	170	Fabrication Shop	C-3	243	Remote Antenna Range Contr	B-1			
97	Development Lab 6 Offices	D-2	171	Materials Service Bldg	C-4	244	Hi-Temp Stor Mag	D-2			
98	Preparation Shop (Solid)	D-2	173	Test Shelter	E-2	245	Spectroscopy Lab	B-7			
99	Chemistry Lab (Solid)	D-3	174	Cooling Tower	C-2	246	Soils Test Lab	C-2			
			175	Water Reservoir	E-?	248	10-It Space Simulator	C-2			

JET PROPULSION LABORATORY
FISCAL YEAR 1983 ESTIMATES
AERIAL VIEW



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1983 ESTIMATES

SUMMARY OF OFFICE OF	FICAL UTICS AND SPACE	ARCH / AND SPACE	TECHNOLOGY		
			CHNOLOGY		
			1982		1983
		1981 Actual	Budget Estimate	Current Estimate	Budget Estimate
			(Thousands of Dollars)		
Research and development.		271.4	264.8	233.0	232.0
Construction of facilities.....		44.0	22.7	22.7	20.1
Research and program management.....		210.5	213.6	218.0	234.2
Total.....		<u>525.9</u>	<u>501.1</u>	<u>473.7</u>	<u>486.3</u>
Number of direct positions associated with aeronautical research and technology		<u>3,729</u>	<u>3,762</u>	<u>3,748</u>	<u>3,764</u>

The objectives of the Aeronautical Research and Technology program are to provide advanced technology for the increased safety, economy, efficiency and environmental acceptability of air transportation systems in response to current and projected National needs; to support the Department of Defense in maintaining the superiority of U.S. military aircraft; and to keep U.S. aviation in the forefront of the international marketplace.

The FY 1983 Aeronautical Research and Technology program is directed toward meeting these objectives by stressing the technology areas judged to be the most critical by both internal NASA assessments and external assessments involving industry, military, advisory groups, other government agencies, and other users of the technology. Emphasis will be placed on maintaining a strong discipline oriented research and technology base supporting all vehicle types and on focused systems technology programs in support of the military.

Increased emphasis will be placed on research and technology base activities in FY **1983**, building on the substantial results from the ongoing program and utilizing both the unique facility capabilities and the expertise which reside at the NASA research centers. In particular, research efforts will increase in the following areas: fundamental supersonic research; analytical and computational methods to better understand and predict aerodynamic characteristics associated with flow over a variety of aircraft shapes; composite materials; analytical methods to improve life prediction and better understand and control the dynamic response of complex aircraft and engine structures; electronics and highly reliable, fault-tolerant aircraft control system software and architectural concepts; crew station technology; and alternative fuels. The research efforts in the various speed regimes will continue to pursue wind tunnel investigations on advanced aircraft and rotorcraft configurations and examine the effects of promising technology advances individually and in combination.

Systems technology efforts will continue on advanced rotorcraft concepts and technology for future high speed military aircraft. The rotorcraft activity will include research on new rotor configurations and other advances in joint programs with the United States Army. The high speed activity will investigate advanced technology and new configuration approaches in cooperative wind tunnel and flight research programs with the Air Force, Navy and Defense Advanced Research Projects Agency.

The construction of facilities program for FY **1983** in support of aeronautical research and technology includes three major projects: modifications to the Transonic Dynamics Tunnel (TDT) at the Langley Research Center, Hampton, Virginia; modifications to the 4 x 7 meter low speed tunnel at the Langley Research Center; and modifications to the 450 psi air system at the Lewis Research Center, Cleveland, Ohio.

The research and program management funding in FY **1983** provides for the salaries and travel of the **3,764** direct civil servants, for the utilities necessary to conduct wind tunnel operations, and for other general operation of installation costs necessary to conduct the NASA aeronautics program.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

RESEARCH AND DEVELOPMENT

ESTIMATED FY 1983 OBLIGATIONS FOR EQUIPMENT TO BE PLACED AT NASA INSTALLATIONS

<u>Program Budget Line Item</u>	<u>1983</u> (Thousands of Dollars)
<u>Space Transportation Systems</u>	<u>159,332</u>
Space Shuttle....	(122,509)
Space Flight Operations.....	(36,823)
Expendable Launch Vehicles.....	(---)
<u>Space Science and Applications</u>	<u>15,895</u>
Physics and Astronomy.....	(3,151)
Planetary Exploration.....	(181)
Life Sciences.....	(2,298)
Space Applications.....	(10,265)
<u>Aeronautics and Space Technology</u>	<u>45,262</u>
Aeronautical Research and Technology.....	(37,678)
Space Research and Technology.....	(7,584)
<u>Tracking and Data Acquisition</u>	<u>22,600</u>
GRAND TOTAL.....	<u>243,089</u>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1983 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1983 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Shuttle	Johnson Space Center Bldg. 35, 72-76-01	Guidance and Navigation Simulator (GNS)	Provides additional Univac 1100/44 computer hardware necessary to configure a host computer system for a Shuttle GNS.	3,692	CoF Project 9370: FY81 \$400K (Phase I) FY82 \$250K (Phase II) FY84 \$650K (Phase III)
Space Shuttle	Johnson Space Center Bldg. 12, 72-81-03	1108 Replacement Central Computing Facility	Increases capacity to cover current requirements and eliminate reliability problems caused by 15-year- old-equipment.	5,469	CoF Project 9226: FY82 \$175K FY83 \$420K
Space Shuttle	Johnson Space Center Bldg. 12, 72-82-03	1100/81 Hardware Lease/Purchase Central Computing Facility (CCF)	Augments the CCF and alleviates the existing shortfall in the CCF's capability to meet user requirements.	1,858	FY80 CoF Project 7290
Space Shuttle	Johnson Space Center Bldg. 30, Administrative Wing, 72-82-04	Software Production Facility	Provides mission reconfiguration of Orbiter onboard software for STS.	4,865	CoF Project 9370: FY81 \$490K (Phase I) FY82 \$350K (Phase II)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS IN FY 1983 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1983 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Shuttle	Johnson Space Center Bldg. 5, Mission Simulation and Training, 72-83-01	Shuttle Mission Simulator 3	Supports additional training required for STS crew members and flight control personnel as a result of increased flight rate.	17,500	FY84 CoF
Space Shuttle	Johnson Space Center Bldgs. 12, 30, and others, 72-83-03	Institutional Communication Network, Central Computing Facility	Reduces costs over current method of computer communications.	300	FY84 CoF
Space Shuttle	Johnson Space Center Bldg. 12, 72-83-04	Xerox 9700 Printing System	Replaces existing Xerox 1200 printing systems in order to meet the form alignment requirements..	195	
Space Shuttle	Kennedy Space Center Pad B, 76-82-03	Operational Television (OTV) System	Provides remote viewing and recording of operations of equipment at the launch pad, which may be inaccessible or too hazardous for on-the- scene observation.	2,738 (reprogrammed from FY82)	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN **FY 1983** BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1983 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Shuttle	Kennedy Space Center Pad B, 76-82-06	Payload Ground Handling Mechanism	Removes and installs payload into the Shuttle vehicle at the launch pad.	5,416 (reprogrammed from FY82)	
Space Shuttle	Kennedy Space Center Warehouse 2, 76-82-07	Shuttle Inventory Management System (SIMS) II	Supports USAF and NASA logistic functions for the Space Transportation System (STS),	2,136	
Space Shuttle	Kennedy Space Center Launch Complex 39 , 76-83-01	Launch Processing System/Software Production Facility	Supports the mission model reaching 24 missions per year, 2 per month.	13,340	
Space Flight Operations	Johnson Space Center Bldg. 5 , Mission Simulation and Training, 72-76-03	Shuttle Mission Simulator (SMS)	Provides full mission trainina for the flight crews and flight controllers.	1,446	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-77-01	Shuttle Data Processing Complex	Replaces computers that will not accommodate the Shuttle data handling requirements.	535	FY77 CoF Project 9370

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1983 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1983 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Flight Operations	Johnson Space Center Bldg. 30, 72-77-04	Network Interface Processor (NIP)/ Hardware	Interfaces the Orbiter Multi-Rate Data Systems from the Space Tracking Data Network (STON)/ Tracking Data Relay Satellite (TORSS).	454	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-78-01	Wide Band Recorder/Switch	Provides capability for switching and recording all data input to the Mission Control Center.	650	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-78-02	Display Control/ Shuttle Data Processing Complex Interface	Provides information required by flight team, Mission Control Center team, and Network team.	5,405	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-78-03	Orbiter Data Reduction Complex	Supports data processing requirements for Orbital Flight Test, Shuttle Avionics Integration Laboratory, Orbiter ground tests, and Shuttle Program Information Management Systems.	1,102	FY83 CoF Project 9370
Space Flight Operations	Johnson Space Center Bldg. 30, 72-78-05	Digital Voice	Converts digital voice from onboard Shuttle to its normal analog output.	596	
Space Flight Operations	Johnson Space Center Bldg. 30, Administrative Wing, 72-79-05	Flight Planning System III	Increases design capability for Shuttle missions from 20 flights/year to 40 flights/year.	2,325	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1983 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1983 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-06	Hard Copy	Provides hard copy of Digital Data Display from the Shuttle Data Processing Complex.	340	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-07	Payload Operations Control Center (POCC) Decommutator	Provides the capability to process, command and control parameters from several independent payload data streams simultaneously.	3	FY80 CoF Project 9370
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-08	Wide Band Interface Equipment	Provides capability to bring independent payload high rate data streams into the POCC.	647	FY80 CoF Project 9370
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-09	Payload Data Interleaver (PDI)	Processes and displays data from the Orbiter downlink through the PDI.	160	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-81-01	Reconfiguration Data Collection System	Collects reconfiguration data and constructs tables necessary for reconfiguration of the Mission Control Center to support Shuttle flights.	444	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-81-04	FR80 Microfiche Upgrade	Provides flight control mission and Shuttle Development Lab products.	100	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1983 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1983 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Flight Operations	Johnson Space Center Bldg. 30, 72-81-05	NASA Encryption	Provides communication security for the Shuttle on NASA missions.	213	FY80 CoF Project 7290
Space Flight Operations	Johnson Space Center Bldg. 4, 72-83-02	Mission Control Center (MCC) Console Trainer	Provides individual systems training of flight control personnel to augment training provided during integrated MCC/Shuttle Mission Simulator Simulations.	410	
Space Flight Operations	Kennedy Space Center Operations and Checkout Building, 76-82-01	Multi-Mission Support Equipment (MMSE) Second Set	Transports payloads from payload processing facilities to Orbiter Processing Facility to Pad and return.	3,658	
Space Flight Operations	Marshall Space Flight Center, Slidell Computer Complex, Bldg. 902. 62-83-01	U-0770 Printer Replacement	Replaces inoperative laser-type printers that cannot meet existing workload or projected increase in workload.	266	
Life Sciences	Johnson Space Center Bldg. 36, 72-80-04	Life Sciences Payloads Science Monitoring Area, Support Data Systems and Display Equipment	Supports the real-time monitoring of Life Sciences Shuttle/Spacelab experiments.	142	FY80 CoF Project 77-JSC-027- M-P-M
Space Applications	Goddard Space Flight Center, Bldg. 22, 51-82-10	Goddard Modeling Activity Advance Computer System	Supplants and extends capability of existing Amdahl 470 V/6 computer system.	5,220	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1983 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1983 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Applications	Johnson Space Center Bldg. 17, 72-82-08	Earth Resources Research Division (ERRD) (previously titled Earth Observations Division Laboratory System)	Processes Landsat data used in the AgriSTARS Program.	585	
Aeronautical Research and Technology	Ames Research Center Bldg. N-233, Central Computer Facility, 21-83-01	Computer Output on Microfilm (COM) Facility Expansion	Supplements an existing COM facility which is becoming saturated.	350	
Aeronautical Research and Technology	Ames Research Center Bldg. N-233, 21-83-02	Mass Storage System	Provides on-line mass storage of data in support of the large-scale computers located in the Central Computer Facility.	1,600	
Aeronautical Research and Technology	ARC Dryden Flight Research Facility Bldg. 4801 Simulation/ RPRV Facility, 21-83-03 (previously 24-82-03)	Simulation and RPRV Computer System	Replaces similar equipment with insufficient capacity to perform the Simulation and RPRV support activities for remote piloted research vehicles.	300	
Aeronautical Research and Technology	ARC Dryden Flight Research Facility Bldg. 4820 Flight Loads Research Facility, 21-83-04 (previously 24-82-02)	Refurbishment and Upgrading the Thermal and Mechanical Loads Control System	Replaces existing, obsolete thermal and mechanical loads control system used for tests on aircraft components of aircraft.	1,300	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1983 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1983 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Aeronautical Research and Technology	ARC Dryden Flight Research Facility Bldg. 4838 Data Analysis Facility, 21-83-05 (previously 24-82-01)	Central Computer Replacement	Ensures the capability of analyzing flight research data through the 1980's at Dryden.	2,660	
Aeronautical Research and Technology	Lewis Research Center Bldg. 142 Research Analysis Center, 22-83-01	High Speed Analytical Processor (HSAP)	Provides major improve- ment in computing speed for long duration computational requirements, initially supporting fluid mechanics and structural dynamics programs.	6,400	
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 14, 51-80-04	Space Telescope Operations Control Center Data System	Required to conduct the real-time operation of the Space Telescope Observatory with planned mission life of 17 years. The data system will require new space area of 5,000 square feet.	9,000	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1983 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1983 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 14, 51-80-02	POCC Pilot Model (POCCNET). This acquisition is the continuation of the design and procurement of several mini/midi computers and peripherals to be used as a nucleus for the new POCCNET pilot model POCC. The pilot model will demonstrate the concept of distributed processing, virtual peripherals common software, shared resources and computer networking.	Required to support the mission control workload in the 1980's and beyond in order to meet quick turnaround, increased support requirements and to minimize the development and recurring costs associated with each new mission. The POCCNET concept is envisioned as very cost effective in the TDRSS/STS/Spacelab era.	300	
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 23, 51-81-01A	Computers, video, audio analog, high density recorders, and time code converters needed to capture data up to 50 MBPS peak rate for Spacelab missions.	Equipment is to build the Input Processing System to capture, quality check, and preprocess Spacelab data.	2,800	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1983 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1983 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 23, 51-82-04	Univac 1100/82 Computer peripherals upgrade and replacement.	Discs, tape units and drums for reliability, redundancy and through- put to edit, time correct, generate fill data, decomm science data and produce experimenter data tapes for the output processor for Spacelab data processing and Free Flyer spacecraft.	1,400	
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 14, 51-82-05	Mission Operations Computing Facility (MOCF). Required to replace obsolete Flight Dynamics System (FDS) .	Provides mission analysis and attitude computing capability to GSFC's POC's as required.	1,600	
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 14, 51-82-06	Mission Operations Computing Facility (MOCF). Required to replace the obsolete Command Management Systems (CMS) .	Provides on-board management support computing capability to GSFC's POC's as required.	700	
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 14, 51-82-07	Mission Operations Computing Facility (MOCF). Required to replace obsolete Orbit Computing System (OCS) .	Provides mission operations orbit support computing capability to GSFC's projects.	4,900	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1983 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1983 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 23, 51-82-09	Computer and special data capture equipment	Provides a capability to capture, quality check, and account for packetized data from the Space Telescope and route data to the Science Institute.	1,900	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1983 ESTIMATES

SUMMARY OF CONSULTING ICES ESTIMATES

	<u>1981</u> Actual	<u>1982</u> Budget Current Estimate Estimate (Thousands of Dollars)		<u>1983</u> Budget Estimate
<u>Research and Program Management</u>				
Consultants Employed by NASA.....	485	653	650	650
Contractual Services.....	<u>388</u>	<u>550</u>	<u>550</u>	<u>600</u>
Subtotal, R&PM Funds.....	873	1,203	1,200	1,200
<u>Research and Development</u>				
Contractual Services.....	<u>2,362</u>	<u>4,404</u>	<u>4,400</u>	<u>4,400</u>
Total, NASA.....	<u>3,235</u>	<u>5,607</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. The management controls established 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

	<u>1981</u>	<u>1982</u>		<u>1983</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)		
Consultants Employed by NASA.....	485	653	650	650

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 outsiders, in addition to NASA civil service personnel, provides the agency with an independent view that assures that selections represent those 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.

Consultant Services.....	388	550	550	550
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NASA contracts with consulting firms for studies of functional processes on a selected basis. In FY 1983 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.....	2,362	4,404	4,400	4,400
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In consonance with its legislative charter, NASA seeks to use the advice from many sources in the private sector on what would be the most productive future programs to assure that before any program or project is presented to the President or the Congress for approval, 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 1983, 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.

<u>1981</u> <u>Actual</u>	<u>1982</u>		<u>1983</u>
	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>

(Thousands of Dollars)

Studies of Future Operational Modes..... **1,450**

These funds will continue the contractual support of two major studies of the organizational structure for the transition to future operational modes: STS operations beyond DDT&E, and Tracking and Data Acquisition operations with TDRSS. The changes in each of these areas will represent major departures from the way we have been doing business in the launch vehicle and tracking functions. The consulting services contracts provide independent evaluation of various options.

Other Consulting Studies..... 350

From time to time the use of outside consultant firms provides a valuable input to decision making. These studies are in the area of management structure, and program evaluation and effectiveness. The specific studies are not defined in advance, but are approved based on demonstrated need.

